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and Its Practical Applications

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# INDEX TO VOLUME LXIV

## GENERAL INDEX

Entries from the Digest of Current Electrical Literature are indicated by D (Digest)

### A

Accident prevention:  
—Don't point at anything electrical, \*626  
—Eye protection from flashes when opening switches, 820  
—Hints, 910  
Industrial plants. By Vogel, (D.) 727  
Industrial safety congress at Chicago, 798  
Photographs. Use of, Rochester, N. Y., \*435  
Progress in, 553  
Relative values of preventive methods. By L. R. Palmer, \*171  
Report of Massachusetts Industrial Accident Board, 554  
Safeguarding employees around series lighting circuits, 1257  
Safety "Hold card," \*773  
Switches and mice, 1257  
Turbo-exciter safeguard, 822  
Accidents. Electrical, in Chicago, 481  
Accounting:  
—Depreciation:  
    Discussion by American Gas Institute, 893  
    Equipment of an electric plant, 1161  
    Reserves for. By H. A. Fee, 82  
    Going value. Two views of, by Erickson of Wisconsin and Duncan of Indiana, 651  
    Short cut methods for small stations, Vicksburg, Miss., \*30  
    Stockroom. By E. A. West, 815  
    Acetylene flame as a light source. By L. A. Jones, \*181  
Acetylene hand-lamp for line inspection, Portland, Me., \*479  
Acetylene torch for soldering connections, Prest-O-Lite, \*95  
Advertising by central stations:  
—Alliance, Ohio, Electric show, \*185  
—Arlington, Mass., House of Edison Light, 134  
—Buffalo, N. Y., Users of electricity classified, \*619  
—Fort Wayne, Ind., Motion picture shows, 524  
—Kansas City, Mo., Newspaper advertisements, 815, \*913  
—Low cost of service advertised, Newark, Ohio, 1252  
—Motion pictures, Fort Wayne, Ind., 524  
—New York Edison Co.:  
    Newspaper advertising in many tongues, \*429, \*181  
    Window displays, \*230  
—Noblesville, Ind., Window display, 815  
—Posters for street cars issued by Society for Electrical Development, \*1052  
—Rockford, Ill., Putting in personality, 914  
—St. Louis, Mo.:  
    Co-operative newspaper advertising, \*1109  
    Human-interest note, 331  
—Value of publicity to the small station. Results at Grimsby, Eng. By W. A. Vignoles, (D.) 142; Comment, 114  
—Worcester, Mass., Newspaper advertising, \*477  
Advertising by dealers and contractors:  
—Baseball "fans" in window display, Western Electric Co., \*92  
—Booklet aids fixture sales, Montreal, 248  
—Booklet "Gifts That Please," \*866  
—Catalogs for fixture display, Central Electric Co., \*201  
—Chicago window display, \*347  
—Children interested in advertising, \*200  
—Christmas campaign, Beardsley Chandelier Mfg. Co., \*99  
—Christmas suggestions. By A. J. Edgell, \*1022, \*1065; H. W. Alexander, \*1068, \*1155  
—Fan advertising. St. Louis, Federal Sign System, \*200  
—Fan business doubled by sales campaign, 1122  
—Flat-top window display, Duncan & Goodell, Worcester, Mass., \*248  
—New Year window display. By A. J. Edgell, \*1267  
—Randy window display, Salt Lake City, \*150  
—Thanksgiving suggestions. By A. J. Edgell, \*926  
—Voltmeter of kerolic size for window display, Montreal, \*201  
—Washing-machine window display. Methods of Western Electric Co., \*200  
—Window cooking demonstration, \*831  
—Window display in the interest of economy, \*1169

Advertising by dealers and contractors: (Cont'd)  
—Window display representing flutering moths, \*395  
Aeroplane, Military, German, (D.) 532  
Agriculture, Electricity in:  
—Dairy. Cost of operating, 941  
—Indiana:  
    Data on small towns and rural service, \*522, 912  
    Rural development. By A. R. Holliday, 652  
    Sign lighting by farmers, \*963  
—Milk purification. Electrical:  
    Report. By J. M. Beattie, (D.) 389  
    Stamford, Conn., \*1153  
—Noblesville, Ind., Meter practice, \*1110  
—Service for the farmer. By C. L. Brown, 895  
—Silos, Steam-power versus electricity for filling. Noxville, Ind., \*514  
—Springfield, Mo., \*1109  
—Threshing with electricity in Iowa. By F. S. Dewey, \*378  
Air, Electric strength of. By J. B. Whitehead and W. S. Gorton, 16  
Air compressors:  
—Combined electric and hydraulic drive, 616  
—Electrically-driven, in English shipyard, \*96  
—Portable motor-operated, Sullivan, \*487  
—Wernicke-Hatcher rotary, \*1020  
Alarm bell for lightning arresters, \*676  
Alpha particles. Mass and velocities of, from radioactive substances. By Rutherford and Robinson, (D.) 1015  
Alternating-current ammeter readings. Meaning of. By W. S. Franklin, \*1112  
Alternating-current circuit. Kinematical model for displaying instantaneous relations between the pressure, current, power and energy. By A. E. Kennelly and H. C. Crane, \*976  
Alternating-current diagrams. Representation of power in. By A. A. Nims, (D.) 239  
Alternating-current lines. Calculation of composition. By A. E. Kennelly, (D.) 727  
Aluminum. Electrolytic insulation. By C. E. Skinner and L. W. Chubb, 766; Comment, 747; E. V. Pannell, 916  
American Bar Association, Meeting of Patent section, 797  
American Electric Railway Association, Convention, 748  
American Electrochemical Society, Convention, 702  
American Gas Institute:  
—Annual meeting, 796  
—Discussion on depreciation and rates, 893;  
    Comment, 890  
American Institute of Electrical Engineers:  
—Board of Directors, First meeting, 367  
—Detroit convention, 13  
—Edition medal presented to Dr. Charles F. Brush, 13  
—New York meetings, 650, 751, 991, 1084, 1190  
—Philadelphia meetings, 648, 752  
—Pittsfield meeting, 749  
—Postponement of Electrical Congress, 748  
—Spokane convention, 367, 606  
—Standardization rules, 116, 162; (D.) 1115  
American Institute of Metals, Discussion of the use of the electric furnace for brass melting, 556  
American Patent Law Association, 701  
American Physical Society, Meeting, 1085  
American Roentgen Ray Society, Annual meeting, 601  
American Society of Mechanical Engineers, Annual meeting, 106  
American Wood Preservers' Association, Convention, 1084  
Ammeters:  
—Direct-current cable-testing, Metropolitan, \*827  
—Effect of wave form on moving-vane. By R. B. Burrows, (D.) 875; Comment, 842  
—Pocket-size volt-ammeter, Hoyt, \*922  
Ampere-hours-meters:  
—Development of. By W. Strelow, (D.) 921  
—Friction compensation. By W. Strelow, (D.) \*1016  
Anchor, Friction and pull. Barbed Anchor Mfg. Co., \*925  
Annunciator drop, Electrically reset. Edwards, \*1061  
Appraisal (See Valuation)  
Arc as a generator of high-frequency oscillations. By F. Mercer, (D.) 1261  
Arc lamps:  
—Carbons, Ayron patent, (D.) 91

Are lamps: (Continued)  
—Electrode industry in Great Britain, (D.) 387, 628, 101  
—Feed controller, Speed Controller Co., \*827  
—Flame:  
    Advantages. By L. C. S. Wood, 508  
    Comparison with other illuminants for the iron and steel industry. By A. T. Baldwin, 671  
    Electrodes. By H. Stafford Hatfield, (D.) \*96  
    German long-burning inclosed, \*394  
    Westinghouse ornamental flame-carbon, \*43  
—French patents. By T. Pausert, (D.) 483  
—Luminous-arc lamp, Improvements in. Electrode design and development of spasmic refractors. Development of 5-amp system, \*661; Comment, 647  
—Operation under high atmospheric pressure in Breslau, by Prof. Lumer, (D.) 678  
—Photographic use of. By V. A. Clarke, \*956; Comment, 939  
—Stage lamp, Universal, \*198  
Arcing at direct-current contacts, 386  
Armour Institute of Technology, Electric vehicle course, 552  
Artificial daylight (See Lighting)  
Asphalt plant, Electrical equipment, Chicago, \*476  
Association of Edison Illuminating Companies. Conventions, 409, 555, 602  
Association of Iron and Steel Electrical Engineers:  
—Discussion of the use of electricity in the iron and steel industry, 667; Comment, 645  
—Meetings, 60, 505, 667  
Association of Railway Electrical Engineers. Convention, 785, 896  
Atomistic theory of energy. By Saul Dushman, (D.) 777  
Auton, (Operating features of the. By E. H. Armstrong, 1149; Comment, 1131  
Austria. Electrical industry. By Emil Honigsmann, (D.) 193, 875  
Automobile business:  
—Boston matters, 5, 701, 893  
—Co-operation between the various branches of the industry, Discussion at Chicago, 846  
—Discussions at New England section, Convention of National Electric Light Association, 798  
—Effect of Philadelphia convention, 793, 798  
—European conditions. By P. D. Wagoner, Comment, 891; H. Beckmann, (D.) 1211; Comment, 1182  
—Low-priced electric automobile, 798, 841; By F. V. Gallagher, 1112  
—Middle of the road and the electric vehicle, 109  
—New England, 475  
—Philadelphia, Vehicle battery charging load desirable, \*1010  
—Pioneer spirit in the industry. By R. M. Lloyd, 889  
—Progress of the electric vehicle and the opportunities of the cheap car, Discussions at Philadelphia convention, 798  
—Stimulating progress, 888 of electric vehicles. By J. H. McCraw, 799, 864  
—(See also Trucks, Electric)  
Automobile door lock, Electrically operated, \*1118  
Automobile horn, push-button, Typhoon, \*295  
Automobile lamps:  
—Boch, \*343  
—Dashboard lamp, Williamson, \*1062  
—Lighting and dimming switch, Connecticut, \*97  
—Searchlight, Pittsburgh, \*1062  
—Three-in-one signal lamp, Standard, \*247  
Automobile steering wheel, Electrically heated, \*1262  
Automobiles, Electric  
—Advantages to the physician, 1252  
—Anderson carbide, \*1262  
—Battery system, Interchangeable, \*1266  
—Berlin, Germany, Conditions in. By E. W. Lloyd, 316  
—Buffalo 1915 coupe, \*630  
—Charging. Universal. By L. E. Gould, 527.  
—Charging plug and receptacle, British recommendation, (D.) 824  
—Cheap electric vehicles. By F. V. Gallagher, 298, 841, 1112  
—Cost. By G. H. Kelly, 799  
—Course of instruction at Armour Institute, 552  
—Discussions at Philadelphia convention, 847

\* Indicates illustrated articles.



Automobiles, Electric. (Continued)

- Kinetic energy. Proposal to use energy of descent in hilly districts. Comment on paper by T. H. Schoepf, 843
- Milburn coupe, \*778
- Ohio Electric Car Co., \*1215
- Ohio data, 219
- Three-unit, two-unit and single-unit systems designed for lighting, starting and ignition purposes. By G. T. Hanchett, 1196
- Use of automobile for testing purposes, Spokane, Wash., \*1160
- Waverley 1915 model, \*1168
- (See also Trucks, Electric)
- Aviation, Wire-telegony in. By H. Thurn, (D.) 438; Comment, 454

**B**

- Bag for lineman's rubber gloves, 186
- Barber pole, Electrically illuminated, Kochs, \*772
- Barker, Forrest E., Death of, \*1037, 1138, 1208
- Battery, Motorcycle, \*733
- Battery charge, Hydrometer for showing, Fritsch, \*296
- Bearing currents, Destructive effect of. By E. G. Merrick, (D.) 823
- Bearings, Repairing large warped. By J. G. Kopp, \*771
- Bell ringer, Electrical, Chicago, \*139
- Bells, Electric:
  - Tolling, General Electric, \*94
  - Skeleton transformer, signal, Empire, \*390
- Blast-furnace gases, Cleaning and utilization. By J. E. Johnson, (D.) 970
- Blue-printing machines:
  - Revolute, high-speed, \*247
  - Wicks compact continuous electric, \*346
- Boiler house, Design and operation. By S. E. Fedden, (D.) 91
- Boiler-room economy, Interesting firemen in, Danville, Ill., 482
- Boilers:
  - Chemical economy in treatment of boiler water, 1160
  - Damper regulator, Restoring operation of, \*236
  - Feed water, Necessity of good, 725
  - Feed-water purification. By W. B. Campbell, 231
  - Quick firing, Scheme to aid, \*1209
  - Types for peak load conditions, 625
- Book reviews:
  - American Electricians' Handbook. By Terrell Croft, 532
  - Application of Electric Power to Mines and Heavy Industries. By W. H. Patchell, 629
  - Commission Regulation of Public Utilities, 921
  - Construzione Elettromeccaniche. By Ettore Morelli, 1060
  - Continuous and Alternating-Current Machinery. By J. H. Morecroft, 411
  - Economics of Business. By N. A. Brisco, 875
  - Eisenbahn-Technik der Gegenwart. Edited by E. C. Zehme, 24
  - Electric Arc Phenomena. By Ewald Rasch, 41
  - Electric Cooking, Heating and Cleaning. By Maud Lancaster, 825
  - Electric Light Accounts and their Significance. By H. M. Edwards, 1261
  - Electric Light and Motor Wiring. By G. E. Kitchgasser, 93
  - Elektrizitätszähler für Gleich, Wechsel und Drehstrom. By H. W. L. Bruckmann, 1164
  - Elementary Magnetism and Electricity. By E. M. Jansky, \*772
  - Elementary Principles of Illumination and Artificial Lighting. By Arthur Blok, 241
  - Elementary Principles of Wireless Telegraphy. By R. D. Bangay, 1213
  - Elementary Statistics. By Franklin and MacNutt, 294
  - Fabrikation und Eigenschaften der Metall-drahtlampen. By N. L. Muller, 241
  - Fuel Economy and CO<sub>2</sub> Records. By A. R. Majner and C. H. Bromley, 485
  - Furnace Efficiency, Combustion and Flue Gases. By J. C. Peckles, 194
  - Future of the Working Classes. By R. W. Balmson, 777
  - Gesammelte Elektrotechnische Arbeiten, 1897-1912. By F. Eichberg, 1164
  - Handbook of Electrical Methods, 532
  - Handbook of Tables and Formulas for engineers. By C. A. Peirce and W. B. Carver, 117
  - Handbuch der Elektrizität und des Magnetismus. By L. Graetz, 143
  - High and Low Tension Switchgear Design. By C. C. O'Neil, 728
  - How to Build up Furnace Efficiency. By J. W. Hays, 294
  - Incandescent Electric Lamps and their Application. By D. H. Ogley, 143
  - Konstruktion und Prüfung der Elektrizitätszähler. By A. Königsworther, 1213
  - Management of Public Electric Supply Undertakings. By A. H. Seabrook, 875
  - Mathematics for the Practical Engineer. By C. H. Bromley and H. R. Cobleigh, 389
  - Mechanical Design and Construction of Generators. By R. Livingstone, 438

Book reviews: (Continued)

- "Mechanical World" Electrical Pocket Book for 1914, 581
- "Mechanical World" Pocket Diary and Year Book for 1914, 581
- Municipal Ownership of Street Railways in the District of Columbia, 342
- National Foreign Trade Convention, 1060
- Practical Telephone Handbook and Guide to the Telephone Exchange. By J. Poole, 342
- Practical Treatise on Subaqueous Foundations. By C. E. Fowler, 389
- Principles of Automatic Telephony. By Walter Atkins, 294
- Proceedings of the Twenty-fifth Annual Convention of the National Association of Railway Commissioners, 1017
- Quarzlampe, Ihre Entwicklung und ihr Heutiger Stand. By Dr. J. C. Pole, 825
- Railway Library, 1913, 971
- Recherches sur les Phénomènes de la Commutation. By J. Rezelman, 1117
- So the People May Know. By H. L. Doherty, 921
- Switches and Switchgear. By R. Edler, 728
- Telegraphie Sans Fil: La Téléphone Sans Fil: Applications Diverses. By G. W. Peit and Leon Bouthillien, 680
- Telephone Construction, Installation Wiring, Operation and Maintenance. By W. H. Radcliffe and H. C. Cushing, Jr., 921
- Telephone Instrument de Mesure. By Augustin Guyau, 971
- Theorie der Wechselstrom. By Alfred Francmel, 194
- Wissenschaftlichen Grundlagen der Elektrotechnik. By Gustav Benischke, \*93
- Year Book of Wireless Telegraphy and Telephony, 342
- Boston Edison Company purchases energy in bulk, 552
- Brakes, Automatic solenoid, General Electric, \*233
- Brass melting in electric furnace, Discussion by American Institute of Metals, 556
- Braun cathode ray tube. By F. C. Kock, (D.) 1060
- Breakdown voltage and height above sea level. By A. Kleinstueck, (D.) \*776
- British Municipal Electric Association, Annual convention, (D.) 41
- Brush discharge, Direct-current. By S. P. Farwell, (D.) 388
- Bucket, Electrically-operated clam-shell, Haywood, \*725
- Bureau of Standards, Work of, Report of Director Stratton, 216, 1187, 1188; Comment, 1181
- Burglar-alarm switch, Convenient. By J. W. Strippel, \*186
- Busbar supports, Pyramid type, General Devices & Fittings Co., \*582
- Bushing:
  - Flexible metallic conduit, Chicago Fuse, \*779
  - Hot-galvanized conduit, Pittsburgh, \*298
  - Loom, Chicago Fuse Mfg. Co., \*633
- Business conditions:
  - Aids for domestic business, 261
  - Bonds, Limited dealings in, planned by investment bankers, 697, 1033
  - Central-station business. By Harrison Williams, F. E. Sylvester, 946
  - Central stations, Financial standing. Maintaining the record, 793
  - Central stations and the war, 357, 645, 793
  - Conditions in the industry. By H. H. Porter, 802
  - Confidence and courage needed, 309
  - Conserving financial resources. Letters sent out by Investment Bankers' Association, 938
  - Dividend in scrip, Philadelphia Co., 597
  - Economy or government taxes, 549
  - Effect of the "Battle of Giants," 359
  - Electric industry, Effect of war, 264, 407
  - By Louis Bell, E. F. Colyer, W. J. Clark and others, 411
  - Electrical securities, Effect of war on value, 551
  - England, Conditions in. By H. L. Doherty, 1088
  - European electrical conditions before the war. By E. W. Lloyd, 316
  - Financing of war-time markets, 455
  - Improvement in financial conditions, 841; By J. M. Wakeman, 1039
  - Increases in Detroit. By Alex Dow, 850
  - Industry maintains its earning power. By H. H. Scott, S. R. Bertron, 899
  - Life and liberty for industry, 453
  - Liquidation of public utility stocks, 264
  - London electrical papers on the war, 415
  - Money available for public utilities, 357
  - New York merchants and prosperity, 1036
  - New York Stock Exchange opened, 1129
  - Obstacles to development. By B. E. Sunny, 415
  - Opinions of electrical manufacturers, 264, 461, 561, 611, 659, 708, 803, 850
  - Opportunities brought by the war, 213, 261, 1040
  - President Wilson discusses business and the railroads, 985
  - President Wilson's message to Congress, 1129

Business conditions: (Continued)

- Price of neutrality, 357
  - Prosperous farmers and electric service, 358
  - Rate of return on investment, Missouri decision, 9
  - Re recuperative power of the industry, 501
  - Report of National Civic Federation, 1087
  - Responsibilities during war, 261
  - Words and legislation. Comment on letter of President to T. G. Jones, 213
  - (See also Export trade)
  - By-products of central stations. By H. Gray, (D.) 39
  - By-products of gas-power plants. By H. R. Trenkler, (D.)
- C**
- Cabinets with "double knock-outs," \*1118
  - Cable (See Wires, wiring and conduit)
  - Cable-box connector, Fralick, \*391
  - Cable connector, Separable, \*623
  - Cable joints, Deterioration in. By W. A. Keatinge, \*235
  - Cable splicer's portable tool box, Minneapolis, \*1156
  - Cable steamer "Edouard Jeramec," (D.) 294
  - Cable support for vertical drops, \*1156
  - Cable terminal tool, Bosch, \*391
  - Cable-testing instrument, Stewart, \*197
  - Calcium carbide manufacture, Design of electric furnace, By Benard, (D.) 971
  - Calculator, Transmission line, \*974
  - California, Electrical activity in, 5
  - California Association of Electrical Contractors, 366
  - California Railroad Commission:
    - News, 11, 120, 220, 319, 512, 563, 709, 756, 901, 1091, 1142
    - Rules on inductive interference, 458
  - Canadian Electrical Association, Convention, 8, 79
  - Carbon-silicof, Silicified. By F. J. Tene, 814
  - Casting pans (See Furnaces, Electric)
  - Measuring ratio of electric charge to mass. By L. T. Jones, (D.) 239
  - Passage of particles through gases. By L. W. McKenna, (D.) 437
  - Central-station business:
    - Accounting methods (See Accounting)
    - Alliance, Ohio, Electric show results, \*185
    - Appalachian Power Company, Benefits from increased coal demand, 754
    - Appliance sales, Bureau of Home Economics scheme of New York Edison Co., \*1122
    - Appliance sales campaign in 24 cities by Bylesby companies, 150
    - Appliances for increasing central-station revenue, 866
    - Billing by post-card, Topeka, Kan., \*1153
    - Bills, Cost of handling, in Chicago, 82
    - Bills and friendship, Necessity for direct relations with the public, 57
    - Boston:
      - Christmas sales, 1169, \*1219
      - Details of general-service buildings. By H. S. Knowlton, \*69, \*123, \*176; Comment, 58
      - Flatiron campaign, 429
      - "House of Edison Light" at Arlington, Mass., \*134
    - Wiring of old houses and special campaigns. By E. C. Kimball, 457
    - Comment, 45
    - Branch office organization and operation, 955
    - Brooklyn:
      - Christmas sales, \*1218
      - Flat-rate easy-payment plan for wiring houses, \*867
    - Buffalo, N. Y., Users of electricity classified, \*619
    - Cedar Rapids, Ia., Quaker oats factory's use of central-station energy, \*132
    - Chicago:
      - Flatiron campaign, 230
      - Telephone order system, \*721
      - Christmas suggestions. By A. J. Edgell, \*1065; H. W. Alexander, \*1068, \*1155
      - Compensating salesmen, System of Milwaukee Electric Railway & Light Co., 429
    - Complaints:
      - Making customer a party to his own search, 1008
      - Plan for reducing, Muncie, Ind., 767
    - Co-operation with local business in heating and cooking devices. By W. B. Johnson, 80
    - Co-operation with contractors, manufacturers and jobbers. Discussion at convention of Iovian order, 86
    - Courtesy to customers and public, Central Illinois Public Service Co., 1052
    - Danville, Ill., Free iron holders, 283
    - Denver, Refrigeration, 574
    - Detroit, Growth, 84; By Alex Dow, 850
    - East St. Louis, Ill., Sale of vacuum cleaners, 134
    - Economy in central-station service, the logical argument of the new business solicitor, 745
    - Franklin, Ky., Wiring campaign, 284
    - Friedrich losses, Showing up, \*1253
    - Grimsby, Eng., Value of advertising. By W. A. Vignoles, (D.) 142; Comment, 114
    - Heating load, Value of, to central-stations. By H. S. Brown, 8
    - Houston, Tex., Daylight peak due to motor load. By W. W. Reed, 189
    - Ice production (See Refrigeration)



## Central-station business: (Continued)

- Increasing business discussed by Colorado Electric Light, Power & Railway Association, 574
- Industrial load building. By J. Solberg, 574
- Kansas City, Mo.:
  - Gasoline-engine factory uses central-station service, \*1108
  - Wiring offer of a dollar-a-month, 475
- Kokomo, Ind.:
  - Housing campaign, \*1206
  - Organization of meter department, 133
- Lighting contracts, Special, 938
- Louisville, Ky.:
  - Christmas campaign, 1169
  - Co-operation with contractors to wire old houses, 635
  - Week-end talks to commercial men, 283
- Wiring campaign, 84, 230
- Merchandising and advertising, National Electric Light Association report, 635
- Merchandising methods. By J. E. North, 880
- Meter reading explained in advance of the solicitor, 1010
- Milwaukee:
  - System of compensating salesmen, 429
- Minneapolis General Electric Co., 133
- Premiums in house wiring campaign, 963
- Motor installations, Sales value of trial, Nashville, Tenn. By R. C. Leonard, 184 (See also Industrial plants)
- Moving pictures that create the wrong impression. By J. R. Dunham, 576
- Muncie, Ind.:
  - Central-station service for Dean Forging Co., \*183
  - Collections from small customers, 868
  - Co-operation with contractors in wiring campaign, 100
  - Flat-rate campaign, 1155
- Nashville, Tenn.:
  - Trial motor installations. By R. C. Leonard, 184
- New York City:
  - Edison Co.:
    - Bureau of Home Economics, \*1122
    - Service advertised in many tongues, \*429
  - United Electric Co.:
    - Contractors co-operate in iron campaign, 46
    - Tungsten fixtures given away, 84
    - Vacuum cleaner demonstration out of doors, \*82
- Newark, Ohio:
  - Advertising low cost of service, 1252
- Newspaper and the public utility. By F. R. Slater, 29
- Noblesville, Ind., Church in the country, \*1009
- North Adams, Mass., Exhibit booth novelties, \*79
- Office racks for assorting cash stubs, \*964
- Ohio, New business co-operation, 219
- Portland, Me. Appeal to the tourist, \*475
- Post-card billing, Topeka, Kan., \*1153
- Public policy hints, 1254
- Pueblo, Col., Advertising in newspapers, 522
- Pumping for the small plant, 214
- Receipt-of-material ship, \*783
- Rural districts, Development of electric service, 964
- St. Louis, Mo.:
  - Appliance business growth, \*184
  - Flotation campaign, 83, 331
  - Human-interest note in advertising, 331
  - Motor load increased, 175
  - Shop drives, \*83
- Salt Lake City:
  - Abandoning appliance-display policy in favor of direct sales, 1010
- Scranton, Pa., Meter reader's picture on card, \*232
- Shreveport, La., Warning customers, 84
- Small consumer, Dealing with, 263; By E. W. Osborne, 558; A. T. Holbrook, 653
- South Bend, Ind., Getting the small customer, 672
- Spokane, Wash., Meter reader's report form, \*868
- Springfield, Mo.:
  - Old coffee pots bring one dollar each, 1053
  - Promoting among the real estate promoters, \*1109
  - Wiring campaign results, 1252
- Store-room balance, Checking, Portland, Ore., 734
- Superior, Wis., Revenue per customer, 769
- Telephone office system used by Commonwealth Edison Co., \*721
- Texas Power & Light Co., Contract with Texas Traction Co., 844
- Toledo, Ohio, Civil Service methods in selecting motor salesmen, 331
- Topeka, Kan.:
  - Circular letter to new customers, 1205
  - Encouraging consumers to verify meter readings, \*574
  - Postcard billing, \*1153
- Toronto, All-night hot-water service, 866
- Tungsten-light renewals. By J. W. Lieb, Jr., 701
- Uniondale, Ind., Prospective load for population of 250, 430
- Walsenburg, Colo., Electric carnival, \*477
- War and central station business, 557
- Washing machine campaign, 1205

## Central-station business: (Continued)

- Washing machines sold by automobile, Santa Rosa, Cal., \*635
- Wichita, Kan.:
  - Booth at exposition, \*1110
  - Meter board educates customers in the economy of tungsten lamps, \*1053
- Wichita Falls, Tex., Card showing variation of lighting hours, \*1053
- Worcester, Mass.:
  - Large contract secured, 1136
  - Obsolescence of the unwired house, 721 (See also Contractors)
- Central-station industry (See Business conditions.)
- Central-station operation:
  - Accident prevention, Guard box for switches, Wichita Falls, Tex., 38
  - Alternator short circuits. By C. M. Davis, (D.) 726
  - Armature coils protected against corona, 773
  - Auxiliaries in hydroelectric plant practice, 986
  - Bearings, Repairing large warped. By J. G. Koppel, \*774
  - Bleed-off turbines in combined manufacturing and generating plant, 725
  - Blowers directly connected to transformer windings, 1209
  - Boiler output at peak loads, Increasing, 774
  - Boiler-room economy, Interesting freemen in, Danville, Ill., 483
  - Boilers equipped for gas and coal firing, Fort Worth, Texas, 370
  - Boilers, Necessity of good feed water, 725
  - Booster for low-pressure steam-heating system, Springfield, Ill., \*38
  - Boston, Edison Electric Illuminating Co., Details of general-service buildings. By H. S. Knowlton, \*69, \*123, \*176; Comment, 58
  - Bulk supply, domestic supply and future prices of electricity. By Sir John Snell, (D.) \*1058; Comment, 1034
  - By-products of central stations. By H. Gray, (D.) 39
  - Cast-iron fittings, Effect of superheated steam, 676
  - Chicago:
    - Compressor service, Reducing bills for, 90
    - Motor-control circuit, Automatic, \*89
    - Service centers, Rehabilitation of, \*136
  - China, Standard distributing voltage for, By R. A. Williams, 238
  - Cinder catchers at Waterside stations, New York, \*822
  - Circuit-breaker location for parallel operation, 1253
  - Cleaning machinery, Wooden nozzle for compressed-air hose, 918
  - Condenser pits, Design, Danville, Ill., 577
  - Connections that insure flexible feeder-circuit regulation, Milwaukee, 577
  - Contractor's maintenance sign, \*237
  - Control circuit for vehicle-charging motor-generator set, \*918
  - Cooling circulating water in pond and towers, Fort Worth, Texas, \*379
  - Costs of electrical equipment, 1204
  - Damper regulator, Restoring operation of, \*236
  - Dangerous habits of employees, \*677
  - Drawing plans to scale, 482
  - Drying out electrical apparatus which has been submerged. By B. G. Lamme, 677
  - Engine-room floor should be kept dry, 676
  - Evansville, Ind., Special connection of condensers. Low-pressure steam distribution, \*271
  - Excitation and voltage control, Ontario Power Co. By J. A. Johnson, (D.) 969
  - Exhaust valve repaired while engine runs, 1066
  - Fire extinguisher, Place for, Muncie, Ind., 37
  - Fort Worth, Texas, \*369
  - Frequency changers, Synchronizing, 1161
  - Frequency changers, Using a cold machine on the peak of the load, Springfield, Mo., 1114
  - Gas and oil engines as auxiliaries in the handling of peak loads. By Reginald Trautschold, 516; Comment, 501
  - Grounding rotary-converter frames, 967
  - Ice production (See Refrigeration)
  - Increasing plant efficiency with low-pressure turbines, 872
  - Insulators, Locating faulty, with a megger, 968
  - Lightning arrester equipment on substation line, Evansville, Ind., \*89
  - Load curves which vary from the average, 1009
  - Load duration curve, Revelations of, Rochester, N. Y., 476
  - Low-tension equipment, Arrangement in station of Milwaukee Electric Railway & Light Co., \*131
  - Milwaukee:
    - Ash-disposal system, 139
    - Tunnel cable crossing under Milwaukee River, \*1113
  - Motor-generator set, Rope-driven, Portland, Ore., \*1013
  - Mutual forces between reactors, \*968
  - Parallel operation of 11,000-volt and 13,200-volt equipment, Public Service Electric Co. of New Jersey, \*528
  - Paralleling generators, Overcoming difficulties in, Owensboro, Ky., \*626

\*Indicates illustrated articles.

## Central-station operation: (Continued)

- Paralleling steam and gas-engine sets. Shreveport, La., \*37; By A. G. Curtis, 189
- Paralleling synchronous apparatus, Effect of reactance on, 1210
- Peak load conditions. Selection of prime mover units for best operating results. By Reginald Trautschold, 516; Comment, 501
- Peaks Keeping down, on power purchased on a peak basis. By T. E. Tynes, 15
- Phase reversal, Avoiding. By E. C. Pritchard, 1156
- Piping at feed-water heater. Providing back-pressure valves with drift, \*384
- Ratio of transformers, Determining approximate, without measuring instruments, 1210
- Reactors, Location of current limiting, 1159
- Reducing maximum demand created by motor-driven fire pump, Chicago, \*379
- Regulation and motor speed, 90
- Regulator, Automatic, for stoker and damper, \*1113
- Reversal of polarity in rotary converters. Preventing, 1219
- Rules for service standards in Illinois, Discussion at Springfield by various electric and gas interests, 169
- Safety of employees, \*725
- Safety. Placing responsibility on one man, 236
- Safety rules in St. Louis, 384
- Scrap material, Classification and sale. By B. I. Budd, 1113
- Service buildings of Boston Edison Co., \*69
- Short-circuiting, \*123, \*101; Comment, 58
- Short-circuit current, Effect of stored magnetic energy on maximum, \*968
- Short-circuiting a field, resistance when starting short motor, \*869
- Sign-load loads, Difference in character of, 234
- Speed regulation and steam consumption affected by dish-boiler, 119
- Steam consumption, Effect of power factor on, 677
- Steam reserve plant, Baltimore electric railway company, 119
- Steam versus electrically-driven auxiliaries, 322
- Storage battery reserve in single-phase station, Zurich. By W. T. Kummer, (D.) 1260
- Storage racks for electric meters, Baltimore, \*871
- Switchboard connections for making commercial transformer tests, Chicago Commonwealth Edison Co., 375
- Switchboard instruments, Mounting. Flexible, Cumberland, Me., \*967
- Synchronous condenser installation for power-factor correction and voltage regulation. By W. O. Ouchman, 669
- Temperature and output of electrical apparatus, 163
- Temperature regulator to maintain constant superheat temperature, \*676
- Terminal boards to facilitate tests on poly-phase machines, 967
- Testing of plants. By W. M. Selvey, (D.) 1260
- Titration method of measuring consumption of low-head turbine, Grand Rapids & Muskegon Electric Power Co., 434
- Traction engine utilized during plant repairs, Maryville, Mo., \*1114
- Transformer connection to facilitate rapid replacing, \*1056
- Transformer installation, Temporary, \*285
- Transformers:
  - Auxiliary cooling for, Danville, Ill., \*237
  - Different types give reversed polarity, Ft. Wayne, Ind., 434
  - Effect of internal characteristics of, on load division and wattless currents, 968
  - Star connection of series. By J. G. Koppel, \*289
  - Two-in-three phase circuit, 725
- Turbine blades, Keeping clean, \*1209
- Turbine placed in operation quickly, Springfield, Mo., 1160
- Water-level indicator, Pneumatic, Columbus, Ga., \*578
- Water tank made from discarded smoke-stack, Topeka, Kan., \*1056
- Whistle in engine-room, Solenoid-operated, Springfield, Ill., \*38
- Wiping a commutator, Safe and unsafe ways, \*677

## Central stations:

- Alton, Ill., East St. Louis Light & Power Co., Single-unit 5000-kw steam plant. Water-power substation tying in with plant at Keokuk, Ia. Application of rotary condensers, \*121; Comment, 310
- By J. S. Mitchell, 527
- Athens, Ohio, Sale of municipal plant, 892
- Bishop Creek, Cal. By C. O. Poole:
  - I.—Electricity from seven stations in tandem transmitted over 400 miles, \*757
  - II.—Construction of Hillsdale tunnel. Layout and equipment of generating stations, \*805; Comment, 794



III.—Intake reservoir of station No. 2. How to show line and steel pressure. By R. K. Ketchum, Eastern Electric Co., 103.

IV.—Transmission system of Nevada-California Power Co., 903

V.—Transmission system of Nevada-California Power Co., Stations at Goldfield, Tonopah, and Reno, 1045

VIII.—Substations of Nevada-California Power Co. at Goldfield, Tonopah, and Reno, 1045

IX.—Transmission system of Southern Sierras Power Co. Control station in Owens Valley. Details of towers and cables, 1143; Comment, 1130

X.—Transmission system of Southern Sierras Power Co. Plant at Lake Bernardino. Substations, Imperial Valley line, 1193

Boston Edison Co. General-service buildings. By H. S. Knowlton. Details of buildings, 69; Comment, 58

Maintenance and transportation departments, 123

Service buildings. Laboratory equipment, 176

By-products. By H. Gray, 114 30

Canadian energy used in United States, 1184

Chicago, Sanitary District's auxiliary steam plant, 175

Cincinnati, Union Gas & Electric Co., Appliance, 240

Cleveland, Ohio: Accidents, 1232

Design and operation of plant. By I. W. Ballard, 1086, 1139

Developments, 1085

Special connection of condensers. Low-pressure steam distribution, 271

Financial standing. Maintaining the record, 768

Fireproof construction. Desirability of, 262

Fort Wayne, Ind., Fort Wayne & Northern Indiana Traction Co., Rebuilding a double-decked station, 711; Comment, 699

Fort Worth Power & Light Co., Texas Steam turbine plant. Cooling of circulating water. Distribution circuits with emergency feeders and lock transformer structures, 369; Comment, 358

Germany. Development in, 1183

Great Britain: Basingstoke station, (D.) 1015

London's electricity supply, (D.) 387, 531

Monmouthshire, Newport station, (D.) 436

Nationalization of electricity supply. By R. A. Chaddock, (D.) 142

Small town supply. By W. A. Vignoles, (D.) 142

Wolverhampton system, (D.) 142

Hot Springs, Ark., City Electric Company. Rapid construction. Emergency service. Operating record on station log sheet, 465

Houston Lighting & Power Co., Valuation report, 1152

Ice productions (See Refrigeration)

Independence, Kan., Cooling-tower cistern. Concrete on roof, 1161

Kalamazoo, Mich., Municipal street light plant, 226

Kansas City Electric Light Co., Valuation of property. Coverage and future of pioneer investors, 645, 648

Louisville, Ky., Centralizing energy production, 913

Mexican Northern Power Co., Chihuahua. Construction difficulties. Experiences of American engineers. By A. C. Hobbs, 1173; Comment, 162, 170

Monopolistic operation. By Samuel Insull, 11

Moravia, Statistics. By K. Sumail, (D.) 437

Nashua, N. H., Overhead charges, 913

Northern Ohio Traction & Light Co., Hydroelectric station at Great Falls on the Cuyahoga River operating in conjunction with 18,900-hp steam plant near Akron, Ohio, 374

Norway, Statistics, (D.) 530

Pacific Coast developments. By W. E. Her-

Central stations: (Continued)

—Paris, St. Ouen plant. By T. Pausert, (D.) 437

Portland, Ore., Northwestern Electric Co. Station in office-building basement, 613

Refrigeration (See Refrigeration)

Wayne, Ind., 711; Comment, 699

Refrigeration (See Refrigeration)

Salem, Mass., Fire, 6

Seattle, Wash., Annual report. Unit cost and rates for street lighting, 705

Small station of new type. By C. F. Weil and, (D.) 824

Switzerland, State ownership, (D.) 192

60,000-volt system supplying energy to 23 communities, 419; Comment, 406

Tryer, Germany. By H. Henney, (D.) 970

—(See also Industrial plants)

Charging for electric energy (See Rates for electric energy)

Chemistry, Industrial. By L. H. Backeland, (D.) 680; F. Foerster, (D.) 1016

Aspects of, 680

L. H. Backeland, 698

Bearing of on lamp development and the use of lamps in chemical processes, 844

Chicago: Board of Supervising Engineers, Removal of George Weston and appointment of E. W. Bemis, 107

Commonwealth Edison Co., Savings fund of employees, Results of first five-year period, 62

Electricity, a new source, 410

Public Service Department, Comment on report of, 113

Water-power extensions for Sanitary District, Report of engineers, 1108

Chicago Gas, Water & Electric Co., 318

China, Standard distributing voltage for. By R. A. Williams, 288

Christmas suggestions. By A. J. Edgell, 1022, 1065; H. W. Alexander, 1068, 1155

Christmas tree lamps for table, 1207

Chrome steels, Magnetic properties. By M. B. Moir, (D.) 141

Cinder catchers at Waterside station New York, 822

Circuit breakers: Re-closing, 145

Tripping device. See Transformation

By B. H. Smith, (D.) 1015

Cistern, Concrete cooling-tower, on station roof, 1161

Cities and utilities, Conference of Mayors at Philadelphia, Proposed National Bureau of Utilities Research, 1, 4, 164, 213, 216, 841, 846, 889, 993, 987

Clamps: Copper ground clamp, Klein, 97

Ground-wire, Electric Service Supplies Co., 147

Cleats, Construction, Knauber, 393

Anchor boards for coal pile, 1209

Spontaneous combustion, Preventive measures for avoiding. Investigation and report by S. W. Farr and F. W. Kressman of University of Illinois, 236

Washing Kansas coal. By A. A. Potter, 895

Waste of coal in center-dump cars, 434

Weathering of coal and its effect on heating value. Tests by University of Illinois and Bureau of Mines, 289

Coal storage pit, Concrete, Muncie, Ind., 190

Coffee and peanut roaster, A. J. Deer Co., 147

Coffee, Electric percolating: Hotpot, 1216

Simplex, 1019

Coal-forming machine, Copper, Garvin, 195

Colorado Commission news, 709

Colorado Electric Light, Power and Railway Association, Annual convention, 508

Commercial electric vehicles (See Trucks, Electric)

Commutator grinding machine, Witton-Kramer, 297

Commutator with molded insulation, U. S. Light & Heating Co., 247

Compensator, Frame to support, 90

Condensers: Construction of condensers and their auxiliaries. By R. M. Ehrhart, 670

Rain-type counter-current jet. Wheeler, 1110

Tube corrosion. Investigation. By E. E. Bates, (D.) 628

Conductors (See Wires, wiring and conduit)

Conduit clamp for wall cases, Paiste, 681

Conduit fittings service cap, Gillette-Vibber, 633

Conduit hickey, Adjustable, Austin, 298

Conduits (See Wires, wiring and conduit)

Conference of mayors (See Mayors' conference)

Connectors for outlet boxes, Gillette-Vibber, 582

Conservation (See Hydroelectric development)

Contact potentials and photo-electric properties of metals in vacuo and their mutual relation. 1059

Contact rectification. By R. C. Hartsough, (D.) 1260

Contractors, dealers and jobbers: Appliance-sales campaign, Hot Point Electric Heating Co., 150

Brooklyn co-operation, 976

Cheerful point of view, 443

Co-operation with central stations, 46

Freeman-Sweet Co., 99

Cincinnati, Regulation of electrical work in, 881

Code of ethics adopted by contractors, 167

Concentrated purchases, Advantages of, 889

Co-operation between contractors, manufacturers, jobbers and the central station. Discussion at convention of the Jovian Order, 863

Co-operation between jobbers and contractors in California, 538

Co-operation of the jobber, the manufacturer and the central station. By E. K. Patton, 782

Co-operative contracting in Central Illinois, Home Electric Construction Co., 586

Credit given to receivers appointed by Court only at risk of creditor, Illinois decision, 99

Flatiron campaign in New York, Co-operation with United Electric Light & Power Co., 46

Fort Wayne, Ind., 299

Freight shipments, Responsibilities in, 880

Germany, Wiring contractor in. By E. Wikander, (D.) 1212

Grand Rapids, Mich., Business boom helps contractors, 734

Kansas City, Mo., Conditions, 443

Leaks—Some ideas for the electrical dealer, 926

Legislation as it affects the electrical contractor, 831

Licensing: Galveston, Texas, 347

Kansas City, Mo., 443

Seattle, Wash., 43

Louisville, Ky., Contractors organize, 635

Milwaukee, Site for contract work constructed under bond, 247

Milwaukee's modern methods, 347

Newspaper published by Home Electric Construction Co., 201

Overhead expense and cost accounting, 443

Providence, R. I., Co-operation with central station, 976

Public policy for electrical contractors, 734

Quality in contracting, 880

Reinstatement of contractors in Chicago, 395

Relation to the central station. By H. D. Learned, 685

Salt Lake City contractors co-operate, 248

Shrewsbury, Mass., Electric appliance shop, 225

Stock-accounting methods, New York City, 489

Success of the electrical contractor as business man. By F. A. Good, 538

Successful selling, Elements of, 976

Table wired for demonstrating appliances Central Electric Co., 150

Vacuum cleaner sales, Graphic record of, Crawl Electric Co., 201

Wiring table for electrical contractors, 100

Contracts: Special lighting contracts, 938

Special electric service contracts in District of Columbia, 1129

Street lighting: Meter basis for, Bessemer, Mich., 431

Watertown, Wis., 809; Comment, 1081

Controllers: Arc-lamp feed, Speed Controller Co., 827

Motor-driven air compressor, Leader, 830

Safety lock for crane controller, Westinghouse, 297

Converters: Motor-driven, 1183

Blanc, (D.) 627

Rotary. By G. Mattausch, (D.) 579

Single-phase mercury, Working tests. By J. D. Epstein, (D.) 579

Starting rotary, British patent, (D.) 727

Starting rotary converters from transformer tapings, Precautions in. By E. P. Hill, (D.) 873

Conveying plant in iron works, Austria, (D.) 584

Cooking, Electric: Chafing dish, Simplex, 932

Chicago Baseball Club, 230, 672

Cost of operating range, Salt Lake City display, 150

Demonstration for New York hotel chefs, 734

Kitchen of Siemens-Schuckert Co. By Kurt Perlewitz, (D.) 1115

- persons. By H. S. Brown, 80
- (See also Stoves, Electric)
- Copper:
- Commercial classification of refined copper.
  - Copper-nickel-manganese resistor alloy. By G. L. Corcoran, 11
  - Cord connector, Hubbell small extension, \*585
  - Costs (See Transmission)
  - Costs of electrical equipment, Tables, 1204
  - Cotton handling (See Industrial plants)
  - Counting paper money by electricity, 390
- Cover for electric conductors, Electrosee, 684
- Covering of electric conductors, By J. E. Brown, 11
- See also Protective electrical enclosures
- Storage-battery revolving post, \*1063
  - Terminal insulators and connectors for traveling crane contact wires, \*723
- Cuba, Sale of American electrical supplies. By J. H. J. Jones, 11
- Curling iron and drying comb, Electric, Landers, Frary & Clark, \*829
- Current between a wire and a co-axial cylinder. By I. S. Thompson, (D.) 727
- Cutout box, Flush-type, \*344
- Automatic time-limit. Independent, \*147
- D**
- Dairy, Electrical, Cost of operating, 941
- Dams:
- Big Meadows, Cal., 72
  - Irrigation dams, Building of large. By E. E. Schuchman, 11
- Dealers (See Contractors, dealers and jobbers)
- Demagnetizers, Direct-current, D & W Fuse, \*1119
- Dental sterilizer, Electric, Quick, \*440
- Depository, 11
- Diaphanograph control from typewriter keyboard, 11
- Dielectrics, Powdered motive force upon. By R. H. Goddard, (S.) 485
- Directors, Payment and responsibility of, 113; By E. F. Dwyer, 433; W. S. Kelley, 11
- Discharges of electricity from cylinders and dynamos, By J. S. Townsend and P. J. Edmunds, (D.) 193
- Dishwasher, Electric, Walker, \*780
- District of Columbia Commission news, 709, 1044, 1124
- Dock, Electric equipment, Hull, England, (D.) 292
- Drainage pumping (See Pumping, Electric)
- Dredges, Electric, Gold dredging. By G. B. Rosenblatt, 607
- Drill holder, Austin, \*198
- Drilling, 11
- Portable, Independent Pneumatic Tool Co., \*143
  - Van Dorn portable, for alternating or direct-current, \*1064
- Drink mixer, Electric, Wisconsin Electric Co., \*677
- Drives, Electric (See Industrial plants)
- Ducts (See Wires, wiring and conduits)
- Duluth, Minn., Referendum proposed in, 1148
- Dynamos (See Generators)
- E**
- Edison, Thomas A.:
- Fire at Edison plant, West Orange, N. J., \*1132
  - Testing his new invention, the telerisc, \*729
- Edison model, Presentation to Dr. Charles F. Brush, 13
- Edison sales managers, Convention, 408
- Education:
- Electrical graduates in 1914, 1135
  - Western Pennsylvania, 4
- Electrical Credit Association of Chicago, Convention, 1039
- Electric Vehicle Association of America, Convention, 266, 649, 798, 847
- Electric vehicles (See Automobiles, Electric; Trucks, Electric)
- Electrical graduates in 1914, Statistics, 1135
- Electrical industry, Milestones in progress of, 113
- Electrical Manufacturers' Club, 892, 94
- Electrical Supply Jobbers' Association:
- Objects, 504
  - Registration in restraint of trade, 549
  - Electrical trade (See Export trade)
- Electrochemical investigation, Practical side of, Symposium, 703
- Electrochemical opportunities, 549
- Electrochemical plants, Evaporation in. By Otto Ostermann, 70
- Electro-dynamic stresses. By P. V. Hunter, (D.) 1259; Comment, 1231
- Electrolysis:
- Contact tools for survey, \*1209
  - Los Angeles case, 941
  - Reinforced concrete, 718
- Electromagnetic puzzle. By F. C. Falston, 235
- Electromagnets:
- Design of, 918
  - Electromagnet as a standard of field strength. By R. B. Bostee, (D.) \*521; Comment, 794
  - Large electromagnets for laboratory purposes. By M. L. Lohme, (D.) \*727
- Electromechanicals, Signs of. By J. W. Rook, (D.) 1116
- Electromechanics, Direct reading, for measuring small currents. By S. Szilard, (D.) 438
- Electricity, See also Electric
- Electrons, Ratio of charge to mass of. By Saul Dushman, (D.) 727
  - Electroscope, Gold-leaf, increasing sensitiveness of. By R. C. Castner, (D.) 1060
  - Elevator gate lock, Electric, \*97
  - Elevator safety control apparatus, Safety Appliance Co., \*144
  - Elevator thresholds, Safety lamps for, \*1011
  - Emission of electricity from substances at high temperatures. By G. W. C. Knecht and W. F. Thayer, (D.) 457
- Empire State Gas & Electric Association:
- Municipal competition, Attitude toward, 504
- Employees:
- Apprenticeship course, Electrical, for steel mills. By B. W. Gilson, 671
  - Disciplining the man to blame for the accident, 1113
  - Electrician, for the most efficient work, Emporia, Kan., 1057
  - Gratuity plan of Cleveland Electric Illuminating Co., 118
  - Insurance:
    - California liability insurance, 1084
    - Mass. liability insurance, 1084
    - New York liability insurance, 1084
    - Insurance Co., 66
  - Obligation of allied companies to employees, Texas decision, 769
  - Safety medal to Commonwealth Edison Co., 1234
  - Savings fund of Commonwealth Edison Co., Results of first five-year period, 62
  - Welfare buildings, Weston Edison Co., 74
  - Wages, Washington Electric & Mfg. Co., 1233
  - (See also Accident prevention)
- Employers' liability insurance (See Employees, Insurance)
- Engineers:
- Engineer and the chemist. By Frank Bailey, (D.) 1213
  - Registration, 1084
  - Use of technical graduate, 572
- Engineers' Society of Western Pennsylvania, Prizes for students, 4
- Engines, Corliss, direct-connected to alternator, Marray Iron Works Co., \*43
- Evolution of electrical apparatus. By J. S. Foster, 11
- Explosions in connection with the use of bitumen in laying mines in England, Report of committee, (D.) 292
- Export trade:
- Appalachian Power Co., Business obtained by, By M. A. Vile, 754
  - Central America, Trade prospects in. Letters received by McGraw Publishing Co., 707
  - Consuls may furnish information, 900
  - Co-operation in United States, 1085, 1229
  - Cuba, Sale of American electrical supplies. By F. H. Jones, 288
  - Dangers of unwise credits, 900
  - Department of Commerce and Pan-American Union caution manufacturers, 609
  - Depression largely offset by gains. By Dr. S. S. Wheeler, 509
  - Discussion at American Manufacturers' Export Association, 610
  - Economic effects of destruction of capital offset by increased exports. By Gano Dunn, 509
  - Electrical export possibilities. By W. S. Kies, 1087
- Factory operation (See Industrial plants)
- Fans, Electric, National Motor & Mfg. Co., \*296
- Farm service (See Agriculture, Electricity in)
- Federal Trade Commission, 1137
- Federation of Trade Press Associations, Convention, 647
- Feed-water purification. By W. B. Campbell, 235
- Feeder embedded in a tree, Long Island, \*714
- Ferromanganese, Melting. By Axel Sahlin, (D.) 1016
- Fertilizer plant (See Industrial plants)
- Fessenden submarine oscillator. By R. F. Blake, \*752
- Field strength, Electromagnet as a standard of. By R. B. Bostee, (D.) \*521
- Filaments (See Incandescent lamps)
- Financial (See Business conditions; Export trade)
- Fire alarms and police circuits:
- Standard line construction. By C. S. Downs, 604
- Fire engine, Electric operation, 284
- Fire insurance rates in Ohio, 218
- Fireproof construction in central stations, Desirability of, 262
- Fires:
- Causes of electrical, 432
  - Edison plant, West Orange, N. J., \*1132
  - Salem, Mass., \*6
- First-aid equipment for the injured. By G. O. Smith, \*625
- Flame-arc lamps (See Arc lamps)
- port trade: (Continued)
- Electrical machinery and apparatus of American manufacture. Value of exports to countries at war and to countries not at war. Tables, 314
- England issues pamphlet to assist electrical manufacturers, 362
- English papers on industrial conditions, 415, 755
- Facts about conditions, 851
  - Foreign conditions. By E. Tripp, 364
  - Germany, Electrical trade conditions, (D.) 755
- Information to manufacturers issued by National Association of Manufacturers, 360
- Japan's electrical imports, 658
  - Latin-American trade, Firm basis for. Report of committee, 803; Comment, 795; By E. N. Hurley, 1232
  - London conditions. By Hayden Harrison, 510
  - Merchant marine, Need for, 309, 315
  - National Foreign Trade Council, 164, 501
  - Needs created by the war. By M. A. Oglin, 361; Comment, 358
  - Opinions of various manufacturers, 510, 611, 755
  - Opportunities for export. Statement made by Acting Secretary of Department of Commerce, 363
  - Productions have good reputation but knowledge of conditions is needed. By F. B. Crocker, 560
  - South American trade. By E. N. Hurley, 363; E. L. Corbell, 365
  - Argentine welcomes American manufacturers, 360
  - Banks and credit. By E. N. Hurley, 462
  - Conditions of success. By David Kinley, 609
  - Credits to buyers, 405
  - Discussion at meeting of Merchants' Association of New York, 754
  - Government and business men must co-operate, 562
  - Government study of conditions by H. N. Douthitt, 707
  - How to enter South America. By E. F. Colyer, 412
  - Problems, 697
  - Representation of the United States interests, 611
  - Ship, exposition furthered by Illinois Manufacturers' Association, 462
  - Shipping facilities, 658
  - Statistics of exports from electrical industries of Germany to neutral countries, nations at war and colonies, 413
  - Study of foreign trade necessary. Banking and credit facilities which have helped foreign nations. By W. J. Clark, 413
  - Suggestions and data relating to opportunities in foreign fields, 611
  - Suggestions concerning foreign fields for American manufacturers, 659
  - United States versus Great Britain, in electrical trade, 365
  - Unemployment for war, 405
  - War conditions. Urgent need for merchant marine. By Maurice Coster, 315; Comment, 309
  - War results. By J. G. White, 560
  - War-time possibilities. By T. C. Martin, 313
  - Wreckage of the industry abroad, how it affects American market. By Louis Bell, 411
- See also Business conditions
- F**
- Factory operation (See Industrial plants)
- Fans, Electric, National Motor & Mfg. Co., \*296
- Farm service (See Agriculture, Electricity in)
- Federal Trade Commission, 1137
- Federation of Trade Press Associations, Convention, 647
- Feed-water purification. By W. B. Campbell, 235
- Feeder embedded in a tree, Long Island, \*714
- Ferromanganese, Melting. By Axel Sahlin, (D.) 1016
- Fertilizer plant (See Industrial plants)
- Fessenden submarine oscillator. By R. F. Blake, \*752
- Field strength, Electromagnet as a standard of. By R. B. Bostee, (D.) \*521
- Filaments (See Incandescent lamps)
- Financial (See Business conditions; Export trade)
- Fire alarms and police circuits:
- Standard line construction. By C. S. Downs, 604
- Fire engine, Electric operation, 284
- Fire insurance rates in Ohio, 218
- Fireproof construction in central stations, Desirability of, 262
- Fires:
- Causes of electrical, 432
  - Edison plant, West Orange, N. J., \*1132
  - Salem, Mass., \*6
- First-aid equipment for the injured. By G. O. Smith, \*625
- Flame-arc lamps (See Arc lamps)

**Flame**, High-temperature. By H. A. Wilson, D., 98  
**Florescent Paints**. Nature of. By A. H. Saxel.  
**Holes**. A formulae. Kelley, 76  
**Flashlights:**  
     — Construction, 1120  
     — Lamp, 1120; Bowtell, 1127  
     — Rechargeable, 1120  
     — Vented-cell holding case, 1127  
**Electricity**. Flashes. Measurement of. 1105  
**Electrolytic Containers**. Adams, 116  
**Emulsions**. Making. See Emulsion  
**Euxine Water**. Vaporization rate, 336  
**Flue-gas samples**. Method of taking, \*190  
**Flux sheets**. Causes of porosity due to, 336  
**Fluxing**. Effect on electrical conductivity. By F. C.  
     Ralston, 235  
**Forebay gate level**, \*1013  
**Foreign trade** (See Export trade)  
**Foundry riddle**. Sand screen. Gyrotary, Great  
     Western Mfg. Co., \*828  
**Franchises:**  
     — Expenses to determine value, New York  
         Lawyer, 892  
     — Indeterminate permit. By Halford Erickson,  
         230  
**Franklin metal**, \*648  
**Freight handling system** for terminals, Electric,  
     1167  
**Frequency changers, Transformers as.** By A. M.  
     Taylor, 138  
**Furnaces.** Methods of design and method of firing  
     on efficiency and smoke production, 578  
**Furnaces, Electric.**  
     — Annealing furnace for brass and German  
         silverware, (D.) 438  
     — Argon-furnaces, and development of the steel  
         casting industry. By Ivar Renner-  
         felt, (D.) 727  
     — Are furnace for medium temperature. By  
         E. M. Schmelz, 556  
     — Brass furnaces. By H. G. Dorcy, (D.) 1016  
     — Calcium carbide manufacture, Furnace de-  
         signed by Besnard, (D.) 971  
     — Cost of energy. In electric steel casting.  
         Easton, Pa. By C. A. Hansen, 37  
     — Discussion by the American Institute of  
         Metals, 556  
     — Helium gas furnace, Test of. By H. J.  
         Hollander, 556  
     — Melting losses in brass furnaces. By Dr.  
         H. W. Gillette and J. M. Lohr, 556  
**Off-peak loads.** Discussion of economies re-  
     lated to loading while off-peak energy  
     Consideration of various forms of fur-  
     naces used in melting metals. By W.  
     McA. Johnson, 762; Comment, 746  
     — Steel manufacturing. By S. Schneider,  
         (D.) 485  
     — Various forms used in melting metals. By  
         W. McA. Johnson, 762; Comment, 746  
**Furnaces, Oil-burning.** Smoke from chimneys  
     of, 482  
**Fuse, Refillable cartridge,** \*1262  
**Gases**. For combustion of cement clinker. By K.  
     Faure, (D.) \*531

## C

- Age level, Forebay, \*1013
- Galloway, J. R., \*167
- Galvanometers:
  - Capacitor design, (D.) \*193
  - Lindqvist, in the study of heart disease, (D.) \*292
- Entailment string, Improvement in, By W. H. Athorpe, (D.) 1060
- High-sensitivity, D'Arsonval type, (D.) 630
- Vibration, Zero method of testing, By S. Butterworth, (D.) 40
- Gamma rays from radium B<sub>2</sub>, Wave length of soft radiation, By Sir Ernest Rutherford and E. N. da C. Andrade, (D.) 40
- Gaskets:
  - Advertising exclusive garaging in Chicago, \*58
  - Boston, Edison Co., By H. S. Knowlton, \*127
- Commercial vehicle, Chicago, \*619
- Danville, Ill., \*815
- Silicic acid steam seal, \*428
- Gas, Electrical process for detection of, By A. Storer, \*371
- Gas Engine Developments: By R. I. Pierce 657
- Gas engines:
  - Combination gas-engine and steam generating sets for Ford Motor Co., Detroit, Mich., 528
  - Cooling water used in manifolds, 1014
  - Diesel, Carrels type, Nordberg Mfg. Co., \*683
  - Diesel, four-cylinder, single-acting vertical, 1217
  - Diesel, McInosh & Seymour, \*95
  - Refuge economy of gas and steam engines, 599
- Steam operation versus internal combustion engines, Economy in handling peak loads, By Reginald Trautschold, 516
- Cement, 501
- Steam as by-product of engine, Bruce Macbeth Engine Co., \*992

## H



## Incandescent Lamp (Continued)

- Terry, '1012  
—(See also Lighting; Street lighting)  
Incubator and hover, Electrically heated, United Electric Mfg. Co., '241  
Indiana Commission news, 67, 221, 269, 319, 368, 312, 301, 104, 1192  
Indiana Electric Light Association, Annual meeting, 505, 632  
Indicating instruments, Alternating-current, Kermel Apparatus Co., '345  
Indicator, for manager's office, Slocum, Avram  
Inductance, Comparison with capacity. By J. I. Dalton, (D.) 638  
Inductive interference (See also Electric energy)  
Industrial conditions (See Bureau of Labor Statistics)  
Export trade  
Industrial chemistry (See Chemistry)  
Industrial plants, Electricity in:  
—Asphalt plant, Electrical equipment, Chicago, '107  
—Brilliant, Wis., Pausan Milling Co., Central Station, '107  
—Car manufacturing plant of J. G. Brill Company, By J. P. Jones, Jr., and F. P. Sulzberg, (D.) 179  
—Chicago, Speeding up machine tool with electric drive, 231  
—Concatenated induction motors for mill, By William Oeschmann, 15  
—Cincinnati, Westinghouse, '107  
—Drive in loft building, New York, By C. E. Daniel, '228  
—Cotton handling, Savannah, Ga., Electric cranes and storage-battery trucks, 769  
—Dean, Kansas City, Mo., Electric station service, '183  
—Discontinuous method for coal, and electric bridges, By K. H. McLean, '108  
—Fertilizer manufacture, Argentina, By C. E. Rose, '767  
—Ford Motor Co., Combination gas engine and steam plant, 528  
—French distribution system in, Boston, France, By J. Reyval, (D.) 579  
—Gasoline-engine factory using central-station service, Kansas City, Mo., '108  
—Iron and steel manufacture, Varied applications of electricity, Discussion by Association of Iron and Steel Electrical Engineers, '667; Comment, '668  
—Limiting and warning device for preventing high maximum demand, Chicago, '139  
—Machine-tool drive, Twenty-five cycle motors for, St. Louis, Mo., '83  
Motor service, possibilities, By J. H. Mitchell, 218  
—Quaker Oats factory, Cedar Rapids, Ia., Use of central-station energy, '132  
—St. Louis, Mo.:  
—Centralization service for isolated plants, 175  
—Wrought Iron Range Co., Economical group drive in factory, '672  
Spain, Use of electric light in, '107  
—Pawtucket, R. I., '1007  
—Steel mill using central-station energy, Warren, Ohio, 325  
—Sweetshop conditions bettered by electricity, 29  
Texas, Power and Light Co., Service to local industries. Commercial organization, '107  
Insulating cover for connector, Dossett, '58  
Insulating joint, Cutler-Hammer, '1263  
Insulating materials:  
—Redmanol, a synthetic gum, '923  
—Sheet insulation, Quality test for, By E. H. Thompson, (D.) 561  
—Schwaiger, (D.) '92, 920  
Insulation of aluminum wire, Electrolytic, By J. I. Shaffer and J. W. Clark, '107  
Comment, '747  
Insulators:  
—Brookfield glass, '42  
—Defective, Locating, Puget Sound Traction Light & Power Co., '821  
—Depreciation and its effect on operation, By E. H. Thompson, '107  
—Design in relation to high-voltage static disturbances, By A. O. Vastu, 559  
—Distributing potential over a string of insulators. Experimental determination of differences in the potential between the successive units on a high-tension line. Effect of corona, By J. L. Brennan and H. M. Crothers, '1095; Comment, 1081  
—Locating faulty insulators with a megger, '968  
—Operating economy of \$5,000-volt. By M. T. Crawford, 608  
—Surface leakage on insulators, By H. I. Curtis, (D.) 92  
—Test, recent tests, Report, By J. E. E. 18  
—Testing breaking strength, Apparatus for, '1114  
Insurance (See Employees, Insurance)  
Interference between systems (See Transmission of electric energy)  
Internal combustion engines (See Gas engines)  
International Association of Display Men, 318
- International Association of Municipal Electricians, Convention, 603  
International Electrical Congress, Panama-Pacific Exposition, 647  
Inventory (See Valuation)  
Investment Bankers' Association of America, Annual meeting, 988  
Ions, Disintegration of ion cluster in a gas under influence of electric field. By R. D. Kleeman, (D.) 292  
In flames, Investigation of positive By A. H. Supet, (D.) 193  
Iron:  
—Hysteresis loss and the effect of titanium. By R. F. Applegate, (D.) 141  
—Magnetic resistance change of pure iron. By R. A. Heising, (D.) 1116  
Iron and steel industry, Use of electricity in. Discussion at convention of Association of Iron and Steel Electrical Engineers, 667; Comment, 645  
—Iron and steel industry, '123  
Irrigation, Electrical:  
—Double crop possibilities, Davis, Calif., 185  
—Wichita, Kan., Success, 1153  
Italy, Electrical trade conditions. By O. I. Alfo, (D.) 921; (D.) 1066
- J**  
Japan, Electrical Imports of, 658  
Jobbers (See Contractors, dealers and jobbers)  
Jovian Order:  
—Plan for higher individual efficiency, 892  
—St. Louis meeting, 117, 748, 800, 863
- K**  
Kansas Gas, Water, Electric Light and Street Railway Association, Convention, 749, 894  
Kitchen, Large electric, Siemens-Schuckert Co. By Kurt Perlewitz, (D.) '1115
- L**  
Laboratories of the Boston Edison Electric Illuminating Co. By H. S. Knowlton, '176  
Lanterns, Electric:  
—Beers' hand, '487  
—Federal, '536  
—Johns-Manville, '735  
—Toy lantern, '1215  
Lathes for ordnance manufacture. Niles, Hement, Pond & Co., '534  
Legal:  
—California rate case, 119  
—Incumbent, local utility competition, '88  
—Electrolysis case in Los Angeles, 941  
—Liability of company using joint poles, 1154  
—Meter readings, Errors in, subject to correction, New Jersey decision, 166  
—Miller vs. American Light & Fixture Co., 99  
—New York Edison Co., Rate case, 942  
—Obligation of allied companies to employees, Texas decision, 769  
—Right of consumer to elect in New York, 119  
—Springfield (Mo.) Gas & Electric Co., Rate case, 9, 268, 318; Comment, 1  
—Steam turbine decision, Curtis, '64  
—Utah Light & Railway Co., 60  
Legislation, (See Trusts and monopolies)  
Liability insurance (See Employees, Insurance)  
Listed at London, Electrical equipment of, '267  
Light:  
—Artificial flame as a light source. By J. A. Jones, 718  
—Brightness, Methods of expressing, By J. R. Cravath, 1157; Comment, 1131  
—Comparing light sources, Use of characteristic equations. By G. W. Middlekauff and J. F. Skogland, 717  
—Diseases treated by electric light. By E. C. Titus, 77  
—Electrically produced luminosity, a step toward a form of telescropy. By L. H. Walter, (D.) 340  
—Standard of radiation. By W. W. Coblenz, (D.) 158  
—Visibility, Indicator. By P. G. Nutting, 718  
—Vision in animals. By H. M. Johnson, 718  
(See also Photometry)  
Lighting, Electric:  
—Airshafts, Illumination of, By Dr. C. H. Sharp, 656  
—Art and science in home lighting. By G. W. Cassidy, 1190  
—Artificial daylight, Production and use, By M. Luckiesh and F. E. Cady, 654  
—Artificial daylight, Realization of. Reproducing north daylight and noon sunlight. By M. Luckiesh, '570; Comment, 350  
—Artificial illumination and its effect on direct vision. Direct adaptation of retinal rods and cones for daylight and in twilight seeing. By F. K. Richtmyer, 519; Comment, 503  
—Bowling alley, Montreal, 233  
—Brightness, Methods of expressing. By J. R. Cravath, 1157; Comment, 1131  
—Bollion board with incandescent lamps, '149
- Floor lamp fixture, Federal, '972  
—Holder, Adjustable, '972  
—Hubbell bottom-outlet pull switches, '634  
—Hubbell reverse motor plug, '733  
—Indirect fixtures, Illinois Electric Co., '394  
—Loosening of socket shells prevented, '917  
—Miniature transformer for all-night service. General Electric, '107  
—National X-Ray Reflector Co., '631  
—Nitrogen-filled lamp fixture, Electric Operations Co., '1167  
—Power lamps, '838  
—Pass & Seymour roses, '975  
—Pilot lamp and receptacle, Hart & Heesman, '148  
—Reflector for street lighting, H. H. H. '439  
—Reversible-howl pendant fixtures, Wakefield, '394  
—Semi-transparent, Shura, Lansing, '142  
—Small area lighting fixture, Van Doren, 779  
—Socket shells, Hubbell, '148  
—Stage receptacle, A. G. Electric & Mfg. Co., '107  
—Stand-lamp fixture, Adjustable, Millar, '879  
—Steel reflector, Friedley-Voshardt, '781  
—Steady stream, steel fixture, National Metal Machine Co., '148  
—Wheeler street fixtures, '441  
—Will-Bar push buttons, '197  
—West End office, '107
- Incandescent lamps:  
—By H. H. Gernsheim, (D.) 436  
—Chemistry, Bearing of, on lamp development, 844  
—Collapsible portable lamp holder for travel, 844  
—Domestic heater, Witt, '444  
—Domestic heaters, By L. Paussert, (D.) 483  
Half-watt  
—Economies. By C. W. Betcher, 600  
—German small candle powers, (D.) 142  
—Manufacture, By British Thomson Houston Co., (D.) 873  
—Starting current, By A. J. Makower and L. A. Oeschwald, (D.) 627  
—Comment, 598  
—Street lighting. By L. Bloch, (D.) 1115, 1259  
House lamp, '1265  
Invention, anniversary celebration, '85, 84  
Line voltage and lamp voltage, Relation between, By D. Cooper, '11 852  
—W. W. W. Co., Ltd. in England, Germany and America, 215  
—Mine lamp, Witherbee, '1266  
—Mine lamps, Requirements of, '107  
—By H. Clark, 715, Hansen, '107  
—Nitrogen-filled lamps:  
—Advantages. By B. H. Durbin, 508  
—Characteristics of. By G. M. J. Mackay, 715  
Historical notes. By E. H. Waldo, 88  
Photometry. By C. H. Sharp, 992  
—By G. W. Cassidy and J. F. Skogland, '1248; Comment, 1230  
—Street lighting with in Germany. By L. Bloch, '1245  
—By H. H. Clark, (D.) 678  
—Portable lamp, Liberty Bell, Hallbauer-Hard, '107  
—Radiation quality of filaments. Relative emissivities from nitrogen-filled tungsten lamps with helical filaments and from vacuum-type tungsten lamps with straight filaments. By W. W. Coblenz, '1048; Comment, '1035  
—Report at Association of Edison Illuminating Companies, '107  
—Spiral filaments, (D.) '238  
—Standardization of metallic filament electric lamps, British report, (D.) 192  
—Three-phase lamps, Ernest Gerard, (D.) '775  
—Tungsten:  
—British patents, (D.) 726  
—Characteristic equations. By G. W. Middlekauff and J. F. Skogland, 717  
—Gladitz patent on ductile tungsten, (D.) 238  
—Just patent on ductile tungsten, (D.) 91  
—Manufacture of wire of uniform tensile strength, Gladitz method, (D.) 825  
—Photography applications. Investigation of gas-filled lamp. By M. Luckiesh, 129, '954; Comment, 114, 939; W. A. D. Evans, 337





- quency, (D.) 531
- Polarity determination. By E. Rosenberg, 60
- Polyphase commutator motor, Diagrams of, 11
- Polyphase induction, Exact circular diagram, By H. Kafka, (D.) 530
- Polyphase motor with unity power factor, By H. Heyland, (D.) 1058
- Power, Determining, for a change of voltage, 775
- Practical problems of operation. By B. G. Starkler, (D.) 919
- Railway: Design, "By R. E. Hellmund, (D.) 969 Regulation of, by field variation. By J. Universal pressed steel. By C. W. Starkler, (D.) 919
- Rating of, By H. M. Hobart, (D.) 873
- Sewing machine, Robbins & Myers, \*149
- Shunt three-phase commutator. By H. K. Schrage, (D.) 1058
- Single-rating approved at Hot Springs, Va., 60
- Small alternating-current, Electric Specialty Co., \*391
- Small battery-operated, Menominee, \*1120
- Speed regulation in motor and mechanical, with double sets of brushes. By J. Jonas, (D.) 91
- Speed regulation in motor and mechanical, with double sets of brushes. By J. Jonas, (D.) 91
- Steering of large ships, Diehl Mfg. Co., \*634
- Switching phenomena. By W. Linke, (D.) 91
- Synchronous motors for power-factor correction. By G. H. Eardley-Wilmot, (D.) 822
- Three-phase commutator series, Formulas for calculation. By F. Von Kleist, (D.) 919
- Three-phase induction, Calculation of magnetic field, By W. H. Barling, (D.) 969
- Three-phase induction, Speed control. By J. Schmidt, (D.) 579
- Three-phase induction, Speed control, with unity power-factor, "Internal compensation," 1058
- Windings, Wave and lap, (D.) 1015
- Wire tables for alternating-current and direct-current. By W. S. Jones, \*478
- Moving pictures that create the wrong impression. By J. R. Dunham, 576
- Municipal ownership:
- Athens, Ohio, Sale of plant, 892
- Building of competing plants, by engineering and contracting companies. By T. D. Day, 480
- Cleveland, Ohio, Design and operation of plant, By F. W. Ballard, 1086, 1139
- Dayton, Ohio, Failure of project, 553, 940, 1086
- Discussion by National Civic Federation, 471
- District of Columbia, Reports, 60
- Municipal ownership and operation of utilities. By C. M. Rosecrantz, N. D. Baker, A. E. Winchester, Robert Crosser and E. C. Howe, 999
- Municipal ownership versus commission regulation, 551
- Ohio conditions. By H. J. Gordon, 219
- Opportunity for public utilities to acquaint Congress with facts. By W. D. Kerr, 576
- Orville, Ohio, Permanent injunction, 796
- Philadelphia conference of mayors, 993; Comment, 1087
- Seattle, Wash., Annual report of lighting department, 703
- (See also Public service corporations)
- Music, Electric violin, \*1263
- Mutual-liability insurance (See Employees, Insurance)
- N
- Napier, 100th anniversary celebration in Edinburgh, (D.) 532
- National Association of Railway Commissioners, Controlled monopoly rather than competition in public utilities, 1087
- National Bureau of Utilities Research proposed at conference of mayors, 213, 216
- National Civic Federation:
- Annual meeting, 1140
- Bill for the regulation of public utilities, 943; Comment, 938
- Report on general business conditions, 1087
- National Contractors' Association, Meeting, 1238
- National Electric Light Association:
- Commercial section: Activities, 845
- Postion meeting, 1187
- Committees, 651
- Executive committee meeting, 456
- Membership, 689
- Committees, 892, 941
- New England section: Convention, 265, 506, 573
- Electric service, 700
- Public policy committee, 940
- Southern section, Convention, 410
- Wiring committee meeting, 1134, 1185
- National Electrical Contractors' Association: Convention, 46, 116, 166; Comment, 163
- New England section convention, 456
- National Electrical Credit Association, Annual meeting, 46
- National Fire Protection Association, Electrical section, 113
- National Foreign Trade Council:
- Members of, 164, 1036
- Valuable service for American industries, 501
- Neon tubes, Influence of diameter on potential difference at terminals. By G. Claude, (D.) 966
- Nevada Commission news, 416
- Trade Electrical Association, Convention, 409
- New Hampshire Commission news, 11, 67, 120, 170
- New Jersey Commission news, 67, 221, 563, 660, 709, 1022, 1091
- New Year window display. By A. J. Elzer, \*1267
- New York City:
- Electrical Show, 648, 700
- Electricity, Public utility control, 270
- Street traffic, Public utility control, 270
- New York Commission news, 67, 121, 221, 319, 388, 408, 483, 506, 573, 660, 709, 1022, 1091
- New York Edison Co.: Bureau of Electric Energy, \*11
- New York Telephone Co., Proposed valuation, 113
- Niagara Falls power companies, Attack on, 1138
- Nitrogen Lamps (See Incandescent lamps)
- Northwest Electric Light & Power Association. Convention, 367, 606
- O
- Ohio Association of Electrical Contractors, Convention, 1038
- Ohio Commission news, 11, 66, 121, 220, 319, 416, 463, 512, 563, 612, 709, 756, 804, 901, 948, 1091, 1239
- Ohio Electric Light Association, Meetings, 164, 218, 282, 1038
- Oil:
- Properties and testing of oils used for electrical machinery. By C. C. Garrard, (D.) 776
- Testing machine of British make, (D.) 921
- Testing set, General Electric, \*982
- Transformer oil. By W. W. Pratt, (D.) 921
- Oil engines (See Gas engines)
- Oil-well flow, Electric heater to augment, Whittier, Cal., 175
- Operation of electrical machinery, Experiences in. By E. C. Farham, (D.) 824
- Oregon Electrical Contractors' Association, Annual meeting, 46, 1232
- Organization chart, Texas Power & Light Co., 471
- Oscillator, Cooper Hewitt, 988, 1034, 1051
- Osmosis, Relation of absorption and adsorption to. By J. F. Trouton, (D.) 727
- Outlet-box attachment, J. C. P., \*196
- Overhead construction (See Transmission lines and overhead construction)
- Oxygen, Electrolytic production, St. Louis, 1247
- Ozone air purifier, Neel-Armstrong Co., \*45
- P
- Pacific Coast Electrical Jobbers, Meeting, 749
- Panama Canal:
- Gatun gates, Details and operation, \*25
- Illumination and electrical features, Detailed description, \*21
- Panama-Pacific International Exposition:
- Electric distribution system, \*1241
- Illuminating features, 845, \*1241
- Machinery palace, Progress of, \*65
- War will not affect, \*409
- Panel boards:
- Starrett improved, \*246
- Unit-type, Bryant Perkins, \*198
- Parcel-post delivery (See Trucks, Electric)
- Patent matters:
- American Patent Law Association, 701
- Aspects of the patent laws, 797
- England acts on foreign patents, 462
- Oldfield bill, 317, 600
- Patent Office activity, 648
- Revision laws, 61
- Statistical data, 164
- Peak load conditions (See Central-station operation)
- Pennsylvania Commission news, 221, 612
- Pennsylvania Electric Association, Convention, 557
- Pennsylvania Industrial Welfare Conference, 940
- Phase advance, Use in improving power-factor of induction motors. By R. Rudenberg, (D.) 678
- Phase reversal, Avoiding. By E. C. Prichard, 1156
- Phase sequence determined by wattmeter method. By A. Kleinstick, (D.) \*581
- Philadelphia conference of mayors to discuss public policies concerning municipal utilities, 1, 4, 164, 241, 846, 886, 965, 993
- Philadelphia, United Gas Improvement Co., Investigation, 1138
- Philippine Islands:
- Flood interruption at Manila, 552
- Pole line construction, 325
- Telephone and transmission lines, 428
- Photoelectricity. By H. E. Ives, (D.) 40
- Photo-electronic effect in sodium and potassium, Investigation of energy of. By W. H. Kadesch, (D.) 193
- Photographing electric sparks. By J. A. Detoni, (D.) 581
- Photography:
- Arc lamps in. By V. A. Clarke, \*956; Comment, 939
- Color photography, Development of. By M. C. Kynny, 656
- Relief designs, Apparatus for photographing. By A. Palme, (D.) 485; (D.) 777
- Tungsten lamp application. By M. Luckiesh, \*954
- Tungsten lamp in. Investigation of actinic value of radiation from gas-filled lamp. By M. Luckiesh, 129; Comment, 114
- W. A. D. Evans, 337
- Photometers:
- Flicker, New design for colored light photometer. By H. E. Ives and E. J. Brady, (D.) 919
- Moving-lamp photometer. By Trowbridge and Truesdell, (D.) 1015
- Photometry:
- Color-absorbing solutions, Experiments with. By H. E. Ives and E. F. Kingsbury, 717; Comment, 699
- Gas-filled incandescent lamps. By C. H. Sharp, 992; Comment, 986; G. W. Mid-Jackson and L. E. Skoedand, \*1248
- Comment, 1230
- Integrating sphere and arc photometry. By N. K. Chaney and E. L. Clark, 718
- Light filters. By C. E. Mees, 717; Comment, 699
- Physical chemistry as applied to industrial processes. By W. F. L. Rutman, (D.) 142
- Physical knowledge, New paths of. By Max Planck, (D.) 680
- Pioneer investors, Courage and faith of, illustrated by Kansas City Electric Light Co., 645, 648
- Pipe, Welded, Strength of. Tests by F. L. Pryor, (D.) 777
- Pipe wrench, Right way to hold, \*339
- Platinum, Vapor pressure of. By Langmuir and Mackey, (D.) 768
- Pliers, Wire-stripping, Smith & Henenway, \*345
- Plugs and receptacles:
- Balassa fuse plug containing six fuse links, \*922
- Buckey Knoll, \*536
- Cover for, Fittings, \*681
- Fusible plug safety device for water heating appliances, Landers, Frary & Clark, \*877
- Hubbell, \*4
- Metropolitan receptacles, \*441
- Metropolitan separable attachment, \*440
- Paiste, \*535, \*633, \*1210
- Premier fuse plugs, \*394
- Trumbull, \*296
- Plumby, Determination of. By E. Rosenberg, (D.) 436
- Pole transmission lines (See Transmission)
- Polishing and grinding machines, Electric, Roth, \*682
- Potentiometers, Testing of. By Wenner and Wevile, (D.) 1017
- Power factor:
- Alternating current circuits. By G. M. Brown and M. Shuttlesworth, (D.) 35
- Improvement, (D.) 30
- Power-factor meter of Carpenter, (D.) \*194
- Presses, Bliss steel-sheet drawing, \*96
- Primary batteries:
- Leclanche type, French patent, (D.) 824
- New type, (D.) 727
- Prime movers:
- Efficient, 599
- Status of. By H. G. Stott, R. J. S. Pigott and W. S. Gatch, 18
- Proof table, Printer's illuminated, \*87
- Public ownership (See Municipal ownership)
- Public service commissions:
- Decisions of commissions to be published, 1085
- Pennsylvania interpretation of public service law, 558
- Politics in commissions, 161
- Rate regulation. By G. D. Nutting, 1055
- Public service corporations:
- Bureau of Standards, Public utilities work of, 1187; Comment, 1181
- Combination of cities against public utilities, 1087
- Conference of city officials in Philadelphia, Proposed national bureau, 1, 4, 164, 213, 216, 841, 846, 886, 965, 993



- Competition against established plants, Idaho decision against, 161
- Controlled monopoly rather than competition, *See* *Electricity, Competition, monopoly, 1081*
- Cooperation from city officials, 745
- Decision, *See* *Electricity, Competition, monopoly, 1081*
- By E. F. Dweilley, 433; W. S. Kelley, 397
- Fundamental planks, By D. F. Wilcox, 997
- Holding companies and their connection with public welfare, By F. T. Homer, C. F. Mathewson and I. P. Goodrich, 908
- Indeterminate permit, By Halford Erickson, 220
- Interlocking directorates, 113
- Newspaper and the public utility, By I. R. Slater, 29
- Public policy of, By G. E. Gaskill, 653
- Recommendations on vital points adopted by majority, 994
- Regulation
- Bill drafted by National Civic Federation, 943; Comment, 938
- Difficult points of view, By E. W. Bemis, Charles Day, C. H. Harrison, J. M. Eshleman and S. P. Jones, 997
- Relative merits of state and local regulation, By Halford Erickson, M. R. Malbitch and L. W. Stratton, J. P. Mitchell and C. E. Merriam, 994
- State regulation, By N. T. Guernsey, 996
- Utilities Board, Plans of co-operation, By L. D. Brandeis, 996
- Various practical problems, By N. T. Guernsey, L. D. Brandeis, Ray Palmer, A. M. Taylor and D. F. Wilcox, 996
- Publicity
- Forty-dollar public-policy idea, 1205
- Traveling public and its purse, By Thomas MacTavish, 235
- Value of, to the small station, Results at Grimsby, Eng. By W. A. Vignoles, (D.) 142; Comment, 114
- Pumps and pumping, Electric
- Bishop-Babcock-Becker automatic water pump, 1064
- Chicago, Fulton Avenue and Jefferson Park stations, 720
- Dayton, automatic, 954
- Dayton pump for short-lifts, 730
- Demonstration in public square, Salinas, Cal., 769
- Dentist's motor-driven vacuum pump, 583
- Draining agricultural lands along Illinois and Mississippi Rivers, Data on first cost. Operating expenses of steam and motor driven pumping stations, 275; Comment, 262
- Fire pumps, Chicago, Reducing maximum demand, 329
- Fort Wayne pump, 684
- Gravel pumped from elevated to cars, Hattiesburg, Miss., 30
- Oil wells in Illinois, 389
- Operating centrifugal pumps with variable delivery, By A. Peterson, 114
- Pumping for the small plant, 214
- Waterbury, Iowa, Data on work with deep well pumps, 230
- Pyrometers, Thermoelectric, English, (D.) 1142
- Pyrometry, Brightest measurements with Holborn-Kilbaum optical pyrometer, *See* *Pyrometry, Thermoelectric, English, (D.) 1142*
- By A. G. Worthing and W. F. Forsythe, (D.) 696
- Q**
- Quantum theory, By S. Dushman, (D.) 874
- R**
- Radiators
- Electric hot-water, Rathbone, 787
- Electric steam, 1019
- Radio-activity
- Distribution of energy in the different types of gamma rays emitted from certain radioactive substances, By Jadwiga Smid, (D.) 1163
- Mass and velocities of the alpha particles from radioactive substances, By Rutherford and Robinson, (D.) 1015
- Radiotelegraphy
- Absorption of electromagnetic waves, By R. Albert, 333
- Aeronautics, Relation to radiotelegraphy, By H. Thurn, (D.) 438; Comment, 454
- Army Signal Corps apparatus for field work, 195
- Atmospheric refraction of electromagnetic waves, By J. A. Fleming, (D.) 1060; Comment, 1045
- Australia, Conditions in, By J. G. Balsillie, (D.) 1261
- Capacity of antennas, By G. W. O. Howe, (D.) 875
- Cooper Hewitt oscillator, 988, 1034, 1051
- Coupled circuit, Mechanical analogue of, By T. R. Kyle, (D.) 1137
- Damped or undamped oscillations, Use of, By H. Rein, (D.) 728
- Diagrams of wave trains and resonance curves obtained with Helley system, Comparisons with Marconi system, (D.) 389
- Radiotelephony: (Continued)
- Direction finder, Marconi, 245
- French colonial stations, By P. Brenot, (D.) 1163
- patent, (D.) 875
- Measuring wave-lengths, By Hans Vogt, (D.) 1164
- Neutrality of United States in European war, 265, 1183
- Paris High School of Electricity, By Paul James, 675
- Regulation, Need of legislation, By Barrett Lee, 675
- Saville, N. Y., Transatlantic station through island, 1183
- Possibility of direct wireless communication between Germany and the United States, By L. L. Hogan, 843
- Comment, 597
- Single-wave produced by coupled oscillation circuits, By E. Girardeau, (D.) 581
- Stations in Central America and South America, (D.) 269
- Theory, By Capt. Fracon, (D.) 629
- Transatlantic station, France, aspects at Wales and New Jersey, Marconi system, Progress, *See* *Transatlantic station, France, aspects at Wales and New Jersey, Marconi system, Progress, (D.) 269*
- By J. L. Hogan, Jr., 843; Comment, 406
- Tinkering, N. Y., Gold changed to silver at rate station. Receives sustained waves from Elbe, Germany, 400 miles away, By J. L. Hogan, Jr., 853; Comment, 843
- War news, *See* *Transatlantic station, France, aspects at Wales and New Jersey, Marconi system, Progress, (D.) 269*
- Wave-length determination, Relation that should exist between length of wave, size of antenna, and current produced therein in order to obtain maximum transmission, By A. S. Blatterman, 326; Comment, 311; Louis Cohen, 772
- Radiotelephony
- Cable system, (D.) 5438
- Deforest call set, 502
- Marconi set, 487
- New system based on a kind of electric relay, By J. L. Hogan, Jr., 843; Comment, 406
- Trains, Communication between, 397
- Transmitter, Radio Telephone & Telegraph Co., 144
- Radium
- Experiments in the active deposit of, By E. M. Wellich, (D.) 1163
- Quantitative determinations of, By Herman Schlundt, 761
- Rail joints
- Direct radio instrument for measurement of resistance, By J. Renard, (D.) 580
- Thermoelectric, By J. Renard, (D.) 580
- Welded joints, By Fred Lind, (D.) 387
- Railway yard, Tower lighting with quartz-tube lamps, 654
- Railways
- Brazil, Difficulties of construction, By H. M. Savers, (D.) 387
- Chicago, Milwaukee & St. Paul, Electrification, 108, 1269
- Direct-current systems, Traction efficiency of, By J. Liska, (D.) 292
- Discussion, By Association of Railway Electrical Engineers, 397
- Plea for high-voltage direct-current traction, By J. A. Shaw, 81
- European, Comments on, 2
- France
- Relfort district, Light railway, (D.) 679
- Paris, Electrification by General Omnibus Company, By T. Pausert, (D.) 726
- Single-phase traction in Haute-Dienne district, (D.) 678
- Germany
- Albstadt single-phase line, By Noeldecke, (D.) 340
- Mountain line in Bavaria, (D.) 726
- Rosen, Paderborn, By J. Liska, (D.) 679
- Vienna-Presburg line, By E. E. Seefehlner, (D.) 126
- Storage-battery traction, By M. Buttner, (D.) 61
- Great Britain, Newcastle municipal system, By Richard Mayne, (D.) 387
- Heating and lighting, electric, By R. Stearns, (D.) 727
- High-voltage direct-current traction, By P. Amsler, (D.) 824
- Hungary, Electrification of the Arad Regyvalja R. By Robert Milch, (D.) 679
- India, Electrification on Eastern Bengal State Ry. By Merz and McLellan, (D.) 436
- Italy, Electrification in, By L. Pontecorvo, (D.) 920
- New York, New Haven & Hartford: Comment on report of Interstate Commerce Commission, 113
- Energy contract with New York Company, 1136
- Pennsylvania, Storage-battery car, 1094
- President Wilson discusses business and the railroads, 985
- Rail feeders, resistance being used to obtain equal drop, By H. M. Savers, (D.) 340
- Rate advance, 407, 453, 597, 795
- Spain, First electric line, (D.) 484
- Transatlantic station, France, aspects at Wales and New Jersey, Marconi system, Progress, *See* *Transatlantic station, France, aspects at Wales and New Jersey, Marconi system, Progress, (D.) 269*
- By J. A. Brodie, (D.) 387
- \*Indicates illustrated articles.
- Ranges (See Stoves, Electric)
- Rates for electric energy
- Benefit of common regulation, By H. G. D. Nutting, 1055
- prices of electricity, By Sir John Snell, 996
- California decision, Pacific Gas & Electric Co., 119, 408
- Cincinnati, Report on rates of Union Gas & Electric Co., 1036, 1229, 1233, 1234
- Cleveland municipal plant, History of city's competition with company and its efforts to establish 3-cent rate, 1040; Comment, 1033
- Decision of rate boards, *See* *Stoves, Electric*
- Hamilton, 863
- Cost, rates of rate-making, By William Adams, 819
- Discussion of public service rates, By H. W. Ashley, 624; B. W. Mendenhall, 996
- Employees get half rate, Salt Lake City 524
- Flat-rate campaign, Muncie, Ind., 1155
- Formulas for rates, By W. T. Norton, 20
- Hartford, Conn. Reduction, 283
- Houston, Tex., 1233
- Lighting rates, Municipal, By Ray Palmer 106
- Making of rates, By George Shand, 895
- Maximum demand determination and its relation to the cost of supply of electric energy, By P. T. Davies, 81
- Philadelphia rates, 988, 1137
- Proposal of Kansas City to charge for both real power and "wattless power," By G. Darrieus, (D.) 484
- Providence, R. I., Narragansett Electric Lighting Co., Off-peak rates, 650
- Relation between incandescent lamp voltage and resulting revenue and service, By R. A. Lewis, 508
- Salt Lake City, Changes, 1085
- San Francisco, Pacific Gas & Electric Co.: Court finds rates confiscatory, 119, 408
- Sandusky, Ohio, Franchise agreement, 706
- Schedules of different countries, By G. Siegel, (D.) 340, 387; Comment, 310
- Short-time lighting load problems, 1033
- Springfield (Mo.) Gas & Electric Co., Rate case, I, 9, 268, 318
- Standardization of rates, A proposed system, By J. H. Bowden, (D.) 91
- Street lighting in Boston, By C. L. Edgar, 106
- Street lighting, Economics of, By R. S. Hale, 621
- Stumps, power, Charge for, By H. D. Nutting, 966; H. G. D. Nutting, 1208
- Three different methods of, By R. A. Lewis, 508
- Reactance, Effect on low-power-factor feeder circuits, 626
- Reactors
- Conical-type, General Electric, 879
- Effectiveness of feeder and bushbar reactors, By Edwin Lyman, L. L. Peterson and A. M. Rossman, 751
- Location for current-limiting, 1159
- Protection of synchronous converters, Reactors for, By I. L. M. K. V. V. V., 75
- Recording machine production, Instrument for, Caterline, 631
- Recording pressure gage for steam-heating system, Muncie, Ind., 339
- Recording system, Long-distance, Bristol, 1163
- Rectifiers
- Aluminum, for rectifying alternating current, By H. Greinacher, (D.) 91
- Cooper Hewitt mercury-vapor, 988, 1034, 1051
- Design of high-voltage machines, By H. C. Wolf and H. Mathewson, 856
- Mechanical rectifier for heavy currents, Sandell, 1263
- Mercury, to prevent "reverse arcing," British patent, (D.) 192
- Refining of gold and silver, Electrolytic, By H. Lacroix, (D.) 143
- Refractometry, By G. A. Shook, (D.) 875
- Refrigeration
- Central-station ice-making, Advantages of, By C. T. Groat, 1053
- Data on ice-cream factory operation, Central Illinois Public Service Co., 380
- Domestic equipment, Westerberg & Williams, 877
- Hester, Electric, for maintaining heat balance during refrigeration tests, Ann Arbor, Mich., 384
- Ice-box refrigerating outfit, Mechanical Refrigeration, 892
- Massachusetts ice business under state regulation, 892
- Regulation (See Public service corporations)
- Regulators
- Automatic voltage regulation, By C. L. Carter, (D.) 1162, 1212
- Controlling small motors, Cutler-Hammer, 106
- Induction, Theory and arrangement, By Zentgraf, (D.) 1162

with crane motor circuits, \*818

Resistance unit, 15,000-ohm, Ward Leonard, 1918

Resistor, Continuous grid type, Electro-Mechanical Brake Co., \*973  
Resonance tests on artificial 240-mile line with A. E. Kennelly and Harold Pender, 278

Water-cooled rheostats for 7500 kw at 6600 v

Rhode Island Commission news, 368  
Rhode Island Electrical Contractors' Association, Convention, 844

Riveting machines, Electrohydraulic Swiss system

Roentgen rays:  
Impact of positive and slow cathode rays, By Sir J. J. Thomson, (D.) 341

Rolling mills, Motor-driven, for steel, brass, copper

Rules for service standards in Illinois, Discussion and performance characteristics, By various electric and gas interests, 169

S

Safety rules for electrical practice, By S. W. Stratton, 1188

Salem, Mass., Fire, \*6

Savings fund (See Employees)

Saws, Motor-driven:  
—Smith portable, \*244

Scales, Electric conveyor, \*534

Searchlights:  
Automobile projectors for the French army, (D.) 678

Marine, Carlisle & Finch, \*145

Vapor-cooled electrodes, Constructional features and performance characteristics, German invention, Test by U. S. Navy, \*181; Comment, 162; Correction, 222

Selenium:  
Electrical resistance, Time factor in, By G. E. Grantham, (D.) 920  
Experimental investigation, By F. C. Brown, 891

Service plants (See Central-station operation)

Service-recording instrument, Esterline, \*631

Sewing machine table, Bissell, \*732

Ships, Electricity on:  
—Argentine battleship "Moreno," By H. A. Hornor, 752

California, Motor-driven, 989

Shoe-repairing machine, Electrical operation, 333

Sign and decorative lighting:  
—Baltimore, Md., Star-scattered-banner center annual, By Poston Scott, \*817

Bank service advertisement, \*85

Bartlesville, Okla., \*1011

Clock signs, Betts & Betts, \*146

Cornice lighting with straight-flament lamps

Denver, Elks' jubilee, \*165

Elyria, Ohio, Slogan sign, \*187

Fishers, Kelley, \*129

Co., \*391  
---Small electric sign, Usefulness of 985  
---Summer garden, St. Louis, \*87

Held invention, \*1069

Signal:  
hospital, By E. Goldbacher, (D.) 971

Berlin, Introduction of block system  
By R. Pfeil, (D.) 192

French systems, (D.) 628

Illuminated targets for daylight signal

Silent-call signal system for hospitals, \*1018

Standby signals transmitted over existing telephone circuits, \*1210

Submarine, Fessenden oscillator, By R. F. Blake, \*752

Smelting, Electric iron, at Hardanger, Norway  
By John Harden, (D.) 143

Smoke monitor and recorder, By W. W. Strong, (D.) \*40

Society for Electrical Development:  
---Directors' meeting, 947  
---Membership employee button, \*892  
---Prize story competition, Awards, 845  
---South America provided by, 611  
Society for the Promotion of Engineering Education, 1188

Sockets (See Incandescent lamp fixtures)

Soldering torch, Acetylene, Prest-O-Lite, \*95

Spark discharge between unlike metals, Experiment by D. M. Rice, 1265

Spark, Resistance of, By J. S. Stone, (D.) 825

Spark potentials, Effect of longitudinal magnetic field, By F. E. Kealy, (D.) 628

Spectra of carbon and some of its compounds, By "Savon" spectrum, (D.) 727

Sphere gap as a means of measuring high voltage, By F. W. Peek, Jr., 16

Sphere-gap discharge voltages at high frequencies, By C. Clark and H. J. Ryan, 16

Spirit level, Electrically lighted, Universal, \*778

Sprinkler tank filled by electrical pumping, 431

Springville, Utah, \*816

Standardization, Rules of American Institute of Electrical Engineers, 1082; (D.) 1115

Standardizing laboratory of the Boston Edison Electric Illuminating Co., By H. S. Ketchum, 1276

Statistics:  
---California, Electrical activity, 5  
---Detroit, Central-station business, 84  
---Electrical data compiled by Chicago department of electricity, 554  
---Exports from electrical industry of Germany to neutral countries, nations at war and colonies, 412  
---Fires, Electrical, 432  
---German centralizations, (D.) 239; Comment, 214; By G. Dettmar, (D.) 679  
---Technical graduates, 572  
---Wash., Report on municipal systems, 705  
---Storage batteries versus isolated plants, By Deussen and J. Hesse, (D.) 580  
---Use of statistics, 222

Team turbines (See Turbines)

Steel:  
---Chromium, Magnetic properties of, By M. B. Moir, (D.) 141  
Electricity applications in all branches of manufacture of iron and steel, Discussion by the Association of Iron and Steel Electrical Engineers, 667; Comment, 645

Hardening of, By Andrew McCance, (D.) 626

Magnetic habits of alloy steels, By J. A. Mathews, (D.) 1116; Comment, 1082

Manufacture (See Furnaces, Electric)

Silicon steel, having low hysteresis coefficient, British manufacturing patent (D.) 39

Stock-counting methods for jobbers, New York City, \*489

Stock-keeper's bin card, \*685

Stokers, Mechanical, Characteristics of, \*871

Storage batteries:  
---Branson system for, (D.) 1016  
---Overload detector, By R. Raulsin, \*92  
---Silicon steel, having low hysteresis coefficient, British manufacturing patent (D.) 39

Stoves, Electric:  
---Cadillac toaster, \*1216  
---Copeman range with elevated ovens, \*631  
---Hotpoint vertical toaster, \*733  
---Hotpoint toaster with automatic oven, \*584  
---P. J. flat type toaster, \*533  
---Rutener range, \*533

---Rutenber toaster, \*487  
---Woods, Mowbray & Newman range, \*827

Street lighting:  
---Bessemer, Mich., Meter basis for contracts, 471  
---Boston:  
Contract situation, 164, 217, 504, 552, 1038, 1136, 1185  
Rates, By C. L. Edgar, 750  
White Way for retail district, 527  
Nitrogen-filled series tungsten lamps, Westinghouse contract, 377  
Posts painted for 55 cents apiece, 817  
Supplemental contract, 117  
Tungsten lamps on Hyde Park boulevard, 80

---Dallas, Texas, Ornamental magnetite arcs, \*575

---Denver, Elks' jubilee illumination, \*165

---General Electric, Inc., \*98

---Germany, Nitrogen-filled lamps, By L. Bloch, (D.) 1115, 1259

---Huron, Ohio, Nitrogen-filled tungstens, 432

---Indianapolis, Ind.:  
Controversy between the city and the Merchants' Heat & Light Company, 457, 601  
Safeguards for decorative lighting, \*869

---Kalamazoo, Mich., Municipal plants, \*226

---Kokomo, Ind., \*185

---Merion, Pa., Ornamental lantern, \*1207

---Milwaukee, Wis.,  
Installing steel-taped cable arc-lamp circuits along paved streets, \*32  
Survey, 1054

---New Bedford, Mass., Improvements, 650

---New York, Gas-filled lamps, 750  
Nitrogen-filled lamps, By L. Bloch, (D.) 1115, 1259

---North Woodland, N. J., Boardwalk lighting, 136

---Parade ground lighted by tungstens, \*87

---Pittsburgh, Inverted magnetite lighting, 187

Public lighting at private expense, 1181

---Railway, Arc, Tower lighting with quartz tube lamps, \*85

---Rates, By R. S. Hale, 621

---Requirements, By Haydn Harrison, 724

---Seattle, Wash., Report on municipal system, 705

---Single-unit standards, King, \*243

---Springfield, Ill., State house illumination, 431

---Standards, Union Metal Mfg. Co., \*634

---Sydney, Aus., Special illumination, \*233

---Washington, D. C.:  
New lamps, 1084  
Ornamental lamp standards, \*525  
Residence street lamps dimmed, 700

---Watertown, Wis., Provisions of contract and specification, 1089; Comment, 1081

Street lighting tables for 1915, 1135

Substations:  
---Albany Power Company, By W. F. Mitchell, (D.) 531

---Nevada-California Power Co., \*1045, \*1093

Subways, Ventilation of, By Brugsch and Brigs, (D.) 1058

Superior as a conductor, By C. A. Butman, 726

Supreme Court of the United States, a national bulwark, Opinions of ex-President Taft, 598

Sweden, Electrical import trade, (D.) 1164

Switchboard connections for making commercial transformer tests, Chicago Commonwealth Edison Co., \*375

Switchboards:  
---Air-compressor control panel, Automatic Switch Co., \*632  
---Battery charging for garage service, Allen-Bradley, \*681  
---Glass, Mutual Electric & Machine Co., 1121  
---Illumination, Brooklyn, \*1257  
---Sealed sectional service board, Chicago, \*818

Switchboxes:  
---Bauer, cast-iron, \*535  
---Chelton, pressed-steel, \*196  
---Chicago sectional, \*533  
---Weatherproof, Fittings, \*393  
---Weatherproof metal, Berry-Glosser, \*582

Switches:  
---Arc-break switch tests, By W. I. Hammond, (D.) 42  
---Bryant push-button, \*533  
---Cutout switch in ornamental poles, Morris, \*245  
---Development in lever and disconnecting switches, By H. G. French, (D.) 824  
---Hotel door, Hart, \*1266  
---Knife, switches, Adam, \*1214  
---Lamp circuit control, Automatic, Cumberland, \*52  
---Magnetic-control switches, Characteristics of, By H. F. Stratton, 667  
---Magnetic switches, Cutler-Hammer, \*1214  
---Manhole oil switches, General Electric, \*1120  
---Metropolitan flush push-button switches, \*441  
---Multi-point snap switch for electric ranges, Bryant, \*488  
---Oil, General Electric high-voltage outdoor, \*43  
---Motor, General Electric, \*784



## SWITCHES (Continued)

- Pole-top switch protection by means of plate form. Pittsburgh, 772
  - Protective case for knife switches. By J. G. Koppel, 947
  - Remote-control service switch, 1264
  - Reversing switches for squirrel-cage motors. Custer Hammer, 826
  - Service switch and cabinet, Detroit, 1149
  - Service switch and fuse box, D & W Fuse Co., 488
  - Stating switch for alternating-current motors. Allen-Bradley, 243
  - Time switch, Paragon, 1215
  - Tool-handle snap switch, Custer Hammer, 442
  - Switchgear for phase advances, Connections employed in. By C. C. Garrard, (D.) 531
  - Switching phenomena occurring with electric machines and transformers. By W. Linke, (D.) 292
  - Switching stations:
    - Air-break, Delta Star, 535
    - High-voltage outdoor, Mahoning & Shenango Railway & Light Co., Youngstown, Ohio. By W. H. Acker and C. A. Harrington, 617
  - Switzerland. Exhibition in Berne of high-tension apparatus. By K. Kuhlmann, (D.) 436
- T**
- Tables:
    - Kitchen table, with electric plate warmers, 1021
    - Wired for demonstrating appliances, Central Electric Co., 150
  - Tailor's work benches equipped for electricity, New York, 1156
  - Telectroscopy. Application of electrolytically produced luminosity. By L. H. Walter, (D.) 340
  - Telegraphy:
    - Combined telephone and telegraph circuit, Washington Water Power Co., 1258
    - Printing telegraph system. By Carl Kinsley, 30
    - Public ownership and operation, Postmaster-General's recommendation, 1181
    - Submarine:
      - Future progress. By H. W. Malcolm, (D.) 777, 1361
      - Signaling device, 972
    - War tax, 749
  - (See also Radiotelegraphy)
  - Telephone values in New York, 113
  - Telephony:
    - Berlin and Magdeburg cable loaded with in-ductance coils. By A. Ebeling, (D.) 143
    - Betulander relay automatic system, (D.) 532
    - Construction of artificial line to correspond with loaded transmission line, British patent, (D.) 294
    - Exchanges of small size for small groups of subscribers. By H. C. Steidle, (D.) 825
    - Experimental studies of a receiver. By I. Boothill and L. Dronet, (D.) 639
    - Generator, Franke design modified, (D.) 164
    - Hamburg, Ger., Statistics. By K. Dohmen, (D.) 1164
    - Induction in telephone lines. By K. W. Wagner, (D.) 93, 241
    - Loading duplex lines, Patent of Pleijel and Olsson, (D.) 342
    - London developments. By C. W. Muirhead, (D.) 680
    - Long-distance cable, Advantages of, over bare line. By F. Breisig, (D.) 41
    - Neutralizing transformers in circuits. By T. Shaw, (D.) 1117
    - Ohio, Consolidation of independent companies, 267
    - Order wire service in large plants. By J. Baumann, (D.) 240
    - Patents, 25, 88, 138, 188, 234, 287, 336, 383, 480, 623, 674, 772, 1012, 1055, 1256
    - Protection of telephone circuits. By W. A. Darrah, (D.) 971
    - Public ownership and operation, Postmaster-General's recommendation, 1181
    - Relays applied to commercial circuits. By C. Robinson and R. M. Chamney, (D.) 728
    - Resonance receiver. By N. Aliamet, (D.) 629
    - Signaling set, Western Electric Co., 445
    - Simplification of telephone theory. By J. A. Fleming, (D.) 438
    - Submarine signaling device, 972
    - Testing set fastened on the breast, Holtz-Cabot, 242
    - Three-phase high-tension line, Effects of, on telephone lines. By O. Brauns, (D.) 1060
    - Toll telephone traffic. By F. F. Fowle, 20
    - Transformer, Effects of iron in, on secondary current. By E. Helwig, (D.) 294
    - War tax, 749
    - Wave transmission theory. By L. Cahen, (D.) 194

## TELEPHONES (Continued)

- See also Radiotelephony
- Telescribe, Edison invention for recording telephone conversation, 729
- Television apparatus devised by A. M. Low, (D.) 57
- Temperature control system, Electric, Railway Utility Co., 442
- Temperature of electrical machinery, Operating. Effect of altitude, 435
- Temperature of metals as affecting their resistance. By L. Schuler, (D.) 970; Comment, 938
- Temperature regulator, Industrial Instrument Co., 476
- Temperature regulator to maintain superheat temperature, 676
- Temperature rise in machines, Table showing limits. By H. M. Hobart, 874
- Temperature scale, Standard proposed, (D.) 531
- Terminal tool, Bosch, 392
- Test bridge, Roller-Smith portable, 98
- Testing laboratory of the Boston Edison Electric Illuminating Co. By H. S. Knowlton, 176
- Testing outfit for core loss, 1216
- Testing outfit for permeability, Westinghouse, 243
- Thermocouple electrical generator, devised by Johannes Marschall, 385
- Thermocouples:
  - Base-metal, By O. L. Kowalek, 764
  - Coal-end compensator for. By C. D. Thwing, (D.) 40
- Thermo-electric apparatus in high-frequency systems. By August Hult, (D.) 874
- Thermo-element, Quick acting of, J. H. Mott, (D.) 293
- Thermo-relay, Baruch, 684
- Thermometers, Resistance-wire, Brown, 197
- Thermopiles, Experimental investigation of bismuth-silver. By W. W. Coblenz, (D.) 1163
- Thermoscope, A new. By F. S. J. FitzGerald, 289
- Thermostat for low temperatures. By J. H. Walton, Jr., and R. C. Judd, (D.) 1213
- Thomson bridge in the measurement of very low resistances. By F. Wenner and E. W. Abel, (D.) 874
- Thread protector for enameled pipe, 486
- Three-phase systems, Methods of connecting transformers. By Charles Fortescue, (D.) 824
- Thunderstorm electricity and phenomena. By W. J. Humphreys, (D.) 970
- Timber preservation, Impregnation processes for poles. By Jean Esard, (D.) 193
- Time-recording machine, Workmen's, Gisholt, 1118
- Titanium, Effect of, on the magnetic properties of iron. By K. P. Applegate, (D.) 141
- Toasters (See Stoves)
- Tool kits, Steel, Kennedy, 486
- Torch, Linemen's kerosene, Hauck, 1019
- Toronto Hydro-Electric Commission, Need of funds, 700
- Tower transmission (See Transmission)
- Transformer wave forms, Effect of delta and star connections. By L. F. Curtis, 606
- Transformers:
  - Bell-ringing and toy, Electric Mfg. Co., 1021
  - Bell-ringing, Kittenhouse, 879
  - Connecting transformers for use on poly-phase systems, Advantages of several methods. By Charles Fortescue, (D.) 824
  - Construction, Arno patent, (D.) 34
  - Construction of exact circular diagrams. By H. Kafka, (D.) 291
  - Construction for steel mills. By G. A. Waters, 669
  - Cooling transformers, Auxiliary, Danville, Ill., 37
  - Design. Calculation of cooling surface of oil transformer. By H. De Pastore, (D.) 627
  - Instrument, Weston, 583
  - Measuring, Difficulties, (D.) 240
  - Parallel operation of subway transformers. By R. C. Powell, 911
  - Comments, 890
  - Paralleling of transformer coils, 290
  - Protection for farm-line instruments, Noblesville, Ind., 816
  - Selection, installation and operation for three-phase systems. By E. A. H. Dinham-Ferret, (D.) 873
  - Series transformers, New type, (D.) 238
  - Star connection of series. By J. G. Koppel, 289
  - Switching Phenomena. By W. Linke, (D.) 292
  - Testing by the differential method. By A. E. Clayton, (D.) 291
  - Testing instrument machines. By P. G. Agnew, 1004
  - Comments, 985
  - Testing large transformers without loading, 529
  - Testing transformer for insulation. By J. Brooks, (D.) 483
  - Toy, Dongan, 1166
  - Two transformers in three-phase circuit, 723
  - Ventilating with washed and cooled air, Brooklyn, 820

\*Indicates illustrated articles.

- See also Radiotelephony
- Baltimore, Consolidated Gas, Electric Light & Power Co., Construction of, 13,000-volt line. By J. T. Kelly, Jr., 431
- Big Creek, Cal., Pacific Light & Power Co., Zero line regulation. Energy delivered to Los Angeles, 240 miles from station. By Edward Woodbury, 665
- Comment, 646; R. A. Philip, 1147; Comment, 1130
- Bishop Creek, Cal., By C. O. Poole, 757, 805, 858, 903, 949, 1001, 1045, 1065
- Burlington (Vt.) Light & Power Company, 513
- Calculation of constant-voltage lines. By H. B. Dwight, (D.) 72
- Calculation of long lines. By U. del Buono, (D.) 192
- Calculation of long-line regulation on long three-phase lines. By B. Soschinski, (D.) 873
- Calculations for lines, Simplified hyperbolic. By H. B. Dwight, 474; A. E. Kennelly, 624
- Calculator for alternating-current line, 974
- China, Standard distributing voltage for. By R. A. Williams, 288
- Comments on new line issues, Kerkow, St. Louis and Big Creek-Los Angeles systems. By R. A. Philip, 1147
- Corona from direct-current circuits, Discussion by American Institute of Electrical Engineers, 291
- Differential equations of long-distance transmission. By G. R. Dean, (D.) 340
- Disconnection of lines, Transient phenomena. By W. Peterson, (D.) 91
- Distributing potential over a string of insulators. Experimental determination of the differences in the potential between the successive units on a high-tension line. Effect of corona. By J. L. Breneman and H. M. Crothers, 1095; Comment, 1081
- Distributing voltage for. By R. A. Williams, 288
- Distribution system for power purposes. By F. D. Smith, 606
- Disturbances during operation of lines. By D. B. Rushmore and Eric Lof, (D.) 628
- Engineering data on high-tension systems. By P. H. Thomas, 13, 17
- Guard around guy wires, 286
- Inductive interference:
  - California rules, 458; Comment, 502, 844; By R. D. Coombs, 875
  - Discussion on Pacific Coast, 608
  - Legal aspects. By G. H. Montgomery, 79
  - Traveling waves, Effects of. By K. W. Wagner, (D.) 93
- Inspecting lines with gas lamp, Portland, Me., 479
- Interruptions on long-distance lines, their origin and prevention. By P. Ackerman, 81; Comment, 58
- Ladders for linemen, 285
- Line construction, National joint committee, Plans, 120, 122
- Mahoning & Shenango Railway & Light Co., Youngstown, Ohio, High-voltage outdoor switching stations. By W. H. Acker and C. A. Harrington, 617
- Mechanical loads, Effects of. By R. D. Coombs, 761
- Nankin, Ohio, Alternating-current distribution at rotary-converter voltage, 334
- Ohio Electric Light Association, Report, 282
- Panama-Pacific International Exposition, 1241
- Philippine Islands:
  - Distribution without poles, Manila, 187
  - Pole line construction, 325
  - Types, 428
- Pole and tower lines:
  - Advantages of, as of other types, 378
  - Bracing of cross-arms, 1014
  - Construction of, when poles, Types of steel towers. By R. D. Coombs, 812
  - Clearances between conductors and earth. Crossings. Obstructions on rights of way. By R. D. Coombs, 233
  - Cost of pole lines, New Jersey report, 274
  - Cross-arms, Steel, for three-phase lines, 486
  - Joint line construction, 334
  - Liability of company using joint poles, Missouri decision, 1154
  - Lower telephone crossarm to reduce inductive noise. Peoria, Ill., 526
  - Southern Sierra Power Co., 1143
  - Width of right-of-way and its relation to line construction. Factor of safety for wires. Length of span. By R. D. Coombs, 761

investigation of voltage rise on artificial  
native, 191  
—Sweden to Denmark, submarine line, 274  
service to local industries, \*470  
supplying energy to 23 communities.  
—Transposing transmission lines, advisability,  
steel plant  
—Ouboukhoff, (D.) 91  
Transmission plants:  
—Big Creek, Cal., Pacific Light & Power Co.,  
Operating conditions, Energy delivered  
to Los Angeles, 240 miles from station,  
By Edward Woodbury, \*665; Comment, 646;  
R. A. Philip, \*1147; Comment, 1130  
\*805, \*858, \*901, \*949, \*1001, \*1045,  
\*1092, \*1143, \*1193  
—Burlington (Vt.) Light & Power Company,  
at Winooski, supplying service to Burl-  
ington, Richmond and Barre-Montpelier  
district, \*513  
—Keokuk-St. Louis long line. By R. A. Philip,  
\*1092  
—Mexican Northern Power Co., Chihuahua,  
(Construction difficulties. By A. C. Hobb-  
le, \*173; Comment, 162, 170  
—Power plant, 60,000-volt system supplying  
energy to 23 communities, \*419, \*470.  
Comment, 466  
Trolley wire, Pick-up device for broken, \*195  
Trucks, Electric:  
—Boston matters, 5  
—Private booster.  
—United Gas & Electric Co.  
—Cost of operation, Wichita, Kan., 1253  
—Discussions at Philadelphia convention, 847  
—Front-drive trolley tractor, Eldridge, \*244  
—Ice-truck, Baker, \*535  
—Lumber hauling, Stetson-Ross, \*1121  
—Ohio data, 219  
—Operative costs. Investigation by the Elec-  
TRICAL WORLD. Authoritative data, a  
Comment, 645  
Pole truck equipped for passengers, Philadel-  
Philly work needed, 1233  
—Sales promotion. By E. L. Howland, 649  
—Ward light-weight delivery truck, \*1021  
—White truck with wireless outfit, \*683  
—Wichita, Kan., Savings through use of. Cost  
(See also Automobile business)  
Trucks, Electric, Parcel-post delivery. Figures  
showing parcel-post traffic, 317  
Trusts and monopolies:  
—Influence of legislation, 745  
—Postponement of trust legislation, 261  
—Progress of legislation, 9, 62, 118, 161, 164,  
217, 261, 265, 318, 408, 553, 601, 649  
748  
—Senate and trust legislation, 161  
Tungsten lamps (See Incandescent lamps)  
Tunneling, Electrical construction of water in-  
take, Milwaukee, \*329  
Turbines, Mercury steam, \*1057  
Turbines, Steam:  
—Curtis turbine development, Legal decision,  
—Ljungström. By J. Morrow, (D.) 192  
turbo-alternator at St. Pancras works

United Gas Improvement Co., Investigation of.

Units and notations.  
—German list. By K. Strecker, (D.) 143.  
(D.) 1116  
—Olm. Absolute measurement of. By F. E.  
Smith, (D.) 194  
V  
—Pittsburgh light-weight  
handle, \*1063  
Pullman cars cleaned with, Memphis, Tenn.,  
61  
—Western Electric, \*585  
\*1211  
Vacuum tube lamps. New form of tube filled  
with noble gases, (D.) 579  
Valuation of public utilities:  
—Cincinnati, Ohio, Union Gas & Electric Co.  
By W. W. Freeman, 1088  
—Houston Lighting & Power Co., 1152  
—Ohio, Report of joint committee, 811  
—Overhead charges, Nashua, N. H., 913  
Valve gear for high-speed Corliss engine, Nord-  
berg, \*1062  
Manville Co., \*45  
Ventilators:  
—American Blower Co., \*536  
Vermont Electrical Association, Annual meeting,  
505  
Villari critical point in ferromagnetic substances.  
By S. R. Williams, (D.) 824  
Violin music, Electric, \*1263  
Voltage:  
—Break-down voltage and height above sea  
level. By A. Kleinsteuck, (D.) \*776  
—Protection against dangerous rises. By R.  
Ryan, 16  
—Testing of cables. By W. I. Middleton and  
Volmeters:  
—Silver and iodine, Comparison of. By G. W.  
Vinal and S. J. Bates, (D.) 437; Com-  
ment, 454  
Volmeters, High-potential, based on corona pres-  
sure. By Joseph Kneib, 1147  
W  
Wagon and truck loaders, Wash. Bureau, \*566  
Washing machines, Electric:  
—Beebe, \*1265  
—Hurley, \*149, \*1166  
—McGowan, \*731  
—Wooden tubs, \*731  
Washington, D. C., Hearing on separation of  
utilities, 312  
Washington Commission news, 319  
Washington Society of Engineers, Annual meet-  
ing, 1040  
Water softening by electrochemical methods, 1257  
Water, Sterilization of, by ultra-violet rays of  
the mercury-vapor quartz lamp. By M.  
von Recklinghausen, 19  
Water heater, Electric, "Geyser," \*924  
Water-level indicator, Pneumatic, Columbus, Ga.,  
\*826  
Water power (See Hydroelectric developments)  
Water testing outfit, Electrical, Biddell, \*878  
Watt-hour-meters, Development of direct-current  
By W. Srowel, (D.) 921  
Wattmeter method of determining sequence of  
Wave-form, Effect of on the readings of moving-  
iron instruments. By R. R. Burrows  
(D.) 875; Comment, 842  
Weather vane, Electric, Shawell, \*94  
Weighing apparatus with illuminated scales  
Anelidie, \*442  
Wireless telegraphy (See Radiotelegraphy)  
Welding, Electric:  
(D.) 921  
wires especially aluminum. By C. E.  
Skinner and L. W. Chubb, \*766; Com-  
ment, 747  
\*Indicator: illustrated articles.

Welding, Electric: (Continued)  
—Iron sheet welding, (D.) 241  
—Portable arc welder, C & C Electric & Mfg.  
Co., 334  
—Small connections, Method of welding, \*1013  
West Virginia Commission news, 1239  
Western Association of Electrical Inspectors,  
Convention, 1038  
Western Electric Co., Effect of war on, 316  
Westinghouse agent-jobbers, Meeting of, 1186  
—Manufacturing Co.  
—Wichita, Kan., 116  
Windows display (See Advertising)  
Wireless telegraphy (See Radiotelegraphy)  
Wireless telephony (See Radiotelephony)  
Wire gripping and stretching tool, Smith & Hen-  
ry, \*113  
Wires, wiring and conduit:  
—Aluminum insulated cables, Discussion of ob-  
jections to use of, (D.) 484  
—Armored cable, Trumbull, \*683  
—Back-yard wiring methods in cities, \*1011  
—Cable installation, Rother's guides, \*915  
—Cable terminal tool, Bosch, \*392  
—Circuit house wiring. The "bare con-  
centric wire." By W. H. Blood, Jr., 1134;  
1185  
—Cheaper wiring methods, Discussion, 1235  
—Conduit ends, Protection of threaded, in  
shipping, 167  
—Conduit fastener, Hart & Hegeman, \*144  
—Conduit lock-nuts, at outlets. By C. V. Tal-  
bot, \*770  
—Conduit wiring on plaster board. By G. M.  
Duffee, \*1143  
—Construction of high-voltage cables. By C.  
J. Beaver, (D.) 1162, 1212  
—Detroit's proposed ordinance to regulate wir-  
ing construction, 167  
—Double-braid wire forced by contractors, 167  
—Europe, Exposed interior wiring. By E. W.  
Lloyd, 317  
—Explosion in connection with the use of bi-  
tumen in laying mains in England, Re-  
port of committee, (D.) 292  
—Faults, Localization of. By K. Simons, (D.)  
42  
—Feeder embedded in a tree, Long Island,  
\*714  
—Fibre ducts, Laying of, Midland, Pa., \*770  
(German wire conditions, (D.) 776  
—Great Britain, Municipalities, Laying and leasing.  
By E. H. Freeman, (D.) 142  
—Heating of conductors. By T. Hirobe, (D.)  
1260  
—Hotel room wiring arrangement, \*87L  
—House wiring results in Boston. By E. C.  
Kimball, 457; Discussion, 506; Com-  
ment, 453  
—Incandescent lamp wiring, 976  
—Joining of cable for underground circuits.  
Pittsburgh Crucible Steel Co., \*1111  
—Laying cable in Hamburg, Ger. By Brugsch,  
(D.) 1260  
—Laying transmission cable across San Fran-  
cisco Bay, \*7  
—Metal-molding branch fitting, Schwartz, \*147  
—Motors, Wiring tables for alternating-current  
and direct-current. By W. S. Jones,  
\*478  
—National Electric Light Association commit-  
tee work, 942  
—Pulling underground cable, Methods at Cruci-  
ble Steel Co., Midland, Pa., \*385  
—Pulling underground cables, St. Louis, \*385  
—Rating of bare copper conductors. By W.  
Coates, (D.) 874  
—Rating of switchgear conductors. By B. E.  
G. Mittell, (D.) \*437  
—Reeling up line wire with auto truck, Spo-  
kane, Wash., \*1057  
—Residence wiring:  
Flat-rate easy-payment plan in Brook-  
lyn, 286  
Proportion of houses wired for electric  
light, 774  
—Specifications. By W. A.  
Dietz, 268  
—Rules for interior wiring in United States,  
Germany and England compared.  
Tables. By Hugo Eisenmenger, 1099;  
Comment, 1083  
—Separation of lighting and telephone wires,  
Lexington, Ky., 480  
—Submarine cable. Core proportion. By R.  
M. Sargent, (D.) 1164  
—Table for electrical contractors, 100  
—Tables for determination of cross-section  
and voltage drop in lines. By Th. Bail-  
lant, (D.) 1260  
—Testing high-tension cables. By Leon  
Lichtenstein, (D.) \*970, 1015  
—Transmission lines. Factor of safety for  
wires. Conditions governing length of  
span. By R. D. J. Coombs, \*569  
—Voltage testing of cables. By W. I. Middle-  
ton and C. L. Dawes, \*19  
—Water removed from power cable, San Fran-  
cisco, 386  
Wisconsin Commission news, 11, 67, 121, 416,  
512, 660, 901, 1091  
Wisconsin Electrical Contractors' Association,  
\*7  
Wrench, Right way to hold, \*339

EDGAR, C. L. Street lighting rates, 750  
Edgell, A. J. Free advertising literature.  
\*1022

- \*Indicates illustrated articles.



... ..

Strippel, J. W. Burglar-alarm switch, \*186

duits at outlets, 270  
Taylor, A. Philadelphia's transit problem, 997  
—Transfers for changing the frequency, 138  
Terry, C. A. Weathering "transit" slump, \*1012  
Thomson, P. H. High-speed radio transmitters for high-tension transmission systems, 14, 17  
Titus, E. C. Electric light in the treatment of disease, 71  
Tone, F. L. Silicidized carbon-silicaz, 814  
Trautschold, Reginald. Economy in handling peak loads, 516  
Tripp, G. E. Foreign trade conditions, 364  
Trix, John. Business conditions, 166  
Tyner, T. E. Methods of keeping down peaks of power, 10

WAKIM, J. M. Business conditions, 1038  
 ——— Electricity and the lighting sign, 139  
 Waldo, E. H. Electric lamp development, 88  
 West, E. A. Accounting methods for stockrooms,  
 1038  
 Wheeler, H. B., and J. A. Hoeveler. Illumina-  
 tion of small show windows, \*335  
 Wheeler, S. S. Effect of the war, 509  
 White, J. G. War results, 560  
 Whitehead, L. E., and W. S. Gorton. Electric  
 strength of air, 16  
 Wilcox, D. F. Fundamental planks in a public  
 utility program, 997  
 Williams, Harrison. Business conditions, 946  
 Williams, R. A. Standard distributing voltage  
 for China, 288  
 Winchester, A. E. Municipal plants, 999  
 Wolf, H. C., and H. Mathews. Design of high  
 speed motors, \*856  
 Woodbury, Edward. Operating conditions of the  
 Big Creek development, 665  
 Woodruff, E. C. Plotting motor curves, 991

YARLEY, J. L. McK. Reactors for protect-  
 ing synchronous converters, 751

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## A Combination of Mayors

The movement inaugurated by the mayors of several cities for a conference of municipal officials to consider public utilities appears to be rooted in the old idea of "home rule." The Mayor of Chicago, one of the four city officials whose names are given in the call issued by Mayor Blankenburg of Philadelphia, has been a faithful, if disappointed, advocate of home rule. He did not want to have state regulation of public utilities in Illinois interfere with the regulation of Chicago utilities by that city. He wanted the city to have all the power over utilities within its borders. This policy would have thwarted the entire theory of state regulation in Illinois. It was rejected and the establishment of a state commission followed. In most other localities state regulation has supplanted city regulation. In our opinion the reason why this is so is that state regulation is better for the interests of the people as a whole than is city regulation. To the extent that the proposed combination of mayors tries to weaken the power of state regulation it will be an undesirable organization. The public desire at this time is for state regulation, and every opportunity should be given to test the ability of this power in government to solve fairly the problems between companies and public. To the extent that the mayors combine merely for the purpose of presenting the interests of their constituents fairly before commissions and of seeking by proper non-political means all of the facts in reference to public utility properties the combination will work toward a desirable end.

## Legislation and Prosperity

President Wilson has reiterated his determination that there shall be trust legislation at this session of Congress. If it be true, as he believes, that this is all that the country needs to start it on the greatest era of prosperity in its history, let us all speed the day of trust legislation. We think that it can fairly be assumed that if trust legislation should heed the President's first specific reassurances to business the country need not be alarmed over the enlargement of governmental activities in regulation. It is also accurate to say that as a whole the early bills proposed in Congress were not at all in harmony with the calm, peaceful program laid down by Mr. Wilson. Either the Wilson economic discussion was a poor interpretation of the ideas of the lawmakers or the Congressional bills were a poor expression of the administration policy. The movement for regulation has progressed through the intervening troublesome months until at the present

time it is much nearer a final stage. An unfortunate thing about this period of doubt is that business men should have been allowed to think that their opinions were not wanted. The views of Mr. Brandeis, Mr. Untermeyer and other self-constituted regulators of business have been sought and welcomed. So long as the views of business interests are expressed in the open the country has no cause to fear them. If it does not allow those views open expression, it encourages them to secret expression. It is a new doctrine that the regulated are too deeply concerned to be consulted about the method or degree of regulation. In spite of the limited expression of business opinion in regard to pending legislation it is greatly to be desired that the prosperous results pictured by the President shall flow from the laws. Certainly business interests want good business and will do what they can to further that end.

## Decision in the Springfield Case

Like other early acts of new commissions, the decision of the Missouri commission in the Springfield case produces somewhat of a shock. In fixing a rate of return the commission bases its finding on the legal rate of interest in the State. The legal rate is applicable to loans. Loans are different from business enterprises. Even if the business enterprise is a public utility, its capital investment is not a loan. There is greater risk in investment than in loaning. It is necessary to pay for that risk in securing capital for investment in all trade and industry. No doubt there are places in Missouri where, notwithstanding the legal limitation of 8 per cent by contract, investigation would show that higher rates obtain. For instance, if notes were discounted on an 8 per cent basis the net full cost to a borrower would be higher than the 8 per cent named. The commission is acting summarily in its dealings with the holding company in this case. Charges made by a holding company to a subsidiary cannot be justified unless they are reasonable and for fair, full and plain value received, but it is idle to suggest that they may be availed of only in the event of inability of the local manager to meet a situation. That is equivalent to saying that a superintendent will not find it necessary, if he is competent, to consult a general manager; a general manager will not consult a president; a president will not talk with the chairman of the board, etc. Any holding company that is worth its salt can give needed and good advice to a subsidiary. As the company will ask for a rehearing of the case, there is a possibility of further review by the commission.



### Some Recent European Railways

Looking over some records of recent achievements in electric railroading on the other side of the Atlantic, it is instructive to note the broad catholicity of view taken by Continental engineers with regard to ways and means of executing the work which falls to their lot. Unquestionably there are those among our foreign confrères who hold very strong opinions as to the best method for operating long electric lines, but the authorities who employ the engineers have not yet reached a frame of mind where they think it necessary because one method is good to regard all other methods as bad. On the Continent one finds in the same territory free use of all the traction methods that have been proved successful in practice, and while the exponents of each may regard the others as mistaken, there is no mutual recrimination to an extent sufficient to stop developments. Italy has long been an enterprising country in the matter of electric roads. If we remember correctly, it is a good many years now since the first American trolley line made fast its suspensions alongside St. Peter's. The Italian engineers—there are none more versatile—have kept up the good record in railway construction. In spite of last year having been one of relatively hard times in Italy, almost the usual amount of activity was displayed in electric traction, employing three-phase, single-phase and direct current where each seemed best to meet the requirements of the situation and the necessary connections. As our readers well know the northern group of electric roads centering about Milan is a three-phase group using about 3000 volts on the trolley wire with a standard periodicity of seventeen cycles. The system reaches from Venice on the east to Mont Cenis Tunnel on the west, and from Brig and the Simplon on the north to Genoa, and the complete network of lines is progressing rapidly toward electric operation, although not yet complete. Apparently everything has been working so smoothly within the last few years that for this particular work three-phase is to be used exclusively.

Further south, in the vicinity of Rome, the other systems come into their own, a considerable northern line extended last year being of the ordinary single-phase type with about 11,000 volts on the trolley wire at a frequency of twenty-five cycles per second. To the eastward, on the other hand, an important 1500-volt direct-current line is being extended. A part of this system was originally electrified with single-phase, a change having been made in method apparently on account of convenience in the matter of branches and connections rather than by reason of any functional troubles. Several other direct-current lines of similar character are under way. Thus active work is being done according to all three of the methods that have been found effective.

Another very interesting installation is being made in Sweden. It is practically the electrification of the mountain division of the international line which runs from the Gulf of Bothnia to the Atlantic, and the part electrified, the northernmost railroad in the world, ex-

tends from the Norwegian frontier very nearly 100 miles toward the east. This line is supplied with energy from a hydroelectric station with transmission voltage of 80,000 single-phase, the emf being reduced to 15,000 at fifteen cycles per second for the trolley wire. The line involves some formidable grades and sharp curves and will be operated by fifteen heavy electric locomotives. We mention this foreign work less because of its engineering interest, which is considerable, than to show the genuine activity in heavy electric traction and the broad view of the engineers who are responsible for the choice of methods.

### Voltage Testing of Cables

It has been known for a long time to cable engineers that when a testing voltage is applied to an ordinary single-conductor cable of homogeneous insulation between the internal conductor and the external cover or sheath, the dielectric flux density is greatest at the inner wall of the insulator, that is, at the surface of the conductor. The flux density is clearly least at the outer wall of the insulator. Since the electric stress acting on the insulator, and tending to puncture it, is directly proportional to the electric flux density, it follows that the puncturing stress is always greatest on the inside and dwindles toward the outside. If the insulating material is homogeneous and free from flaws, it will therefore collapse electrically under unduly heavy stress on the inside surface next to the conductor.

If we suppose that the flux density at the inside layer reaches the break-down point, we may imagine that this layer collapses dielectrically and becomes conducting. When this happens the conductor becomes virtually enlarged and the insulator diminished in thickness. It might be supposed that since the original thickness of insulation gave way, the reduced thickness must next inevitably give way until the whole thickness collapses, but this is not true. If the conductor diameter was less than 36.8 per cent of the external insulation diameter, the electric collapse of the inside layer, if it occur symmetrically and not in radial streaks, will result in diminishing the internal stress. That is, the average stress and the average flux density will be increased by the reduction in the outstanding thickness of insulation wall, but the maximum stress and flux density on the inner layer of insulation will be lowered. If, however, the conductor diameter is greater than 36.8 per cent of the external insulation diameter, the collapse of the inside layer means increasing the flux density everywhere and should be followed by the collapse of the whole insulating wall. Consequently, when in a homogeneous insulator the conductor has less than 36.8 per cent of the external diameter the insulation may be overstressed on the inside and give way without breaking down the insulation as a whole. As Jona pointed out in 1904, there is experimental evidence for believing that such conditions are occasionally encountered.

The bearing of the above relations on the testing and design of transmission cables is pointed out in a useful paper by Messrs. W. I. Middleton and Chester L. Dawes, read at the recent A. I. E. E. convention. The authors hold up to merited ridicule the commonplace notion that the testing voltage of a cable should be in simple proportion to the thickness of the insulating wall. They also point out, with the aid of abundant oscillographic evidence, the importance of a sine-wave generator in testing all but very short lengths of insulated cable. Where the sine-wave form is deviated from, as is likely to be the case with transformers and powerful charging currents, the use of a peak-voltage voltmeter is distinctly desirable. An ingenious form of this instrument based upon the ordinary oscillograph is described in the paper.

### The Status of Prime Movers

The report of the A. I. E. E. committee on prime movers submitted at the Detroit convention is an admirable compendium of the present status of prime movers for use on a very large scale. It deals essentially with the conditions met in central-station practice on a gigantic scale, and therefore is of special importance with respect to its outlook upon the great problems of centralized energy production which are now at last beginning to be dealt with properly. As regards small prime movers one must look elsewhere for full information. Indeed, it is fairly evident that the conditions as to relative economy of the various prime movers would be very radically altered in considering units, say, of 1000 kw or less.

The main feature of the report is the complete treatment of modern steam-turbine practice carried out on a very large scale, an excellent idea being given of what can be done with the recent generating units of from 10,000 kw up. We are inclined, however, to think that the figures put forth are somewhat optimistic in the sense that they represent the very best attainable practice rather than ordinary results. It is such improved conditions, indeed, that one must consider in thinking of the great power plants in the future. The most striking single item of information brought to the front is the very high thermal efficiency at present reached by the best and largest steam turbines, an efficiency exceeding 20 per cent of the value theoretically possible and quite surpassing the corresponding figures for any except the most economical engines of the internal-combustion type.

The committee points out that thermal efficiency is really the criterion of the performance, since the mere water rate depends so much upon the conditions of pressure, superheat and vacuum that it is difficult to make proper comparisons between tests of different units. However, by comparing performances under a standard condition of 175 lb. pressure and 100 deg. Fahr. super-temperature for 28.5 in. vacuum, the committee arrives at exceedingly instructive curves in terms of pounds of steam per kilowatt-hour and rating

of turbo-generator. Taking the average results, a steam consumption of 14 lb. per kilowatt-hour is passed at an output rating of about 5000 kw, and 13 lb. is reached and barely passed only when the output approaches 30,000 kw. The fuel consumption, therefore, does not vary considerably with even a great increase in output rating of the turbine after a comparatively moderate figure is passed, a fact which should give good cheer to owners of stations of moderate output. Moreover, the cost per kilowatt, while of course less in the very large units, is not decreased to any very great degree, and one may fairly say that the advent of the large turbo-generator has given the medium-sized station a better chance for making records of economy than it has ever had before.

The report contains comparatively meager data as to the smaller turbines. For various reasons the results in the units of small output—say, 1000 kw and below—are not so favorable as are those reached with the large units of many thousand kilowatts. Indeed, in such minor sizes there seems to be very good evidence that better records for efficiency are held by reciprocating engines of the high-efficiency types. But the turbine seems to hold unquestioned supremacy over the very best that has been done with reciprocating engines when one considers outputs of 5000 kw and upward, so that the committee's statement that the reciprocating steam engine has become practically obsolete is entirely true for the class of work which it has chiefly in mind.

At the present time the highest thermo-dynamic efficiency is reached with the Diesel type of engine and the next with the gas engines using producer or natural gas. The efficiency curve of the very largest steam turbines is of the same general magnitude and indeed passes that of the ordinary gas engines. In turbines of no more than 1000 kw output the efficiency is distinctly lower, as might be expected. In spite of the fact that oil and gas engines, on the whole, have a large advantage in efficiency over the steam engines and turbines, showing a theoretical output duty of 1 hp per pound of coal or thereabouts, it nevertheless is held that the internal-combustion engines are not successful competitors of the best steam engines, either reciprocating or turbine, in the matter of the total cost of energy, because their cost and weight are relatively great and the repair bills decidedly high.

The facts are that a new plane of practical efficiency has been reached with the very large multi-stage turbo-generators of the present time, and, what is equally important, the cost of the prime mover per kilowatt of output rating has fallen so far below that reached by internal-combustion engines that the theoretical economy of the latter in fuel consumption becomes of no moment. The turbine has increased greatly in efficiency over the earlier units, but it is of even more importance that its price per unit of output has fallen from a high to a very moderate sum, so that its cheapness brings out an economic advantage quite as important as the saving in fuel.



# The News of the Week

## Activities and Events in the Electrical Field— Reports of Meetings—Commission Findings, Etc.

### Combination of Cities Against Public Utilities

Mayor Rudolph Blankenburg of Philadelphia has sent a letter to the Mayors of all of the principal cities of the country in which he says in part:

"The city of Philadelphia is preparing to bring, in the early autumn, before our new Public Service Commission, a case in which that body will be asked to pass upon a proper schedule of rates for electric light and power. We have come to realize that the side of the people has seldom if ever been adequately presented before other public service commissions, while the interests of the public utility companies are presented and argued by the best informed and most able men in the country. If the cities do not join together for the presentation of their cases as the public utility companies have, the laws and precedents established by the commissions stand in danger of being biased by the able arguments of the representatives of these corporations.

"The equipment required for an adequate presentation of the rights and interests of the people involves a degree and extent of technical knowledge and information which it is not practicable for any one city to obtain. This knowledge and information is much the same for each city, and its cumulative use would greatly add to its value. It must be borne in mind that the utility companies constitute themselves an offensive and defensive alliance, probably stronger than any other interest in this country. Its weakest member is never without information and assistance of every kind.

"To meet this situation it has been suggested that there should be formed a Bureau of Public Utilities Research which shall equip itself to give to the cities the same able assistance which the public utility companies' associations give to the public utility companies, thus in effect constituting an offensive and defensive alliance among the cities similar to that existing among public utility corporations."

It is proposed to hold a conference of city officials in Philadelphia in the autumn to discuss the matter. Mr. Blankenburg says that Mayor Mitchel of New York, Mayor Harrison of Chicago, Mayor Baker of Cleveland and Mayor Shroyer of Dayton join him in the matter.

### Electrical Research at Massachusetts "Tech."

According to a statement issued last week by the research division of the department of electrical engineering, Massachusetts Institute of Technology, the following investigations are now either under way or in immediate prospect: An extended study of the effect of the length of ride on street railways upon the return upon the investment, requiring five years for completion according to present estimates; an analysis of the cost of delivery service in a large department store in New York City; a study of skin effect in solid and stranded conductors when carrying high-frequency currents; a high-accuracy analysis of sound waves; a study of core losses in electrical machinery; a study of forced and free vibrations of loaded and unloaded telephone diaphragms; a study of transient electrical

phenomena in a 750-mile artificial transmission line, and a measurement of rail resistance to alternating currents up to sixty cycles. A final report upon the cost of motor and horse traction on highways will probably be completed early this summer. Nine research associates and assistants will shortly be exclusively occupied in the work of the research division, more than \$20,000 being available for this work during the next year.

### Engineering Society Prizes for Students

The Engineers' Society of Western Pennsylvania, Pittsburgh, Pa., has awarded prizes in its first annual competition among students of technical schools of collegiate rank. The competition involved the solution of problems in the fields of civil, electrical and mining engineering. In the electrical engineering competition the problem was the design of a 30,000-volt transmission line and substation. Data were given for the daily load curve, required voltage, supply voltage, phase and frequency, and length of transmission. The answers were judged with regard to judgment, method, accuracy and neatness. Although the competition was limited this year to a few schools, the society was so satisfied and encouraged with the results that it has been decided to open the competition in the future to all engineering schools which care to enter.

The first prize was this year awarded to Mr. John R. Lainbach, of the Georgia School of Technology; the second prize to Messrs. F. C. Gaines and Millard C. Howe, of the same institution, and the third prize to Messrs. Frank Fischer and F. H. Graham, of Pennsylvania State College.

### Society for the Promotion of Engineering Education

The twenty-second annual meeting of the Society for the Promotion of Engineering Education was held at Princeton, N. J., from June 23 to 26, 1914. The proceedings cover a wide range of subjects, but the central idea brought out was that emphasis should be laid upon fundamental principles, and that education is not so much a matter of administration as of purpose and spirit. The meeting was notable because of the attendance of official representatives of a large number of educational institutions. Institutional membership is a new feature of the society organization inaugurated during the past year. Its purpose is to make the findings of the society more immediately applicable to the educational life of the country. The institutional delegates were very enthusiastic in regard to the possibilities of this new feature of the society activity.

The following elections were made on the last day of the conventions: President, Dean Anson Marston, of the division of engineering, Iowa State College, Ames, Ia.; vice-presidents, Prof. Henry H. Norris, formerly of Cornell University, now associate editor of the *Electric Railway Journal*, New York, and Dean C. Russ Richards, of the college of engineering, University of Illinois, Urbana, Ill.; secretary, Dean F. L. Bishop, of the school of engineering, University of Pittsburgh,



Pittsburgh, Pa.; treasurer, Mr. William O. Wiley, of John Wiley & Sons, New York; members of the council, Messrs. R. H. Fernald, professor of dynamical engineering, University of Pennsylvania, Philadelphia, Pa.; A. H. Fuller, dean of the college of engineering, University of Washington, Seattle, Wash.; A. M. Greene, Jr., professor of mechanical engineering, Rensselaer Polytechnic Institute, Troy, N. Y.; E. V. Huntington, assistant professor of mathematics, Harvard University, Cambridge, Mass.; Vladimir Karapetoff, professor of electrical engineering, Cornell University, Ithaca, N. Y.; B. C. Miller, professor of physics, Cass School of Applied Science, Cleveland, Ohio, and W. M. Riggs, president of the Clemson Agricultural and Mechanical College of South Carolina, Clemson College, S. C.

The reports of the various officers showed that the society is in a flourishing condition, the individual membership now being nearly 1400 and the institutional membership about fifty. The council recommended that the 1915 meeting be held in the Middle West.

### Westinghouse Strike Situation

A company of the State Constabulary of Pennsylvania went to East Pittsburgh on June 29 for the purpose of assisting in the maintenance of order in the district affected by the strike of employees of the Westinghouse Electric & Manufacturing Company. The State Constabulary were sent at the request of Sheriff Richards, of Allegheny County, made after a demonstration by strikers which threatened disorder.

Employees of the Union Switch & Signal Company who walked out on June 12 have returned to work. Mr. H. G. Prout, president of this company, in announcing that all the men had returned to work said: "This walk-out was an Industrial Workers of the World effort thinly disguised, and the men went out without presenting any grievances, demands or requests. No concessions whatever have been made by the company."

### The Electric Vehicle at Boston

At the annual field day of the Electric Motor Car Club of Boston, held at the Kennel Club, East Braintree, Mass., on June 23, President Day Baker pointed out that there are now two important "load centers" of electric-truck service in Boston. One of these consists of the territory within about one-half mile radius of the South Station, and the other is in the Roxbury district. In the former there are now operating forty-two trucks of from 1000 lb. to 3.5 tons capacity, all used in express service; two 5-ton trucks for handling freight in broken lots at the New York, New Haven & Hartford terminal; three 5-ton ice-handling trucks for the Commonwealth fish pier (mentioned in the *Electrical World* of June 27, page 1512); nine 5-ton trucks used in hauling coal, gasoline, sugar and confectionery, and eighteen other trucks operating in a varied service, conspicuous features of which are the delivery of chocolate almost daily in 14-ton shipments, wholesale milk distribution, coffee delivery, provision handling, etc.

In the Roxbury district the Boston Edison company garage is the operating center for eighty-two electric trucks owned by the company, including machines ranging from light delivery wagons to those of the 5-ton truck type, and twenty-four patrol and department vehicles. Twenty-two other trucks are in service in this district, seventeen being in the brewing industry. Others include a hospital ambulance and a small electric truck for making quick deliveries of

hot food to patients remote from the kitchen. Nearly 175 trucks are in service in these two centers, with the prospect of further development in the near future.

### The Inventor at Play

At the third annual field day of the Edison interests, held at Olympic Park, Newark, N. J., June 25, Mr. Thomas A. Edison took an active part in the sports of the day. Despite his sixty-seven years, "the Old Man" opened the baseball game by gleefully tossing the first ball across the plate and afterward took his place in the judges' stand for the electric automobile races. Nearly



MR. EDISON PITCHING THE FIRST BALL

2000 Edison employees and their friends attended the field-day exercises. Mr. R. A. Coe won the cup presented by Mr. R. A. Bachman, vice-president of the Edison Storage Battery Company, for the best all-round athlete.

### Electrical Activity in California

At a prosperity dinner given in San Francisco on Monday night of this week Mr. John A. Britton, vice-president and general manager of the Pacific Gas & Electric Company, showed wherein public service corporations have contributed to the material welfare of the State. In all communities, he said, there are two main factors—namely, transportation and lighting and industrial motor service—the success of which marks the success of the community and its people. Of primary importance is the matter of transportation. Second only to that is the matter of the distribution of energy for lighting, heating and motor service. As concerns prosperity, it may be said that the steel rails of the transportation companies which gridiron a state parallel the transmission lines which convey electrical energy. Both enterprises are large employers of labor, and by the distribution of a large portion of their earnings to the masses employed many other industries and other lines of business are encouraged.

It is on record in the State Treasurer's office at Sacramento that there was contributed by these two enterprises to the State of California as taxes for the year 1913 a total of \$8,259,001.84, which represented a gross earning of these corporations of \$174,954,000, the tax being based on a payment to the State of 4.6 cents on each dollar earned.

The total income derived by the State of California from electric-service companies was \$1,941,326, representing an income of \$42,082,534. According to Mr. Britton, these companies expended for operation of their plants during the year 1913 approximately \$24,000,000 and expended in betterments of the plants approximately \$20,000,000, making a total of \$44,000,000.

Statistics of various power plants in California show that for every dollar expended either for operation, maintenance, repairs or new construction about 40 cents is used for labor. It is therefore certain that the electric-service companies expended for labor in California during 1913 \$17,600,000 and expended at least \$10,000,000 more in the purchase of material and supplies, thus forming the never-ending chain of money circulation.

In reviewing the six months of 1914 just passed there is no reason to doubt that the same ratio of revenue and expenditures will continue; in fact, the balance sheets of the companies show an increased revenue.

The wages paid to laborers in California in the electric-service industries, as shown in the report of the United States Census Bureau, are in excess by 34 per cent of the wages paid in all other parts of the United States for similar labor. This fact has a marked effect on the prosperous condition of other enterprises.

From United States census reports, California ranks first in the horse-power installed per capita, there being one-third of a horse-power for each person, or a total of 800,000 hp. The rates paid by the consumer are lower than in all other states but one, Nevada. Compared to Wisconsin and Massachusetts, the nearest competitors in agricultural pursuits, the average rate per horse-power-hour in California is 2 cents, in Wisconsin 3.9 cents, in Massachusetts 5.6 cents.

### Salem (Mass.) Central Station Survives Conflagration

A conflagration resulting in an estimated loss of \$10,000,000 occurred at Salem, Mass., on the afternoon and evening of June 25. The fire rendered about 20,000 persons homeless and consumed approximately 1000 buildings, sweeping the shoe and leather district and many residential streets. Early in the evening the city was placed under martial law, and although dynamite was freely used to check the flames, strong and shifting winds carried the fire over an area about 1.5 miles long by 0.5 mile wide.

The loss of life was fortunately small, as ample warning was given in nearly every case of the approach of the flames. Many of the principal factories were wiped out, including the large mills of the Naumkeag Steam Cotton Company, the employer of 2000 hands and the largest customer of the Salem Electric Lighting Company, which supplies the electrical service of the city. The lighting company lost its office building and storehouse, while its general manager, Mr. S. Fred Smith, a past-president of the New England Section of the N. E. L. A., lost his home, as did a number of other employees of the company.

#### Employees Remain in Station Surrounded by Flames

Early in the evening it became necessary to open the various electrical distribution circuits of the company as the fire swept across the city, and this fact gave rise to the report that the company's 4500-kw turbine plant on South River had been destroyed. The station magnificently met the test, however, and, aside from a burned coal conveyor, remained unharmed although the fire attacked the building on all sides. The Salem company is one of the Tenney properties, the

headquarters of the general management being in Boston.

About two years ago this station was reconstructed under the direction of Mr. F. C. Sargent, head of the engineering department of the Tenney syndicate, special attention being paid at the time to the question of fire protection. The walls of the plant are of brick, about 1 ft. thick; all windows are of wired glass, and all but two of the doors are of fireproof construction. The roof is of tile. Five employees courageously remained in the station as the flames closed in upon it, shutting every possible opening to the outer air, and manning the hose lines. As the heat increased, water was played upon the two wooden doors. The city water pressure fell from a normal of 50 lb. to a minimum of 7 lb. during the fire, but the faithful corps within the plant kept up steam in the boilers, and although the turbines had been shut down, as there was no longer any load to be carried, an exciter was operated at normal voltage throughout the entire period.

The conveyor belt caught fire and carried a slight blaze into the overhead bunker, but this was extinguished by the men within the building. The latter



SALEM POWER HOUSE AFTER THE FIRE

were subjected to severe heat and much smoke. Many sparks were blown into the building through cracks by the heavy draft of the fire. The flames finally passed the building and by 1 o'clock on the morning of the 26th the national colors were run up the staff amid the cheers of thousands of spectators, the flag being seen as clearly as at noonday in the light of the nearby burning buildings.

A view of the station, unscathed except in the loss of its coal conveyor, but surrounded by ruins, is shown herewith. The company garage is seen at the left, below the conveyor and at its rear. This garage also went through the fire safely.

#### Restoring Service to the Stricken City

Before the fire was over the local officials of the company and other officers and employees of the Tenney companies were taking steps looking to the resumption of service on the distribution system. All the mains connecting the plant with the various centers of distribution were cut off by the fire, and the problem of reconstructing temporary connections was at once taken in hand. The Boston Edison Company, the Lynn Gas & Electric Company, the Beverly Gas & Electric Company, and practically every other central-station organization in eastern Massachusetts, offered all possible assistance, and on the morning after the fire a large force of linemen was at work installing temporary mains and poles.

On the night of the fire candles were sold at \$1 per



dozen, but on the evening of the following day street-lighting service was resumed on six circuits in the down-town section and two lines supplying commercial lighting and a limited amount of residential service were in operation, and by the second night the company was handling substantially all the service which its remaining customers called for.

A large tent erected in the former storage yard at the side of the station served as a commissary. About 40 miles of new wire of from No. 6 to No. 0 size was erected to connect the station with the unharmed districts of the city, and the work of rehabilitation included the removal of injured portions of the overhead equipment which might interfere with the service. A temporary office was opened by the company at 72 Washington Street, Salem, in the retail business district, which escaped the conflagration. The ability of the station to withstand the conflagration was of immense value to the community.

#### The Fire's Effect on Other Electrical Interests

The Bay State Street Railway Company, which provides all the trolley service of the city, escaped with the loss of a portion of its overhead system. The local office of the New England Telephone & Telegraph Company was not injured, but telegraph operators were obliged to transfer their work to Beverly.

The firm of Stone & Webster, Boston, has contributed \$5,000 toward the relief fund, and it is doubtful if any event in New England electrical circles has done so much to vitalize the spirit of co-operation as this visitation upon the famous old city of Salem.

### Laying Transmission Cable Across San Francisco Bay

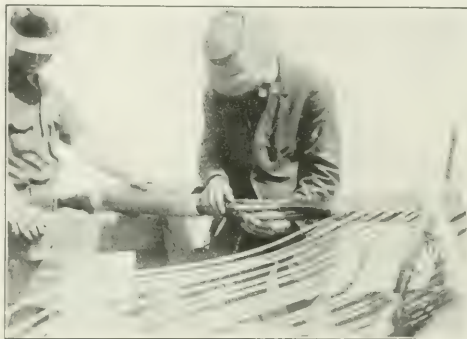
The Great Western Power Company has heretofore brought energy from Oakland substations to supply its San Francisco distributing system by means of a single 11,000-volt cable that crosses beneath the bay separating these two cities. Recently the service supplied by the company in San Francisco has increased enough to warrant the laying of a second cable, parallel to the first, and designed for a normal loading of 6000 kw. An unusual feature in the placing of the second cable was that the contractor furnished a bond for the satisfactory performance of the work, guaranteeing that when in place the cable would withstand for five consecutive minutes a 30,000-volt difference of potential between conductors, or 22,000 volts between any one conductor and ground. The contractor was also made responsible, under the bond, for the "perfect operation" of the cable at 11,000 volts for a period of sixty days after it was put in service.

The actual submerged length of the cable is 20,500 ft., but shore connections brought the total length laid up to 21,300 ft., of which 1350 ft. at each end was of 300,000-circ. mil section and the remainder 250,000-circ. mil. The cable consisted of three stranded copper conductors each insulated by 6/32 in. of 30 per cent Para rubber, over which was wound 2/32 in. of varnished cloth. Spaces between conductors were filled with jute and insulating compound, and all three were wrapped together in a 5/32-in. varnished-cambric belt. Over this was a 5/32-in. lead sheathing wrapped in jute and armored with No. 4 B. W. G. galvanized-steel wire with a "lay" of about 3 ft. This cable was 4 in. in diameter, weighed about 23½ lb. per foot and was delivered by the General Electric Company on reels that contained 1358 ft. each.

The method of laying the cable was first to tow over the proposed route a barge from which was paid out a

1½-in. messenger cable, this being placed exactly and the necessary amount of slack determined by subsequently underrunning it with the same barge. Reels of the high-voltage cable were then loaded on the barge and the messenger cable was once more underrun, this time the cable being paid off the reels and lashed to the messenger cable so that the two thus connected would be paid out continuously over the course. Every 20 ft. the cables were lashed firmly together with No. 6 B. W. G. steel wire, a light wrapping of the same wire following along between lashings. This method, which involves leaving the messenger cable on the bottom with the transmission cable, has been patented by Mr. A. J. Pahl. A launch was used to tow the barge, and the latter was stopped and held firmly at any point desired by locking the messenger cable to the barge. This was accomplished by an ordinary cable-railway grip solidly attached to the barge just above the messenger cable.

It was found that a 30-ft. by 75-ft. barge would carry four 1350-ft. reels of the cable mounted on axles and would also afford ample working space for splicing, etc. A 40-hp gasoline launch was all that was required



JOINING THE CONDUCTORS

in towing. The paying out of the cable progressed at the rate of 1350 ft. in about four hours. When the end of a reel was reached the barge was held in place by the grip while a splice was made. When all the reels were empty a cap was soldered on the end of the cable, and this was carefully lashed to the messenger and paid out as before. The messenger was then underrun by the barge until shore was reached, when a set of full reels was substituted for the empties. With its new supply of cable the barge was run back under the messenger until the cable end appeared, when a splice was made and the laying continued.

In all fifteen splices were made on the barge. These involved exposing the copper conductors for a length of about 1 ft. on each of the ends to be joined and connecting them under an insulation of 30 per cent Para rubber equal to that on the remainder of the line. A 4.25-in. lead sleeve 0.25-in. thick was used and joints were filled with insulating compound. Jute was placed over the sleeve and the wire armor was lapped for about 3 ft.

The work occupied about thirty days, including delays. The contract was signed April 8 and the successful test of the cable at 30,000 volts was made by the transmission company on June 19. The cable was placed in regular service on June 20, when it was connected in parallel with bay cable No. 1 to carry the city load. The average crew totaled about ten men exclusive of those manning the launch chartered for the job. The contractor was A. J. Pahl, of the K-P-F Electric Company, San Francisco.



### Canadian Electrical Association Convention

One of the most enthusiastic conventions in the history of the Canadian Electrical Association was held in Montreal June 24, 25 and 26, with a registration of more than 400. The sessions were held in the new Ritz-Carlton Hotel.

Col. D. R. Street, the president, opened the initial meeting of Wednesday, and on behalf of the Mayor of Montreal Alderman Leslie Boyd welcomed the delegates to the city. President Street then reviewed in a general way the work of the association for the last year, which he declared to have been a hazardous one in its history.

#### President Street's Address

At the outset of 1913, said Colonel Street, the association found itself without a secretary and with considerable disaffection in its ranks. Some of the members had felt that municipal plants should be taken into membership, some of the manufacturers desired the full privileges of Class A members, and others seemed to feel that there was no special advantage in belonging to the organization. Mr. J. H. Larmonth, of Toronto, was about this time obtained as permanent secretary and began a study of the electric plants in Canada which showed there to be 364 privately owned stations and 174 municipal plants in the Dominion. Of the privately owned plants only fifty-four were Class A members, but these represented a capitalization of \$110,000,000 and had an aggregate annual pay roll of \$2,000,000. Other personal interests then compelled Mr. Larmonth to resign, and Mr. Allan Sullivan was in turn appointed to the position, for which, said Colonel Street, he is extremely well qualified.

The president then pointed out several matters that should receive attention from the incoming executive: (1) Obtaining, if possible, public-service commissions in several provinces. (2) Keeping in touch with all legislation affecting central stations. (3) The formation of an association statistical department. (4) Closer study of the question of insurance. In closing, Colonel Street expressed his appreciation of the benefits to be obtained from Canadian affiliation with the National Electric Light Association.

#### Report of Secretary Sullivan

The secretary's report, presented by Mr. Allan Sullivan, reviewed the strength, both financial and physical, of the central-station interests of Canada. Secretary Sullivan particularly urged an increase in the number of Class A members. He divided the work of the association into two general classes: First, that of accumulating and classifying statistics, and, second, the psychological function of influencing the minds of men. This latter point he further elaborated with respect to the idea of molding public opinion and strengthening the bonds between the public and the public-service corporation.

The National Electric Light Association was represented by Mr. T. C. Martin, executive secretary, who presented the congratulations of Mr. H. H. Scott, the new president. Mr. Martin in reminiscent humor recalled the early years of the N. E. L. A. and the first electrical exposition, which was held at Philadelphia some thirty years ago, having been preceded by an international meeting of electrical engineers in Montreal.

The committee on rates submitted its report, which was read by Mr. J. C. Wills, representing Chairman W. S. Robertson. The report included a list of Canadian electric-service companies with their rates for service and discussed the desirability of standard

forms of contract and uniform terms and conditions. In view of the keen competition existing in some localities the committee proposed drawing up only a confidential list of rates, to be supplied to Class A members only. The committee also recommended the adoption of a demand rate based either on a five-minute continuous-demand peak with the alternative of 80 per cent of the momentary peak, or, secondly, on an integrated twenty-minute peak with the alternative of 70 per cent of the momentary peak.

The commercial committee reported progress.

Mr. A. A. Dion, chairman of the meter committee, stated that steps are being taken to test the various demand meters manufactured in America and in Europe and to investigate the question of current limiters for small-residence service. The committee will also take up with the Bureau of Weights and Measures the question of standardizing Canadian meters.

The interesting report of the committee on standardization of line construction was presented by Mr. S. B. Hood, its chairman. The report covered in detail the construction of lines for pressures up to 35,000 volts, and it was accompanied by thirty-five drawings. A new method of cross-arm bracing, which is mechanically more correct than some of the older methods, was also featured.

#### Electrical Development for Canada

The Society for Electrical Development was represented by Mr. J. M. Wakeman, general manager, who came, as he stated, preaching co-operation. "What the Society for Electrical Development Can Do for Canada" was the title of Mr. Wakeman's address of Thursday morning. The society, he said, now numbers more than 1300 members, has its initial \$200,000 pledged, and is starting active work. Its representatives will travel through the country, forming local electrical leagues and rendering central stations such aid as outlining and inaugurating new-business campaigns. A traveling engineer will also be maintained to investigate the use of electricity in various industries. A campaign of national advertising has been begun, and moving-picture films depicting the advantages of the domestic use of electricity have already been arranged for.

#### Governmental Meter Inspection

Mr. Ormond Higman, chief electrical engineer of the Department of Inland Revenues, also addressed the convention informally on the general question of governmental meter inspection. He stated that in 1908 33,000 meters were tested and in 1913 approximately 150,000. Branch testing laboratories are now under construction at Vancouver and Winnipeg. In reply to a question by Mr. D. H. McDougall, of Toronto, Mr. Higman stated that approximately 500 corporations are registered as electric-light companies in Canada, representing an investment of approximately \$300,000,000. Replying to Mr. A. A. Dion, of Ottawa, the speaker said that the question of standardization of meter connections, dials, etc., is receiving the attention of the department, which is sending to manufacturers blueprints showing acceptable dials and recommending to them that meter connections enter at the left and leave at the right. In connection with the duration of demand peaks the department has made no definite rulings as yet, but does not look favorably on any demand of less than ten minutes. This would not hold for such wholesale energy as is sold at Niagara, but refers to small customers only. Mr. A. L. Mudge, of Toronto, suggested that several peaks be standardized for various classes of service.

### Election of Officers

The executive session was attended by Class A members only and was not a public session. The officers elected for the coming year were as follows: President, Col. D. R. Street, Ottawa; first vice-president, Mr. D. H. McDougall, Toronto; second vice-president, Mr. R. M. Wilson, Montreal; third vice-president, Mr. Wills MacLachlan, Toronto; honorary secretary, Mr. T. S. Young, Toronto; secretary and treasurer, Mr. Allan Sullivan, 610 Confederation Life Building, Toronto; managing committee—Messrs. W. G. Angus, Hamilton; Robin Boyle, Niagara Falls; P. T. Davies, Montreal; A. E. Dunlop, Pembroke; J. S. Gould, Smith's Falls; G. Radcliffe Hulme, Montreal; George Kidd, Vancouver; G. W. Magalhaes, Toronto; H. R. Mallison, Montreal; H. G. Matthews, Quebec; Earle L. Milliken, Sydney; J. S. Norris, Montreal; L. W. Pratt, Hamilton, and W. S. Robertson, Toronto.

The association passed a resolution making the president of the N. E. L. A. a member ex officio of the managing committee. The N. E. L. A. was represented at the executive session by Messrs. T. C. Martin, F. C. Henderschott and W. H. Blood, Jr. At the executive session there was also presented a report on the work done during the past year by the N. E. L. A. street-lighting committee, of which Mr. Wills MacLachlan, who presented the report, was a member.

Abstracts of the papers presented at the Montreal convention, together with the discussion which followed, have been withheld from this issue for lack of space but will appear in a later number.

### Progress of Trust Legislation

The steady grind of debate on the trade commission bill began in the Senate on June 29, with every prospect, according to Senate leaders, that anti-trust legislation will be under consideration in the Senate now for six weeks.

The trade commission bill has now been made the "unfinished business" of the Senate, which means that every day when the so-called "morning hour" ends at 2 o'clock the trade commission bill comes up.

The Clayton anti-trust bill, passed by the House, is still unfinished by the Senate judiciary committee. The railway capitalization bill is in the same condition in the hands of the Senate interstate commerce committee.

Just when these two measures will get to the floor of the Senate is a problem. The Clayton bill, which deals with interlocking directorates, holding companies, price-fixing, labor union exemptions from anti-trust laws and injunctions in labor disputes, has been remade and remade again and again by the Senate judiciary committee, some of whose members declare a number of the paragraphs of this bill to be unconstitutional. The fight in committee on this bill presages a greater fight on the floor of the Senate. The railway capitalization bill is now the subject of daily hearings before the Senate interstate commerce committee.

The Senate is far from resigned at the prospect of six weeks' discussion of anti-trust legislation. In view of the difficulties of the Senate judiciary committee in straightening out the Clayton bill, the proposed Democratic conference on anti-trust legislation has been postponed until that committee concludes its work. Reports from the home states of members of the Senate judiciary committee declare that in the case of communities where one or two men are directing nearly all the corporations of such communities the Clayton bill would upset those communities and benefit no one.

On the floor of the Senate a number of speeches have

already been made, although the debate is proceeding with some interruptions. Senator Robinson has had read into the record, in connection with the unfair competition clause of the trade commission bill, instances taken from decrees of federal courts in cases arising under the Sherman act, namely, United States vs. American Coal Products Company, United States vs. General Electric Company and United States vs. American Thread Company.

Mr. Borah is leading the fight against the trade commission bill and has replied upon several days to Democratic Senators who have spoken for it. He began to speak on June 26 and concluded his arguments for the present on June 29. Mr. Borah said that passage of the bill would lead, not to certainty among business men as to what they may lawfully do, but to another period of uncertainty such as followed the passage of the Sherman law.

### Decision in Rate Case in Springfield, Mo.

The Public Service Commission of Missouri made public its decision on June 24 in the Springfield Gas & Electric Company rate case. According to the abstract of the decision made public by the commission, it is found that a net return of 7 per cent is adequate for the company, and a reduction in rates amounting to more than 30 per cent is ordered. According to the calculation of the commission, this will have the effect of reducing the revenues approximately 37 per cent. The decision was written by Chairman Atkinson and Commissioner Shaw and was concurred in by Commissioners Kennish, Woerner and Wightman.

The company, it is announced, will file an application with the commission for a rehearing of the case.

The Springfield Traction Company and the Springfield Gas & Electric Company were the defendants in the case. All the stock of these companies is owned by the Springfield Railway & Light Company, a holding company of Maine, and all of the latter company's stock is owned in turn by the Federal Light & Traction Company, a holding company of New York.

On Feb. 8, 1913, a 6-cent maximum-rate ordinance was passed by the city of Springfield. On Feb. 17 a tripartite agreement was executed between the Springfield Railway & Light Company, the Maine holding corporation, and the Springfield Gas & Electric Company and Springfield Traction Company, transferring the steam-power plant to the Gas & Electric company for \$388,416. This consideration was paid by entries on the books of the companies. Later the valuation of the steam plant was increased and a further book entry was made against the Springfield Gas & Electric Company, making a total consideration of \$414,526. The commission holds that this attempted transfer was a palpable attempt to transfer a useless power plant from the unprofitable Traction company and unload it upon the prosperous Gas & Electric company and thus have its value amortized out of the earnings of the more prosperous company. The commission holds that the attempted transfer and sale while the rate matter was pending was a fraud upon the public and therefore void. In the subsequent consideration of the case this power plant is treated as the property of the traction company.

Evidence was introduced at the hearing to the effect that an up-to-date distributing system could be built at Springfield for \$151,266. It was noted also that the assessed value of the entire property of the Gas & Electric Company for 1911 was \$150,000, inclusive of the gas department. It was found, the decision says, that \$500,000 stock and \$277,000 bonds were



issued on property for which the secretary of the company testified \$300,000 was paid. The assets of the Gas & Electric company as shown by the books are \$865,713 for the electric department. The commission observes that no deductions for superseded property had ever been made by the company, and that, except for an item of \$5,666, no depreciation had been deducted during twenty-nine years, and further that \$60,000 is included as franchise values of the gas and electric property. The commission arrives at the conclusion that \$270,000 is the corrected original cost of the electric department of the company, holding the amount for which the plant was transferred upon the books of the company, \$414,526, to be entirely too large.

The companies claimed that the business had a distinct "going value" of between \$60,000 and \$137,900, based upon the earnings of the present plant. The commission holds that a distinction is to be made between a valuation of the properties of public utilities for the purpose of sale or condemnation and a valuation for rate-making purposes. The commission says that no proof was offered tending to show that the company suffered early losses, but that the record disclosed much evidence indicating that the early losses, if any, have long since been recouped through excessive rates, and that the alleged earnings have been from the electric department and the losses, if any, from the gas and street railway departments. It is the duty of the company to show by competent proof that losses have been incurred and, applying the distinction between sale and condemnation cases and rate-making cases, no separate and distinct item for going value is allowed in this case but the commission takes "into account the fact that the plant was in successful operation" in fixing the fair value for rate-making purposes.

The commission in arriving at the rate of return to be allowed states that 6 per cent is the legal rate of interest in the State and by contract the rate may not exceed 8 per cent, holding that 7 per cent is a just net return on property invested in public utilities. The rate of return must be determined from the facts of each case. For depreciation the commission makes an allowance of 5 per cent of the present fair value of the property.

In view of the fact that the Springfield Gas & Electric Company and the Springfield Traction Company have a contract with the Ozark Power & Water Company for electric energy and a supplementary agreement whereby the Ozark company agrees to furnish break-down service from the Empire District Electric Company, the contention of the complainants that no necessity exists for an auxiliary steam plant at Springfield is upheld, the evidence failing to convince the commission that any part of the steam plant at Springfield is used or useful for the public, and it is not taken into consideration in allowing a valuation upon which the return is to be based.

The opinion also states that the citizens of Springfield are entitled to good and adequate electric service and to receive the benefits of their natural location, if any there be, and should partake of the advantages in the reduction of the cost of hydroelectric energy.

In considering the salaries and commissions paid to the Federal company the opinion states: "We think, because of this situation [control by the Federal company through the Railway company of Maine] and the very human tendency of corporate greed of some holding companies to 'milk' the earnings of subsidiary companies through 'dummy' directors, that it is the duty of this commission to limit strictly the amount of any such charges, which shall be only for the services rendered by such holding company, to the lowest reasonable charge for the services actually rendered."

The public at Springfield is paying the salaries of a competent manager and a competent secretary of defendant companies who reside at Springfield, and we do not think that the public should be called upon to pay any other 'managerial services' or management by 'long distance,' from the New York office of the holding company in this case. No charge should be allowed for commissions, except for services actually rendered to the company, and that at no higher cost than the local company could employ the services of a competent independent engineer, provided that the manager in charge is not able and competent to render such service to the company himself. . . . We disallow any charge whatever for 'managerial services.'" Open, fair, arm's-length dealings, one with the other, is stated to be better in the end for interrelated corporations. The deduction of salaries and commissions takes \$18,000 annually from operating expenses.

In conclusion, the commission finds that the fair present value for determining reasonable and just rates in this case of all of the property of the electrical department of the company, as of Sept. 30, 1913, is \$300,000. The commission found the rates, for electric energy to be unjust and unreasonable and the schedule of rates in force to be unjustly discriminatory and unduly preferential, and declared that rates should be fixed upon a sliding scale with maximum prices for the various amounts of electric energy furnished.

The commission found that the operating revenue for 1913 was estimated at \$185,900. It figured operating expenses, allowance for contingencies and depreciation and return on investment, as corrected, at \$116,000, which in its opinion justifies a reduction of 37 per cent below the 1913 revenue.

Analysis of consumers' bills for September, 1913, discloses an average rate of 9.69 cents per kw-hr., an average motor-service rate of 5.5 cents and an arc-lamp rate of 5.8 cents. The following is the substance of the schedule of rates prescribed by the commission: Residence light, 8 cents per kw-hr. for the first thirty hours' use and 5 cents for additional use; general lighting, 8 cents per kw-hr. for first thirty hours' use, 5 cents for next sixty hours and 3.5 cents for further use; "large light and power," 7 cents per kw-hr. for first thirty hours' use, 4 cents for next thirty hours' use, 3 cents for next sixty hours' use and 2.2 cents for additional use; street lighting, \$60 per incandescent arc lamp per year and \$6 per incandescent 40-watt lamp per year. The minimum charges follow: Residence, 75 cents per month; general lighting, 5 cents per month for each 60-watt equivalent load with no charge less than \$1; street lighting, incandescent light available only when arrangements have been made for the use of fifty or more lamps; "general power," 75 cents for each kilowatt of connected load; "large light and power," \$1 for each kilowatt of maximum demand.

### Removal of Mr. Weston from Chicago Board

Mayor Harrison of Chicago wrote to Mr. George Weston on June 23 removing him as a member representing the city of Chicago on the Board of Supervising Engineers, Chicago Traction. This action is the culmination of a fight which has been waged by the Mayor against the board for a long time and is generally understood to be due to politics. The formal concurrence of the City Council was voted on June 29. Mr. Weston still holds his position as chief engineer of the board. Advices from Chicago say that Mayor Harrison will appoint Prof. Edward W. Bemis to succeed Mr. Weston as the representative of the city on the board.



## Public Service Commission News

### Missouri Commission

A decision has been rendered by the Missouri Public Service Commission in the case of S. W. Weaver vs. Kirksville Light, Power & Ice Company. The opinion was delivered by Commissioner Shaw and concurred in by the other members of the commission. It finds the value of the property of the company for rate-making purposes as of June 30, 1913, to be \$65,000. The commission also found the rates charged by the company for electrical energy within the city of Kirksville to be unjust, unreasonable and excessive, the schedule being found to be discriminatory and unduly preferential. The maximum schedule of rates prescribed by the commission, in substance, follows: General lighting and power, 10 cents per kw-hr. for first thirty hours, 7 cents for next thirty hours and 4 cents for the remainder. Minimum charges: Residence lighting, 75 cents per month; commercial lighting, 5 cents per month for 60-watt equivalent of connected load with no less charge than \$1; power, \$1 per kw monthly minimum. This schedule is to continue in force for three years from July 1, 1914, and is a reduction of approximately 18 per cent from the rates charged in 1913.

### Ohio Commission

Mr. E. W. Breyer has been employed by the Ohio Public Utilities Commission to prepare a system of depreciation charges applying to public utility companies.

Mr. Breyer does not employ the word "depreciation" in his system, but rather contemplates the creation of reserves by contemporaneous charges to operating expense accounts to provide for defraying the cost of "extraordinary maintenance, deferred upkeep and contingencies."

By the term "extraordinary maintenance" Mr. Breyer contemplates large repairs, but something less than the replacement of an entire unit. This would come about through deterioration of buildings or equipment for a long period of time. "Deferred upkeep" would mean the necessary replacement of complete units, retired by inadequacy, advance in the art or because of obsolescence. "Contingencies" would cover losses by fire, flood, earthquake, storm, etc.

Corporations must be given the trusteeship of the funds accumulated for these purposes, as representing trust funds paid in advance by the public, according to the commission's idea, and it is not contemplated that these funds should remain idle. The funds may be used for working capital or for financing extensions and improvements temporarily. Interest must be paid and evidences of indebtedness to the trust funds must be given.

### Wisconsin Commission

The Wisconsin commission has authorized the Wisconsin-Minnesota Light & Power Company to issue \$988,000 in common stock, \$1,700,000 in 7 per cent cumulative preferred stock, and \$3,750,000 in 5 per cent bonds. Stock to the amount of \$650,000 and \$1,288,000 bonds are to be exchanged for similar amounts of the company's securities now outstanding; common stock to the amount of \$538,000 and \$1,500,000 bonds are to be exchanged for the properties of the Chippewa Valley Railway, Light & Power Company and the Chippewa Valley Construction Company. The Wisconsin-Minnesota Light & Power Company, which was originally the La Crosse Gas & Electric Company, is now controlled by the American Public Utilities Company.

The commission has approved the application of the

Richland Center Water, Light & Power Plant for a minimum bill for power service of 25 cents per hp per month and has approved the increase of 1 cent per kw-hr. for lighting service in so far as it applies to non-residents.

### New Hampshire Commission

The Public Service Commission has issued an order approving the purchase by the Manchester Traction, Light & Power Company of a controlling interest in the Nashua Light, Heat & Power Company. The Manchester company will pay \$224,280 for 5607 shares out of a total of 6000 outstanding shares in the Nashua company, and the rates will be reduced in Nashua to the Manchester schedule, the decrease below the present charges in Nashua being about 18 per cent. The transfer of control was to take place July 1, when an option on the Nashua property expired. The capital stock of the Manchester company will be increased 10 per cent to pay for the Nashua system, although the two companies will be operated separately, with a transmission tie line between their respective generating plants, which are about 25 miles apart. The line will be built in the near future, and the Manchester company will be able to utilize a portion of the output of the Nashua steam plant in case of a shortage of output in the hydro-electric stations of the Manchester company. Tucker, Anthony & Company, of Boston, are the banking interests in charge of the deal.

### California Commission

The Southern California Edison Company has filed an application with the Railroad Commission of California for an order authorizing it to sell its electric distributing system at San Fernando, Los Angeles County, to the Pacific Light & Power Company.

### Illinois Commission

An investigation has been ordered by the City Council of Lincoln, Ill., of the water and electric rates charged by the Lincoln Water & Light Company. The committee will make a valuation of the plant, study rates and report its findings preliminary to an appeal to the state commission.

The dispute between the city of Barry and the Central Illinois Public Service Company over the rate for electric energy and the service to be given has been settled before the Illinois Public Utilities Commission. When the company's franchise expired in Barry the city refused to renew it unless a reduction in rates and better service were stipulated. The company refused to meet the terms, and a party of local business men formed a company and applied to the utilities commission for a certificate of convenience and necessity, the understanding being that they would ask the commission, after getting the certificate, to compel the Public Service corporation to sell them energy at a price which would enable them to retail it at the lower figure mentioned by the City Council. There has been a private agreement, however, and the commission granted the certificate to the new company with the understanding that the franchise which that company will get will be transferred to the Public Service company, a consolidation thereby being effected. The new company amends its twenty-year franchise to give to its customers a maximum rate of 12 cents per kw-hr. for the first thirty hours' use per month of the active connected load (figured at 75 per cent) and 8 cents per kw-hr. for each additional hour's use per month, and a discount of 1 cent per kw-hr. for cash within ten days after the first of the month. The Public Service company will rehabilitate its plant and furnish twenty-four-hour service.

## Current News Notes

**ICE IS NOT A PUBLIC UTILITY.**—The public welfare committee of Los Angeles, Cal., has reported to the City Council that in its opinion the Council cannot regulate the price of ice. The Council adopted the report. The question of regulation of the price to be charged for ice arose from alleged discrimination.

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**GOOD THUNDER WANTS ELECTRICITY.**—The village of Good Thunder, Minn., with a population of about 500, has petitioned the Mankato division of the Consumers' Power Company for electric service. The good people of Good Thunder agree to construct the necessary transmission line from Rapidan, where the hydroelectric generating station is situated. The proposed transmission line would be 6 miles long.

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**LINEMEN DEMAND THAT THEY SHALL WORK IN PAIRS ON HIGH-TENSION LINES.**—In order to minimize the possibility of accidents while working on high-tension circuits the linemen employed by the Springfield (Ohio) Light, Heat & Power Company have demanded that two men be allowed to work together on all high-voltage lines. By so doing it is claimed that accidental contact with conductors carrying dangerous potentials can be avoided to a great extent.

**HIGH HEAD DAM COMPLETED IN PORTO RICO.**—The Porto Rico Railway, Light & Power Company, which supplies the city of San Juan with its electrical utilities, has recently completed the erection of a 126-ft. dam at its plant in the mountains of the interior, 18 miles from the coast. The dam is 476 ft. long, and the head provided thereby adds greatly to the possible output of the station. At present the energy demand for lamp service is over 80,000 16-cp equivalents.

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**MUNICIPAL OPERATION URGED IN MICHIGAN.**—At the annual convention of the League of Michigan Municipalities held at Bay City, Mich., June 24, Mr. William H. Fitzhugh, superintendent of the Bay City municipal lighting plant, read a paper presenting arguments for municipally owned electric-lighting plants. Mr. Fitzhugh argued that one of the principal causes of corruption in municipal governments is the attempt of franchise owners to increase their privileges under franchises already held.

**A BOX-KITE TELEPHONE LINE.**—During a recent flood in the Salinas River in California a number of poles of a telephone-line crossing were washed out and until the waters receded box-kites were resorted to to support the temporary circuits across the swollen stream. A bridge wire was first sent across the river by means of a number of kites, and then this strand was used as a messenger for drawing the telephone wires across. The kite-supported line served for communication until a permanent cable could be laid across the stream.

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**MIDDLE WEST UTILITIES COMPANY PERFECTS SAFETY-FIRST ORGANIZATION.**—To foster the development of safety-first principles employees of the subsidiaries of the Middle West Utilities Company have until recently been holding quarterly joint meetings under the direction of officers of the several companies. The results of these meetings were limited, however, as the men were loosely organized. A new system has therefore been established whereby the men in each division work through a committee and these committees in turn submit suggestions and recommendations to the officials

through a general committee composed of heads of the smaller committees.

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**CONDITIONS FOR TESTING WIRELESS STATIONS.**—The attention of owners and operators of radiotelegraph stations is called to the fact that considerable interference is being caused near the larger centers of population by stations conducting tests without due regard to the traffic being simultaneously carried on. Commissioner E. T. Chamberlain of the Bureau of Navigation, United States Department of Commerce, gives notice that stations desiring to conduct such tests should communicate with the local radio inspector by letter or telephone, stating the probable length of time that will be required. A station conducting tests or temporary experiments should "listen in" to determine that no interference is being caused, and during the test should "listen in" frequently for the interference signal, "Q R M." The station conducting tests must also transmit its official call signal frequently.

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## SOCIETY MEETINGS

**ANNUAL JOVIAN MEETING.**—The next annual meeting of the Jovian Order will be held on Oct. 14, 15 and 16 in St. Louis, the home city of Jupiter W. N. Matthews.

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**SASKATCHEWAN STEAM ENGINEERS.**—The Saskatchewan Brotherhood of Steam and Operating Engineers will hold a convention and exhibit at Regina, Sask., Canada, July 28 to 30. Mr. H. J. Fox, Regina, is secretary.

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**JOVIAN OUTING AT LOUISVILLE, KY.**—The Jovian League of Louisville will hold an outing at Senning's Park July 14. Mr. Robert Montgomery and Capt. Walter Smith have charge of the arrangements. Mr. R. E. Brian is president of the league, and the board of directors comprises Captain Smith, chairman, and Messrs. John R. Chowning, Fred W. Gantt and James Clark, Jr.

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**BROOKLYN COMPANIES' SECTION, N. E. L. A.**—The sixth annual convention and banquet of the Brooklyn Company Section of the National Electric Light Association was held at the Oriental Hotel, Manhattan Beach, New York, June 24. At the afternoon session abstracts of the Philadelphia convention papers were read and the following officers were elected; Chairman, Mr. C. H. Stevens; vice-chairman, Mr. E. G. Bogeart; secretary, Mr. F. J. Farley; financial secretary, Mr. E. K. Ponzert, and treasurer, Mr. F. C. Hill. After the banquet addresses were made by Messrs. H. H. Scott and W. F. Wells.

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**CEDARMEN ON CAMPING PARTY.**—Members of the Northern White Cedar Association left Minneapolis, Minn., June 16, for an outing on the shore of Big Smith Lake, 8 miles from Marcell, Minn. There for three days the party enjoyed the liveliest kind of frontier life and incidentally held a business meeting to discuss the current affairs of the association and to receive the reports of various committees. Those in the party were President J. W. Benham, Chicago; Vice-president L. A. Page, Jr., Minneapolis; Directors M. J. Bell and L. A. Furlong, Minneapolis; Secretary N. E. Boucher; Messrs. J. Willemer, H. F. Partridge, W. C. Moss, T. M. Partridge, H. S. Gilkey, P. H. Anders and W. A. Kerr, Minneapolis; M. H. Bissell and H. W. Reade, Escanaba, Mich.; M. Sperry, Milwaukee, Wis.; J. T. Kinney, Chicago; M. Chapman, V. Anderson, T. P. Bradley and Archibald McIntyre, Duluth, and Joseph Nagle, Bemidji, Minn.



## A. I. E. E. Convention at Detroit, Mich.

**Report of closing sessions of summer meeting with attendance of 459—Abstracts of papers and discussions presented at the six sessions—Recreation features of convention**

**F**INAL registration at the thirty-first annual convention of the American Institute of Electrical Engineers, held in Detroit on June 22-26, was 459. This is considerably larger than the attendance at Cooperstown last year. Fifteen papers were presented at six sessions. There was considerable discussion, which is reported more fully below. Ample time was given for recreation, and the hospitality of the Detroit electrical men was greatly enjoyed. A brief report of the first three sessions was given in these columns last week.

### High-Tension Transmission Systems

At the morning session of Thursday, June 25, President C. O. Mailloux, of New York, called to the chair Mr. Percy H. Thomas, of New York, chairman of the engineering data committee. Mr. Thomas presented his elaborate report on "Engineering Data Relating to High-Tension Transmission Systems." The report makes seventy printed pages, with several elaborate inset tables. The facts collected are presented without theorizing. About sixty drawings are reproduced, while others may be inspected in the office of the Institute in New York. There was considerable discussion on points brought out in this report, much of it relating to the deterioration of conductors of overhead transmission lines and the protection of telephone lines.

A specification covering the inspection and tests of high-tension line insulators of porcelain for over 25,000 volts was also presented by Mr. Thomas, as chairman of the high-tension transmission committee of last year and the engineering data sub-committee of this year. In the discussion Mr. E. E. F. Creighton, of Schenectady, N. Y., recommended strongly the use of oscillation transformers in the testing of insulators. Mr. Creighton described a method by which both very high voltages and very high frequencies may be obtained. The apparatus is portable and can be used for testing insulators on the line unless the pins are grounded. Mr. Creighton thinks this test better understood and less dangerous than the impulse test recommended in the appendix of the committee's specification. Mr. Thomas, however, thought that the test described by Mr. Creighton was not ready for formal recommendation in the specifications. As an operating engineer Mr. Farley Osgood, of Newark, N. J., strongly recommended the use of high-frequency tests for insulators.

### Prime Movers and Cables

Past-president H. G. Stott, of New York, as chairman of the prime movers committee, presided over part of the session of Thursday afternoon. In introducing him, President Mailloux referred to Mr. Stott as the father of central-station economics. The president also pointed out that Mr. Stott's prominence in the study of this subject has led to his recognition as an authority by the International Electrotechnical Commission. Mr. Stott abstracted the paper on "Present Status of Prime Movers," by Messrs. W. S. Gorsuch, R. J. S. Pigott and himself. As a steel-mill electrical engineer Mr. R. Tschentscher, of Chicago, defended the

blast-furnace gas engine, although later Mr. Stott explained that most of his gas-engine figures did not refer to the blast-furnace type. Mr. D. B. Rushmore, of Schenectady, N. Y., objected to the paper as having nothing to do with electricity. President Mailloux said that papers of this kind are of the greatest importance. Electrical engineers have taught power-plant men how to buy fuel and how to burn it scientifically. "We are entitled to the field of central-station economics," said Dr. Mailloux, "by right of discovery."

Messrs W. I. Middleton and Chester L. Dawes, of Cambridge, Mass., presented a paper on "Voltage Testing of Cables." Mr. Middleton abstracted the paper and there was discussion by Messrs. W. A. Del Mar (written), H. G. Stott, C. O. Mailloux and others.

### Presentation of Edison Medal to Dr. Charles F. Brush

A pleasant feature of the convention was the presentation of the Edison medal to Dr. Charles F. Brush, of Cleveland, on the evening of June 25. President Mailloux made the presentation speech. He said that Mr. Brush laid the foundation for an entire industry, that of electric lighting. Brush's invention of the series arc lamp, his improvement of the Gramme dynamo-electric machine and his automatic cutout for arc lamps constituted an entire system. By 1880 a new art and industry had been created. In 1882 the first incandescent electric-lighting central station was put into operation. Dr. Mailloux referred to the conflict which ensued between the arc and incandescent lighting systems. He said that he was in a position to know because about that time he was editor of the *Electrical World*.

It is remarkable, commented Dr. Mailloux, how the names of Edison and Brush are now coupled after thirty years. Time has worn away all of the contentions of that earlier period. The speaker also said that Dr. Brush really invented the compound-wound dynamo in connection with the electrodeposition of metals. The work of Brush in connection with the storage battery was also outlined. In 1882 and 1883 the Brush Electric Company paid much attention to its storage-battery system. It demonstrated that storage batteries could be charged from an arc circuit, also that incandescent lamps could be operated on arc circuits. As an interesting historical incident, Dr. Mailloux mentioned the fact that in 1883 he published an interview with Edison, who then referred to the storage battery as one of those things that serve as an excuse for lying. To-day Brush has been out of the storage-battery business for twenty-five years, while Edison is himself conspicuously in the storage-battery business.

As president of the Institute, Dr. Mailloux then handed the Edison gold medal, incased in a leather receptacle, to Dr. Brush, saying that the medal was conferred in recognition of the epoch-making series of inventions which led to the creation of the pioneer electric-lighting industry. Dr. Brush responded briefly, expressing his appreciation of the honor. As the two men stood together, it was noticed that both wore the red ribbon of the Legion of Honor.



### The Incoming President Introduced

President Mailloux handed past-presidents' badges to Secretary F. L. Hutchinson, with the request that they be presented later to Past-presidents Gano Dunn and Ralph D. Merston.

Mr. Farley Osgood, of the board of directors, presented to Dr. Mailloux his president's badge. In doing so he gave a gracefully worded recital of the services and honors of the present president of the Institute.

Mr. Paul M. Lincoln, of Pittsburgh, president-elect of the American Institute of Electrical Engineers, was next introduced by Dr. Mailloux and spoke briefly. He made an earnest plea for the co-operation of the members. Later the ladies and gentlemen adjourned to the basement restaurant in the hotel, where many of the prizes for athletic and other contests were awarded.

### Sterilization of Water

On Friday afternoon Dr. M. von Recklinghausen presented a paper entitled "Sterilization of Water by Ultra-Violet Rays of the Mercury-Vapor Quartz Lamp." Dr. von Recklinghausen, recently of Paris, but now of New York, expounded the subject of his paper, with the aid of charts and lantern-slide pictures. An interesting contribution to the discussion of this paper was made by Mr. Theodore A. Leisen, general superintendent of the Detroit Water Works. The author of the paper made the statement that with electricity at 1 cent per kw-hr. it would cost about 60 cents per 1,000,000 gal. to sterilize drinking water by use of the ultra-violet rays in the manner described.

### Telegraphy and Telephony

Mr. Frank F. Fowle, of Chicago, chairman of the telegraphy and telephony committee, presided while one paper was presented. It was that by Mr. Carl Kinsley, of the University of Chicago, and gave the first public description of a system of high-speed printing telegraphy devised by the author. Mr. Kinsley demonstrated the receiving end of the apparatus, which uses a perforated tape. Mr. C. R. Underhill, of New Haven; Mr. Ralph W. Pope, honorary secretary of the Institute, and Prof. G. S. Macomber, of Cornell University, participated in the discussion.

President-elect Lincoln presided while Mr. Frank F. Fowle presented, in abstract, his paper on "Toll Telephone Traffic—An Experimental Study of the Relationship Between Circuit Loads and Delay to Traffic." The author said that the paper was a consideration of the fundamental problem, from the commercial point of view, of the handling of toll traffic. Mr. J. L. Wayne, of Indianapolis, discussed the paper, and then Mr. Lincoln declared the technical sessions adjourned.

### Section Delegates in Conference

Every day during the convention the delegates from sections met together at luncheon and discussed in an informal way matters of common interest. On the afternoon of Friday, the closing day of the convention, there was a general experience meeting, open to all members of the Institute, at which reports were received from various sections. Mr. P. Lincoln presided at this conference. It is interesting to note that the Institute has thirty sections and that twenty-six of this number were represented officially by delegates present at some time during the convention. Not all, however, were able to stay until the concluding meeting.

Short reports were received from section chairmen and others as follows: Atlanta, Mr. A. M. Schoen; Boston, Mr. G. W. Palmer, Jr.; Chicago, Mr. W. B. Jackson; Cleveland, Mr. E. H. Martindale; Detroit-Ann Arbor, Mr. H. H. Norton and Mr. E. L. Bailey; Indian-

apolis-Lafayette, Mr. R. Fleming; Ithaca, Mr. W. G. Catlin; Los Angeles, Mr. E. R. Northmore; Lynn, Mr. E. R. Berry; Madison, Mr. C. M. Jansky; Minnesota, Mr. W. T. Ryan; Panama, Mr. F. C. Clark; Philadelphia, Mr. H. A. Hornor; Pittsburgh, Mr. A. M. Dudley; Pittsfield, Mr. W. W. Lewis; Portland, Ore., Mr. G. P. Nock; St. Louis, Mr. F. J. Bullivant; Seattle, Mr. S. C. Lindsay; Spokane, Mr. J. B. Fiske; Toronto, Mr. D. H. McDougall; Urbana, Mr. Morgan Brooks; Vancouver, Mr. E. M. Breed.

### Some Other Features

During the convention a very enjoyable outing was held on the afternoon of June 24. It took the form of a steamboat excursion to Bois Blanc Island. At this beautiful park there was a baseball game which resulted in the defeat of Captain Hall's Tigers by Captain Osgood's Giants, the score being 17 to 6. There was a pleasant evening ride back to Detroit and the party returned to the hotel about 11 p. m.

Resolutions of thanks were adopted, expressing the appreciation of the Institute for the hospitality of local members, the Detroit Edison Company, electrical manufacturing companies, automobile manufacturing companies, the Detroit Golf Club, the Detroit Tennis Club and others. Mr. Farley Osgood, of Newark, N. J., was chairman of the convention committee, and Mr. C. C. Owens, of Detroit, was chairman of the general local committee.

An abstract of Mr. H. C. Ford's paper on the use of gyroscopes in marine work was presented in last week's issue in connection with our report of the first three sessions of the convention. In the following columns will be found a number of abstracts of remaining papers and the discussions which followed their presentation.

### Electric Heating in Marine Service

While electric heating is relatively more expensive than steam heating, the actual cost of such heating is not so high aboard ships, where energy can be generated for about 1 cent per kw-hr. or even less in some cases. Messrs. C. S. McDowell and D. M. Mahood pointed out in their paper on "Electric Heating as Applied to Marine Service" that electric heating aboard ships is particularly desirable because of the convenience in locating the heater where it is most effective, the simplicity and low first cost of such installations, better heat regulation, and the absence of leaks, noises and disagreeable odors. In addition, an electric heater saves space and minimizes weight.

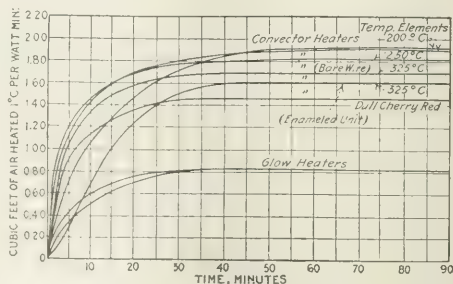


FIG. 1—COMPARISON OF GLOW AND CONVECTOR HEATERS

Radiant heaters are adapted to conditions where a small amount of warmth is needed intermittently. The glow-lamp type is used most extensively, although the resistance-wire type operated at red heat is coming into use. Convector heaters are better adapted to continuous heating. Attention was called to the fact that it is more economical to heat a large volume of air

through a few degrees than to heat a small quantity to a higher temperature. Practice has settled upon a long low heater equipped with a deflector which distributes the heated air uniformly about the room. Curves were shown indicating the rate of temperature rise for different heaters, and temperature distribution in different-sized rooms using various deflectors.

Results of tests led to the following conclusions: For each 1000 cu. ft. of space 1500 watts input is required to maintain a temperature of 70 deg. Fahr. in a stateroom provided the heater is placed in the center of the space and the entire air content has to be replaced by air at 32 deg. Fahr. every fifteen minutes. When heaters are placed close to metal bulkheads 1300 watts are required per 1000 cu. ft. of space. Deflectors reduce the energy requirements in the above-mentioned cases to 1200 watts and 1100 watts respectively. Where the space heated exceeds 20 ft. in length or width more than one heater is needed. When heaters are installed near a bulkhead or metal work they should be separated therefrom by heat insulation. It was also pointed out that it has seldom been found necessary to increase the generating equipment of ships for electric heating as the heating load fits in with the other demands to make a diversified load.

#### Discussion

Mr. W. S. Hadaway, Jr., of New York, contributed a written discussion which was read by Mr. W. C. Smith, of Pittsfield, Mass. Mr. Hadaway declared that the author's conclusion in favor of the convection method of heating was a little premature. Mr. Alfred E. Waller, of Bronxville, N. Y., thought that the inclosed-coil heater was as effective as the open-coil type. For marine use he recommended the inclosed heaters so that the moisture encountered would not come into contact with the resistance. Mr. D. B. Rushmore, of Schenectady, noted the fact that the cost of 1 cent per kw-hr. given in the paper was apparently arrived at without taking into consideration investment or interest charges. On land distributing cost would also have to be taken into consideration. Prof. F. C. Caldwell, of Ohio State University, pointed out that with the radiant heater the heat is directed only on the body to be heated and that therefore the cost is not so great as might be imagined. Mr. C. D. Knight, of Schenectady, also took part in the discussion.

#### Direct-Current Motors

Mr. R. H. McLain presented a paper on "Direct-Current Motors for Coal and Ore Bridges" in which he pointed out that because of its greater torque a series-wound motor is best adapted to this class of work. Curves were shown and discussed regarding the necessary gearing for certain lengths of runs with given accelerations and decelerations. A problem was also worked out in full showing the method for determining the necessary resistance to put in series with the armature. On hoist service there is a choice of series, compound or shunt-wound motors. The conditions affecting the choice are amount of power available, voltage variation, height of hoist, and time required for the trip. In the opinion of the author, a series-wound motor should be used for speeds of 360 ft. per minute or less, if the height of hoist is such that at the speed used more than eight seconds is consumed in the trip. For greater speeds and shorter time periods a compound-wound motor should be used. For still greater speeds, 700 ft. per minute or more, a shunt-wound motor should be employed.

#### Discussion

The discussion was brief. Mr. D. B. Rushmore, of Schenectady, N. Y., remarked that in the industrial ap-

plications of electric motors one of the largest fields remaining for exploitation is the conveying of materials and goods in packages. The conveying of bulk material electrically has been pretty well covered. Mr. T. E. Tynes, of Buffalo, told of the use of electric hoisting motors, hoisting in multiple and lowering dynamically with one motor. In closing, the author said that dynamic braking was advantageous in the case of large hoisting motors because friction brakes are too large and expensive to maintain.

#### Keeping Down Peaks

Mr. T. E. Tynes in a paper entitled "Methods of Keeping Down Peaks on Power Purchased on a Peak Basis" mentioned two general ways of reducing peaks. The first method is to furnish the peak power from some separate source, such as a local steam-turbine plant. The second method is for the purchaser to store up energy previously and to use it during peak conditions. The author then described a method by which a mixed-pressure turbine was installed to take peaks. The turbine would not, unassisted, take all the peak that it was desired it should, and therefore a motor rheostat was furnished. On installing a maximum-demand meter which integrated the one-minute peaks the rheostat method of control was too slow. Another scheme of control was devised whereby a rod carrying three points which successively make contact with mercury cups was used. On making contact, a section of the resistance in the shunt-field rheostat of the turbine is short-circuited, thereby raising its voltage and causing it to take more load. At the same time a section of resistance is cut into the shunt-field rheostat of the motor-generator set, weakening its field and reducing its load. The third point makes contact if the other two do not raise the load on the turbine sufficiently.

#### Discussion

In opening the discussion Mr. R. Tschentscher, of Chicago, pointed out that reduction of the peak is of benefit to the seller as well as to the buyer where energy is purchased for the operation of industrial establishments. Mr. Paul M. Lincoln, of Pittsburgh, remarked that the maximum-demand method of buying and selling electrical energy is the only reasonable and scientific method. Mr. J. L. Woodbridge, of Philadelphia, said that it would be interesting to have the financial as well as the technical results of the Tynes method. Mr. J. R. Bibbins, Chicago, looked at the subject from the point of view of the central station. He spoke of a large contract for supplying energy to a street-railway system where the maximum period was one hour. The question is, Is the one-hour maximum justifiable where the real maximum for which the station must be prepared is less than one hour? Should a shorter period be prescribed? Mr. R. H. McLain, of Schenectady, contended that central-station companies should not force individual customers to go to great expense to cut down the peaks of their loads; rather they should seek other customers, with varying demands, so that the diversity factor will remedy the matter largely. A written discussion by Mr. E. D. Dreyfus, of Pittsburgh, summarized by Mr. K. A. Pauly, of Schenectady, made the point that Mr. Tynes' method was a specific application rather than a general remedy.

#### Concatenated Induction Motors for Mills

The paper presented by Mr. William Oschmann, entitled "Concatenated Induction Motors for Rolling-Mill Drive," described a six-speed concatenated induction-motor set for driving finishing rolls of a twelve-stand continuous mill. A set of nineteen curves showed the results of tests made on the whole steam plant. As a result, it was found that a large amount of exhaust



steam would be lost in case the low-pressure turbine were used for driving the finishing rolls directly. Moreover, more steam would be wasted if the turbine speed were varied with the mill speed. Operation and investment costs for the turbine equipment were also too high. It was therefore decided to install motor drive. The direct-current motor, while practicable, presented no advantages over the concatenated motor. An induction motor operating with a speed-regulating set had the disadvantage of requiring a commutator motor or synchronous converter. A concatenated induction motor was installed having a double-wound main motor and single-wound secondary motor, the primary motor to have fourteen and seventeen poles and a wound rotor. The secondary motor is to be arranged for four-pole and eight-pole connection, and its rotor will be of the squirrel-cage type. Both stators were mounted on a common bed-plate, and the rotors on a common shaft. The control system was described in detail. It is simple, and no regular attendant is needed. The motor has six definite speeds and two additional resistance speeds. As a result of the year's operation there have been but three interruptions, and the total loss of time due to these has been sixty-eight minutes.

#### Discussion

As a steel-mill man, Mr. R. Tschentscher, of Chicago, commented favorably on the equipment described in this paper, noting its reliability, low operating cost and ability to control machine movements rapidly. Mr. A. E. Averett, of Schenectady, declared that where there is a big range of speed, the power-factor of the concatenated motor will be very low. With limited range of speed it is possible to install an equipment of concatenated motors reasonable in cost.

#### High-Voltage Measurement with Sphere Gap

In his paper entitled "The Sphere Gap as a Means of Measuring High Voltage" Mr. F. W. Peek, Jr., declared that a gap method of measuring high voltage is desirable in certain tests since the gap measures the maximum point of the voltage wave. At high voltages the needle gap is unreliable, inconvenient and seriously affected by humidity. The sphere gap is free from complicated corrections and the curve is subject to calculation. The correction for air density—that is, altitude and temperature—which has to be made wherever voltage is measured by a gap has been made for the sphere gap over an air-density range equivalent to that from sea level to 18,000 ft. elevation. A spacing three times the radius may be used without appreciable corona. An equation is given for calculating the sphere spark-over voltages for various spacings, radii, air density, etc. The apparent surface gradient at spark-over, in the non-grounded case, increases with decreasing radius of sphere. Tables are given showing the spark-over voltages for different-sized spheres and different spacings, at sea level and a temperature of 25 deg. C. These give a standard curve which may be made to apply to any given altitude by means of a correction factor. Curves are given showing how well the measured values check with the calculated values. Curves should be calculated, it is emphasized, only when standard measured curves cannot be obtained. Over commercial range there is no variation due to frequency. The author believes that local over-voltage and not high frequency causes destruction of insulation. A non-inductive resistance should be placed in series with the gap to prevent oscillations and to limit the current discharge.

#### The Electric Strength of Air

Dr. J. B. Whitehead and Mr. W. S. Gorton, professors of electrical engineering at Johns Hopkins Uni-

versity, in the fifth of a series of articles entitled "The Electric Strength of Air," presented the account of an investigation of the influence of frequency on the corona between sixty cycles and 3000 cycles per second. The wire and coaxial cylinder method was used. A sensitive

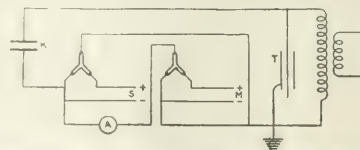


FIG. 2 DIAGRAM OF CONNECTIONS FOR MEASUREMENT OF MAXIMUM VOLTAGE

gold-leaf electroscopes were used to detect the first appearance of corona. The maximum value of the alternating voltage wave was found by the method of Chubb and Fortescue, substituting the mercury-arc rectifier for the mechanical device used to have one-half the current wave pass through the measuring instrument. The current taken by the condenser could not be used to maintain the arc, consequently the cathode was kept active by an arc playing between the cathode and an auxiliary mercury anode (for arrangement and connections see diagrams). A Crémieu electrostatic-electrodynamic balance was used to measure the effective value of the voltage. The corona voltage at 2000 cycles is lower by 3 or 4 per cent than it is at sixty cycles. At about 425 cycles, and within a certain range of field excitation, there was a pronounced evidence of reso-

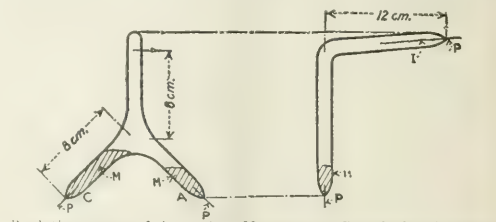


FIG. 3—ARRANGEMENT OF AUXILIARY ARC

nance in the high-tension circuit. The corona in the range 300 cycles to 3000 cycles has a number of qualitative differences compared with that at sixty cycles. The rate of discharge of the electroscopes was found to be directly dependent on the frequency and at high frequencies the presence of the corona caused the wire to vibrate greatly.

#### Sphere-Gap Discharge Voltages

Mr. J. Cameron Clark, assistant professor of electrical engineering, and Mr. Harris J. Ryan, professor of electrical engineering, at Leland Stanford, Jr., University, presented a paper on "Sphere-Gap Discharge Voltages at High Frequencies," in which they described a series of experiments made by them to determine the values of steady, high-frequency, high voltages required to discharge between 7-in. copper spheres, in air, at ordinary temperatures and barometric pressures. A 15-kw Poulsen-Federal arc generator was used as a source of high-frequency sustained high voltage. The apparatus used in securing and measuring currents from 85,000 cycles to 612,500 cycles is described in detail. The sphere-gap standard consisted of electrolytic copper spheres mounted on the ends of brass tubes in treated wood frames. Gap lengths were determined by means of calipers and micrometer screw or steel scales.



The 123,000-cycle values locate a right-line relation for sphere gaps and discharge voltages, which when produced passes through the origin. The authors give the mathematical relation existing between the root-mean-square kilovolts and the gap length for frequencies between 123,000 cycles and 255,000 cycles.

#### Discussion

The three scientific papers by Messrs. Peek, Whitehead and Gorton, and Clark and Ryan were discussed together. Dr. Whitehead, who presided at the session as chairman of the electrophysics committee, remarked in opening that the whole subject of the investigation of the corona as affected by frequency is in a chaotic condition. A written discussion by Mr. L. W. Chubb, of Pittsburgh, was read by Mr. Paul M. Lincoln. The writer said that the theories of corona formation so far advanced can hardly be adopted as laws. Below 300,000 volts the sphere-gap seems to furnish a reliable method of measuring high voltages. Above that it is rather unreliable. Mr. Chubb described the breakdown tests in the laboratory of his company at Pittsburgh.

Prof. F. C. Caldwell, of Ohio State University, alluded to the trouble experienced from oscillations in testing transformers. A communication from Mr. D. M. Mahood, of New York, was read by Mr. A. E. Waller, of Bronxville, N. Y. This contribution related to the Clark and Ryan paper, and Mr. Mahood said that the results outlined should be checked further for stability. Mr. C. L. Fortescue, of Pittsburgh, said that some of the assumptions in Mr. Peek's paper were unwarranted. He spoke of the experiences of Mr. Chubb and himself with spark-gaps representing voltages of 600,000 and more. He said that there was a large discrepancy between theoretical figures and the actual figures obtained by test at Pittsburgh. As to the Whitehead and Gorton paper, Mr. Fortescue declared that the use of the mercury rectifier introduced possibilities of error. The speaker also gave an account of the work in Pittsburgh relating to resonance in transformers. In relation to the Clark and Ryan paper Mr. Fortescue was inclined to think that the tests cannot be considered as final.

Prof. D. D. Ewing, of Purdue University, called attention to the fact that the commercial direct-current permanent magnet instrument must be used with caution. Mr. E. E. F. Creighton, of Schenectady, N. Y., commented on the lack of some instrument that will actually measure voltage at high frequency. Mr. Creighton recommended the use of high frequency for testing insulators and alluded to a new vacuum lightning arrester. Mr. H. B. Dwight, of Hamilton, Ont., said that the use of choke coils with iron cores should be avoided. With diagrams he described a method of testing 100,000-volt insulators.

Mr. W. W. Lewis, of Pittsfield, Mass., said that some carbon rods have been found to be reliable. He alluded to rods having about 400 ohms resistance. Reference was made to tests designed to show the effect of the presence of objects of wood, metal and porcelain in sphere-gap arc-overs. Other contributors to the discussion were Messrs. E. P. Peck, of Atlanta; J. R. Craighead, Schenectady, and Dr. M. G. Lloyd, Chicago.

In closing, Mr. Peek said that it is unwise to deprecate theory in the making of an investigation such as that under consideration. The discrepancies between the speaker's results and those obtained by Mr. Chubb were doubtless caused by oscillations. Dr. Whitehead said that the papers gave some evidence of the lowering of the corona voltage with the rise of frequency, but this lowering is surprisingly slight. As to Mr. Fortescue's statement that the mercury rectifier may have caused error in the Whitehead-Gorton investigation, the explanation was interesting but doubtful.

#### Report on High-Tension Transmission

The sub-committee presented its report, prepared by Chairman P. H. Thomas, giving "engineering data relative to high-tension transmission systems." This report gives an analysis of the engineering data received from twenty-five power transmission companies operating high-tension systems, in answer to a printed list of questions. A considerable part of the data has been consolidated in tables. Other data are presented under the various topics to which they relate, and in a third section notes have been added. The reporting companies have been listed with a brief statement as to the character of each plant. In addition many companies furnished blueprints, drawings, maps, etc. Many of these are reproduced in the form of illustrations at the end of the report.

#### Discussion

Mr. J. B. Fiske, of Spokane, brought up the subject of deterioration of metallic conductors used in overhead transmission lines. He exhibited a sample of a solid copper conductor that was pitted to the extent of perhaps 1/16 in. This was part of a transmission line installed at an elevation of 2500 ft. where the average precipitation is 22 in. The cause of the pitting is unknown. Mr. E. V. Pannell, of Toronto, said that 40 per cent of the companies mentioned in the committee's report are using aluminum transmission wires to a greater or less extent. Aluminum is now also used on very long spans. Mr. Fiske said that no deterioration has been noticed in his company's aluminum wires after five years of operation. Mr. Thomas mentioned the possibility of using steel-aluminum transmission cables. Mr. E. E. F. Creighton, of Schenectady, said that perhaps the corona discharge caused nitrous oxide to form and corrode the copper in Mr. Fiske's sample. Mr. F. W. Peek, Jr., of Schenectady, thought this explanation of brush discharge to be the correct one. At each tie wire apparently a miniature nitrous-oxide generator is established. Mr. Peek explained the chemistry of this theory. Apparently aluminum is not affected in the same way. Mr. Peek said that the cause of the trouble is the combination of two dielectrics of different specific capacity in series. It can be corrected by coating the top of the insulator with conducting material and connecting that coating to the conductor. Mr. Thomas remarked that it is not the potential but the fall of potential across the air-gap which produces ozonizing or nitrous-oxide formation. Mr. R. Fleming, of Indianapolis, said that he was not entirely satisfied with the nitrous-oxide explanation. Dr. M. von Recklinghausen, of New York, gave his opinion as a chemist that the trouble might be due to electrolysis between the tie wire and the conductor. Prof. D. D. Ewing, of Purdue University, thought the trouble might be due to organic salts in dust from the soil.

Mr. E. F. Peck, of Atlanta, described a method of protecting a telephone circuit operated on the poles of a 110,000-volt transmission line. The normal operating potential of this telephone line is 5000 volts to ground. Trouble had been experienced with the insulators breaking down, and Mr. Peck described the careful method worked out to protect the telephone line, including the use of the new vacuum arrester, a condenser and a drainage coil. Mr. Thomas explained the principle of the drainage or leakage coil. It is important to have enough capacity in the drainage coils and to have a number of them on long lines. These coils will enable speech to be maintained. To protect the operator, lightning arresters, air-gaps and one-to-one transformers are necessary if the telephone circuit is on the same overhead construction as the transmission lines.

Mr. Creighton, of Schenectady, spoke of the new

vacuum lightning arrester. Designed specifically for the signal circuits of steam railroads, it can never be short-circuited and so give false signals. It will stand 1000 amp of direct current at 600 volts and open the circuit-breaker without short-circuiting. Its limitation is that it cannot carry current for a long time. Mr. R. E. Argersinger, of Schenectady, said that where two parallel transmission lines are installed reverse-energy relays should be used for protection. Messrs. S. C. Lindsay, of Seattle; E. A. Lof, of Schenectady, and others took part in the discussion.

#### Specifications for Insulator Tests

In the report on specifications covering inspection and tests of high-tension line insulators of porcelain for 25,000 volts and above, methods were described which have been found useful under ordinary conditions of energy-transmission work. The report is expected to serve as a skeleton and to be supplemented where conditions warrant it. Certain portions were added as a guide where several bidders are competing. In the specification attention is paid to the following, for inspection: form, drawing, inspection, design; corrosion and factor of safety of metal parts; quality, glazing and absorption of porcelain, and assembling. For testing, attention is directed to wave-form, control and measurement of voltage, conditions of test, frequency, breakdown and flash-over definitions, rain and oil tests, mechanical and electrical design tests, and electrical routine tests before and after assembling.

#### Discussion

Mr. E. E. F. Creighton, of Schenectady, recommended strongly the use of the oscillation transformer in testing insulators. A convenient frequency is 200,000 cycles. Insulators of the older type are apt to be porous owing to under-firing. It is often desirable to test insulators in place, and the apparatus described can be used as a portable set for testing of this description. Mr. Creighton thinks that this test is better understood and less dangerous than the impulse test. Chairman Thomas, however, said that he thought the test described by Mr. Creighton not yet ready for specification. He commented on the rapidity with which the dielectric strength of porcelain goes down as the temperature goes up. Prof. Edward Bennett, of the University of Wisconsin, indorsed the Creighton test in preference to the impulse test. He remarked that both can be made identical as to heating by the use of a circuit-breaker in the primary circuit.

Mr. Farley Osgood, of Newark, N. J., as an operating engineer, made a vigorous plea for the use of high frequencies in testing high-voltage insulators. The new standard insulator for this purpose is smaller than the old one but has thicker petticoats. Each insulator should be, from an operating point of view, a spillover point, like an arrester.

Mr. J. B. Fiske, of Spokane, said that he had found out that there was no danger from a stream of water from a fire hose striking a 60,000-volt transmission line. Therefore, he believes that the rain test of insulators is entirely unnecessary.

Mr. F. W. Peek, Jr., of Schenectady, declared that the term "high frequency" is used without sufficient discrimination. Just what is meant should be defined.

Mr. W. B. Jackson, of Chicago, spoke of mechanical shock to insulators and the importance, if possible, of devising some test approximating in advance the effects of weather conditions.

#### Prime Movers

Messrs. H. G. Stott, R. J. S. Pigott and W. S. Gorsuch, of the committee on prime movers, presented a paper entitled "Present Status of Prime Movers," treating

the topics of capacity, efficiency, economy, weight and cost of the reciprocating steam engine, steam turbine, gas engine, oil engine and hydraulic turbine both separately and comparatively. The steam turbine has now with a few minor exceptions successfully defeated the reciprocating engine in all instances. Curves were given for the steam turbine, showing the water rates, the Rankine-cycle efficiency, total weight and weight per kilowatt, total cost, cost per kilowatt and cost per pound for various sizes of machines. For the gas engine the following curves are shown for various sizes of machines, both for vertical and horizontal types: Average weight per kilowatt; total, average and minimum weights; total cost; cost per pound; cost per kilowatt, etc. In addition curves are shown for fuel consumption, lb.-Fahr. heat units per kilowatt-hour, and thermal efficiency in terms of per cent of normal full-load rating. The figure \$95 per kilowatt installed, including engine and generator complete but without foundation, is given as the average of the most reliable figures available for the Diesel engine. Efficiency curves are shown for waterwheels and hydraulic turbines. Efficiencies of hydraulic turbines have recently been obtained reaching 90 per cent and higher. The cost of these turbines and generators larger than 200 kw will vary from \$30 to \$10 per kilowatt installed, exclusive of foundations. Comparative investment and fuel costs of a 750-kw and of a 20,000-kw steam turbine, gas engine and oil engine, including a directly connected sixty-cycle generator operating at different percentages of normal full load, were shown. These curves reveal that the ratio of steam to gas and oil units is decidedly in favor of the former. In low-priced fuel districts the hydraulic turbine is only a competitor of the steam turbine where the development costs are moderate and the load-factor reasonably high. Other curves show the thermal efficiency and rates of heat consumption per kilowatt for the different types of prime movers. The authors not only declare that the steam turbine is more economical than any other type of heat engine but add that it has surpassed even the gas engine in thermal efficiency.

#### Discussion

Mr. R. Tschentscher, of Chicago, took up the cudgels for the blast-furnace gas engine. In the last seven years the situation has been materially altered. Many troubles were encountered at first in the use of this type of gas engine, but it is now realized that this form of prime mover has a footing based on true economics. Of about 450,000 kw generating capacity in the steel-mill electric plants, about 175,000 kw is driven by blast-furnace gas engines. The United States Steel Corporation alone has about 140,000 kw in blast-furnace gas-engine-driven units. Plants range in size from 1000 kw to 64,000 kw. As to size of units, manufacturers will bid on machines up to 3000 kw. The weight per output is less for the larger sizes. Operating costs are less than 0.275 cent per kw-hr. As to cost of fuel for gas engines, the figure of \$3 per ton mentioned in the paper is too high; \$2 would be more nearly right. The investment cost of \$65 per kw given for the gas engine is too high in the case of blast-furnace engines; \$50 would be nearer right.

Mr. J. R. Bibbins, Chicago, as one rather favorably disposed toward the gas engine, also criticised mildly some features of the paper. Referring to the comparison of one 20,000-kw steam turbine with ten 2000-kw gas engines, Mr. Bibbins said that it was not fair to take the half load of one 20,000-kw unit and compare that with ten 2000-kw units at half load, whereas in the case of the gas engines five of them could be operated at full load to get the same output.



### Voltage Testing of Cables

Messrs. W. I. Middleton and Chester L. Dawes, in a paper on "Voltage Testing of Cables," contended that the present practice of allowing a factor of safety of 2.5 was basically wrong. They would substitute the

$$\text{formula } S = \frac{0.863 V}{d \log_{10} D}, \text{ showing that the allowable stress,}$$

besides being proportional to the voltage, depends also upon the diameter ( $d$ ) of the conductor and the diameter ( $D$ ) of the insulation. This means that the minimum stress and maximum allowable voltage occur when the conductor has a diameter 10/27 of the diameter of insulation. If the insulation is overstressed there is an accompanying change of insulation resistance and capacity. In this country rubber compound, paper and cambric are generally used for cable insulation. In testing, the voltage may be applied, (1) by submersion, (2) between the conductor and metallic sheath and (3) between wires. The first is the most severe. A sine wave is desirable for testing purposes,

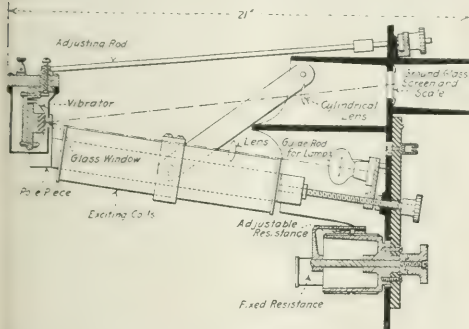


FIG. 4—SECTIONAL VIEW OF SIMPLEX VIBRATING VOLTMETER

but rarely occurs with a commercial generator under these severe conditions of load. However, a special 85-kva generator has been built which so far has given a sine wave. Reactance is not satisfactory in reducing the volt-ampere load on the generator. On measuring the voltage the alternating-current voltmeter was not successful. The needle spark-gap was tried but was too apt to cause serious disturbances and thus break down the insulation. The writers have devised an instrument, based on the principle of the oscillograph, with which the maximum voltage may be determined regardless of the wave form. A sectional view is shown.

### Discussion

Mr. W. A. Del Mar, of New York, in a written discussion, commended the paper and believed it should have a good influence in improving conditions of cable testing. Dr. C. O. Mailloux, of New York, described an English method of making paper insulation, not generally known in this country. Mr. H. G. Stott, of New York, told of cables laid fifteen years without showing deterioration. These cables have been tested at two and one-half times rated voltage at least once a year. Some underground cables designed for 6600 volts are operated at 11,000 volts. Heavier insulation is required for large conductors as compared with small conductors for mechanical protection. Messrs. E. E. F. Creighton, of Schenectady; C. L. Fortescue, of Pittsburgh; Percy H. Thomas, of New York; J. R. Craighead, of Schenectady, and the authors of the paper took

part in further discussion. Some attention was paid to the interesting fact that long cables will not stand as much voltage under test as short lengths of cable. Mr. Fortescue said that this might be accounted for by distributed capacity.

### Sterilization of Water

Mr. M. von Recklinghausen, in a paper entitled "Sterilization of Water by Ultra-Violet Rays of the Mercury-Vapor Quartz Lamp," described the advantage of the ultra-violet ray in that capacity. The only industrially applied source of ultra-violet light is the mercury-vapor quartz lamp. With an increase in temperature of this lamp there is a considerably greater increase in the ultra-violet rays than in the violet rays. The true way of defining the ultra-violet radiation, by spectrum analysis, is inconvenient and scarcely practicable. The power of the ultra-violet spectrum may, however, be examined by analysis of the energy in the spectrum, by ultra-violet light falling on a condenser, thereby ionizing the air, by chemical reaction, and by bactericidal or abiotic action. In this last reaction the method employed is the measure of exposure necessary to kill paramicia. For most efficient results the mercury lamp should be submerged entirely in the water to be sterilized, at the same time protecting it from direct contact with the water. At the present time there is a large unit in Luneville, France, sterilizing the city water supply, and one in New York for the purification of the water in a swimming pool. The smallest lamp used operates at 110 volts, taking 2 amp; the largest at 500 volts, taking 2.5 amp. In such a case the energy consumption is between 50 kw-hr. and 130 kw-hr. per 1,000,000 gal. of water.

### Discussion

After Prof. Morgan Brooks, of the University of Illinois, had made a remark on the physics of light sources, Mr. Theodore A. Leisen, general superintendent of the Detroit Water Works, remarked that the subject of water purification is one of real importance. He brought up the question whether increased turbidity of water would necessitate increased consumption of electrical energy in the ultra-violet process. Commercially this method will come into competition with the use of certain chemicals which have been successfully applied for water purification. However, the electrical method will be welcomed because there is objection to the introduction of any chemical into drinking-water supply. If hyperchloride of lime is introduced in too large quantities, some odor, and perhaps some taste, will result. Mr. Leisen believes that almost any city will be willing to spend a little more for the electrical method if it is equally effective.

Mr. W. B. Jackson, of Chicago, remarked that ozone is also used for water sterilization, and he asked as to the comparative costs of the two methods.

In closing, Dr. von Recklinghausen said that it would depend on the character of the suspended matter whether the sterilization would be handicapped. If the suspended particles are themselves polluted with microbes, it is probable that the process will not kill them. When very turbid, water should be filtered before being sterilized. Probably the use of hyperchloride of lime is cheaper than the electric ultra-violet light method, but more intelligent labor is needed with the chemical method. With electricity figured at 1 cent per kw-hr. it is believed that sterilization of water with ultra-violet rays will cost about 60 cents per 1,000,000 gal. However, the question should not be settled on the basis of dollars and cents, for the question of pure water supply is vastly important. In one



test abroad the cost of the ultra-violet method seemed to work out less than the ozone method.

#### Printing-Telegraph System

Prof. Carl Kinsley, of Chicago University, presented an article describing the high-speed printing telegraph system devised by him. The scheme used is simple and inexpensive and consists of a commercial typewriter to which is connected a punch which perforates a half-inch strip of paper with groups of holes distinctly placed in five rows, each group representing a letter. This paper then passes through the transmitter under a fine-wire brush which makes contact at the perforations. Batteries of either polarity are thus connected between the earth, and either one of a pair of conductors or batteries of different potential may be used. At the receiver end there are five elements, separately controlled, which make an autographic record by means of a local battery on a moving sensitized paper wherever they touch the surface. The author has been able to operate with a speed of 650 words per minute working duplex over an artificial line which was equivalent to 375 miles of an open-wire circuit having a conductor 0.43 cm in diameter.

#### Discussion

Mr. C. R. Underhill, of New Haven, who is himself an inventor in this field, said that this was one of the simplest forms of high-speed printing telegraph that had ever come to his notice. He wanted to know how the system would work in damp weather when there might be leakage on the line. Mr. Ralph W. Pope, of New York, expressed admiration for the novelty and ingenuity of the Kinsley system. Prof. George S. Macomber, of Cornell University, said that the Kinsley system seems to be a combination of the two general classes of high-speed printing telegraphs—the electromagnetic and the electrochemical types.

#### Toll Telephone Traffic

Mr. Frank F. Fowle gave the results of an experimental study of the relationship between circuit loads and delay to traffic in a paper on "Toll Telephone Traffic." The number of telephone messages per day which can be handled over a single toll circuit depends chiefly on the operating method employed and the number of circuits required to handle the total traffic between the given terminals. In Mr. Fowle's experiments the traffic was studied only on normal days; that is, Saturday and Sunday were excepted. Curves were given showing the relationship between circuit loads and average delay to traffic, typical load curves of toll traffic and the percentage of terminal traffic handled within a given interval or less. A study of curves shows that with a constant load-factor the effect of increasing the circuit loads will be to increase the average delay to traffic, and vice versa. There is a limit beyond which the delay in traffic will cause a loss of business due to dissatisfied subscribers. The revenue per circuit-mile per annum is directly proportional to the product of the circuit load of the toll rate per minute-mile. Consequently, the relationship between the quality of service of the toll-rate schedule is in general an obvious one, assuming that a certain fixed percentage of return on the plant investment is maintained.

#### Discussion

In the discussion Mr. J. L. Wayne, of Indianapolis, remarked that in telephone traffic the public should realize that speed costs money. He told of the practical difficulties of telephone operation, many of which are little realized by the general public in its eagerness for good service with low rates.

### THE FORM OF ELECTRIC RATES

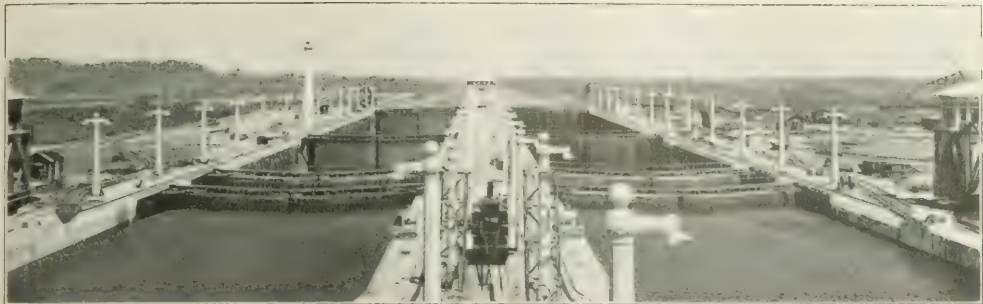
In an address presented before the Michigan Section of the National Electric Light Association on June 17 on "The Form of Electric Rates" Mr. William J. Norton, of Chicago, said that there are only three basic elements which should enter into the form of electric rates—quantity, demand and customer expense. The element of quantity is found in all rates, either in a simple form, as in the meter rate, or in an estimated quantity, as in the flat rate. The element of demand in electric rates is based upon the individual responsibility of the customer for the investment of the central station which stands ready to serve such customer. The customer expense is a minor element in rate-making and represents the cost to the company for such charges as meter reading, billing, postage, bookkeeping, etc., and bears no relation to either the quantity used or the demand of the customer upon the station.

Mr. Norton gives definitions and examples of different kinds of rates. The straight-line meter rate is the simplest of all. He advocates demand rates. A year or so ago he would certainly have said that the flat demand rate was antiquated and should not be used. But in the last year the development of this type of rate for small residence customers, especially as shown by Mr. S. E. Doane as the result of his interesting investigation in Europe, has brought this rate again to the front as a particularly desirable type. On the whole, for small users, the Wright demand rate is the most satisfactory to-day, said Mr. Norton.

The customers' output rate, Mr. Norton said, has been tried many times, but on the whole with very little success, and it generally results in letting the customer obtain service at an unduly low rate.

Of nine simple rate forms outlined Mr. Norton describes seven as distinctly good and two, one the step meter rate and the other the customers' output rate, as bad. He believes that any rate schedule should be based absolutely upon one of the seven good types, and after the cost curve for any particular class of business has been determined properly the company has its option of choosing one of the seven types. It is doubtful if the companies will ever have uniform rates, as rates are entirely functions of costs which vary in different localities, but it ought not to be difficult to have all of the rates established on one of the standard forms, and when so established better results are obtained by adhering closely to the standard form than by attempting to complicate a rate.

Mr. Norton considers it advisable in all cases that the cost curve be studied carefully and that afterward a proper selection of one of the seven types of good rates be made. The type of rate which most closely approximates the cost curve should be selected. Absolutely nothing is gained by innovation, and it may leave the rate schedule with inequalities which it will be extremely difficult to eradicate. Perhaps one of the best tests of a good rate schedule is to find out whether it can be changed. By change the speaker had generally in mind reduction. The business is developing so rapidly that reductions are possible very often, and if such reductions can be introduced into the schedule without disturbing it the schedule is apt to be a good one. This can be emphasized further in another way. In making the change in any rate schedule it should be made with a clear conception of not only the immediate change but what the subsequent changes may be. If the rates are on one of the simple standard forms, this can be accomplished generally with ease. If, on the other hand, the rates are complicated or contain steps that do not truly follow the cost curve, a change to a proper rate would become a difficult and serious matter.



## Illumination and Electrical Features of the Panama Canal

THE lighting of the Panama Canal locks divides itself into three separate classifications—the exterior, the tunnel and the machine-room lighting. The locks are in duplicate, each lock having two boat chambers with a common center wall between and two side walls on the outside. At Gatun there is a triple lift with approach and wing walls at either extremity. The chambers are 110 ft. wide, the center wall is 60 ft. wide, and the side walls vary in width at the coping from a few feet to about 60 ft. It has been found desirable to throw the light from 300 ft. to 400 ft. back of the side walls. The total area illuminated at Gatun, therefore, is a strip a quarter of a mile wide and a mile long. At the Pedro Miguel and Miraflores locks the strips are somewhat reduced in length owing to the fact that single and double locks are constructed at these places.

### Exterior Illumination

It was necessary to arrange the exterior illumination in such a manner that the pilots of ships approaching the locks should have a distinct view of all range and

signal lamps. Light is obtained from 500-watt tungsten lamps set in concrete hoods 30 ft. above the coping. Single-bracket standards are used on the center wall and double-bracket standards on the outer walls. The standards on the center wall are arranged in two rows and are staggered. A single row of standards is installed on each outer wall. The lamps are spaced on centers from 50 ft. to 60 ft. apart and 21 ft. back from the chamber edge.

The proportions of the standards are massive, conforming to the heavy construction of the lock masonry. The standard is twelve-sided and is of simple design. It tapers from a section which is 1 ft. 10 in. between diametrical edges at the top to one at the base of the pedestal which is 3 ft. 6 in. between diametrical edges. The reflector is more ornate in design, but is essentially an arm of square cross-section supporting a concrete reflector at its extremity. The reflector is hood-shaped and is designed primarily to reflect the light properly. The bracket is surmounted by a concrete ball 1 ft. 11.5 in. in diameter. The over-all height of the complete standard is 34 ft. 4 in., while the over-all length of

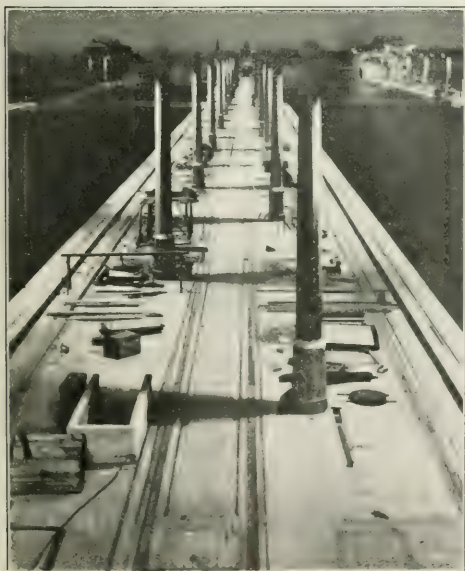


FIG. 1—NIGHT ILLUMINATION, GATUN LOCKS, LOOKING UP-STREAM ALONG CENTER WALL



FIG. 2—NIGHT ILLUMINATION, GATUN LOCKS, LOOKING DOWN-STREAM ALONG CENTER WALL



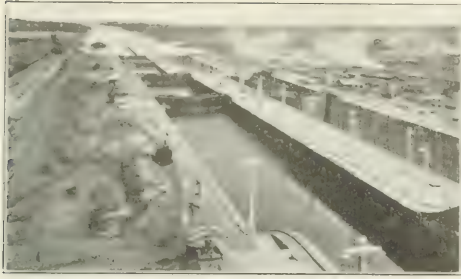


FIG. 3—GENERAL VIEW OF GATUN LOCKS LOOKING DOWN-STREAM FROM LOWER RANGE TOWER

the single-arm bracket is 7 ft. 1 in. and that of the double-arm bracket 12 ft.

The standard is designed to withstand a wind pressure of 25 lb. per square foot. The columns were reinforced with small angle irons on account of rough handling encountered in the casting yard. The pedestal was reinforced with deformed bars for anchorage purposes. The reflector bracket was reinforced with deformed bars used as a cantilever and also on account of rough handling in the casting yard. In the single-arm bracket the overturning moment is resisted by a U-strap bolted to the column reinforcement. This U-strap is unnecessary in the double-arm bracket, which is balanced. The reflector hood is reinforced by small rods formed on a template and electrically welded into a mesh which conforms to the outline of the hood. The

TABLE I—AMOUNT OF CONCRETE AND REINFORCEMENT IN STANDARD

	CONCRETE		Reinforcement, Lb.
	Lb.	Cu. Ft.	
Pedestal	5870	39.2	177
Column	5835	38.9	886
Collar	300	2.4	11
Bracket (double-arm)	1640	10.7	73
Bracket (single-arm)	380	6.5	44
Ball	730	4.9	10
Cap	12	0.1	0

welding machine was designed and constructed in the field. The top ball is solid, and its weight adds to the stability of the bracket.



FIG. 4—NIGHT ILLUMINATION, PEDRO MIGUEL LOCKS, LOOKING NORTH

The column, pedestal and bracket of the standard are hollow, the core serving as a runway for the wires to the lamps. The ends of the cross-arms are plugged with treated wood to prevent the entrance and nesting of bats, birds and insects. The entire standard is constructed in six pieces—the pedestal, column, collar, bracket, ball and a small cap over the lamp socket in

TABLE II—DISTRIBUTION OF STANDARDS

Location	Single-Arm	Double-Arm	Total
Gatun	116	90	206
Pedro Miguel	80	50	130
Miraflores	101	67	168
Total	297	207	504

the reflector. The double-arm bracket, of course, has an additional cap for the second lamp. In general, all the separate parts were cast at a central plant and assembled in place, usually with a locomotive crane operating on the lock tracks. Joints are grouted after alignment and leveling, except the top ball and cap, which are removable to give access to the wiring. Some of the pedestals, which rest on the back-fill of the locks instead of on solid masonry, were designed with a large



FIG. 5—NIGHT ILLUMINATION, WEST CHAMBER, GATUN LOCKS, LOOKING DOWN-STREAM FROM CENTER WALL

spread base and were cast on the ground integral with the sub-base. In Table I are given the unit quantities of concrete and reinforcement used in the different parts of the standard. The total volume of the double-bracket standard is 96.2 cu. ft. and its total weight 15,524 lb. The total volume of the single-bracket standard is 92 cu. ft. and its total weight 14,875 lb.

There is a total of 504 lamp standards, distributed among the three locks as shown in Table II.

The unit cost of the lamp standards, erected in place, averages as follows:

Excavation	\$10.74
Pedestals, column, sub-base and entire erection	227.74
Brackets (average double-arm and single-arm)	35.39
Wiring and connecting lamp and outlet box	13.04
Bronze outlet box	20.81
Socket	1.50
500-watt tungsten lamp	2.87
Two telephone receptacles	.45
One lighting receptacle	.15
Miscellaneous (estimated)	5.00
<b>Total</b>	<b>\$317.69</b>

Each lamp standard is provided with an outlet box installed in the concrete pedestal. This outlet box permits the insertion of plugs to connect a portable lamp circuit and a portable telephone circuit. A portable lamp may be required at any moment in the operation



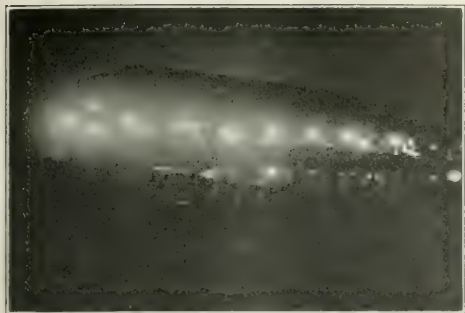


FIG. 6—NIGHT ILLUMINATION, WEST EMERGENCY DAM. GATUN LOCKS; NO REFLECTORS USED

of the locks to light one of the electric locomotive or the deck of a passing vessel. A portable telephone makes it possible for a supervisor of lockages to communicate with the central control house from any position on the lock walls. The outlet is placed in the pedestal of the lamp standard as a matter of operating convenience during lockages, as the standards are accessible throughout the entire length of the lock walls. The box is made of bronze and is provided with a hinged waterproof cover.

The lamps are connected alternately upon separate circuits, providing thereby a duplication of wiring as well as a means of economical operation whenever half the full amount of illumination is desired. All the lighting circuits are remotely controlled by the attendant in the control house, the operating center for all the lock machinery and indicating apparatus. Remote control is accomplished by means of solenoid-operated circuit-breakers, the main contacts of which connect the lamp circuit to the lighting bus of each transformer room, the solenoid being connected to the control wires, which are run from the transformer rooms to the control house. The control circuits, which are carried to a small benchboard in the control house, are connected to relays under the benchboard, the relays being operated by push-button switches on the bench. The push-buttons and relays are so arranged that (1) any individual circuit can be switched on or off, (2) certain groups of switches can be switched on or off, and (3) all the lamp circuits at the locks can be switched on or off by means of the master control switch.

The entire reflector, with lamp and socket, as well as the outlet box in the pedestal, is weatherproof and is suited in every respect to resist the deleterious effects of tropical deterioration.

#### Interior Illumination

The machinery which operates the gates, valves and other auxiliaries of the locks is housed in small chambers under the coping or top surface of the lock walls. All the chambers are connected by operating tunnels or walkways which extend the entire length of all three main walls, except the approaches and wings. The operating tunnel is comparatively narrow (5 ft. 6 in. in width) and is of low head room (7 ft.). The decking over the operating tunnel is 12 in. thick. The machine rooms have the same head-room as the tunnel, but the decking over these chambers is invariably a removable manhole cover of sufficiently large dimensions to permit the installation and removal of the machinery underneath. It is therefore impracticable to locate lamps in the ceiling of the machine room, and recourse to side-wall illumination is necessary. During the day natural light penetrates to the operating

tunnel and the machine rooms through glass prisms which are set in the decking and in the manhole covers.

#### Tunnel Illumination

On account of the low head-room in the tunnels it was difficult to design a system by which to secure uniform illumination on the floor level. This difficulty has been overcome to a great extent by placing the lamps on 15-ft. centers along the longitudinal axis of the tunnel, alternating the lamps with deck lamps, which latter are also placed on 15-ft. centers. The reflectors are set in the ceiling along the center-line of the tunnel. Forty-watt tungsten lamps are used. Alternate lamps are connected to separate circuits, and groups of ten to twelve lamps are wired on a single circuit from the panelboard, permitting an economical control of the lighting whenever operating conditions are such that half the full amount of illumination is sufficient. The wires for the lighting circuits are run in covered chases, which are formed in the concrete at the upper corner on both sides of the tunnel. The cut-out switches are located in panelboards situated at convenient load centers along the tunnel. The ceiling reflector is of simple design, consisting of inclined surfaces at the four sides to diffuse the light in proper directions. The total number of tunnel lamps is 2041—952 lamps being used at Gatun, 677 at Miraflores and 412 at Pedro Miguel.

#### Machine-Room Illumination

Approximately 5000 lamp recesses were cast in the concrete walls of the machine rooms at about the level of the eye. A concrete reflector similar to the ceiling reflector, but vertical instead of horizontal, is grouted in the wall recesses. A weatherproof lamp socket designed for a 40-watt tungsten lamp is set into the top of the reflector, and wires are brought to the socket through chases in the walls. In front of the lamp is

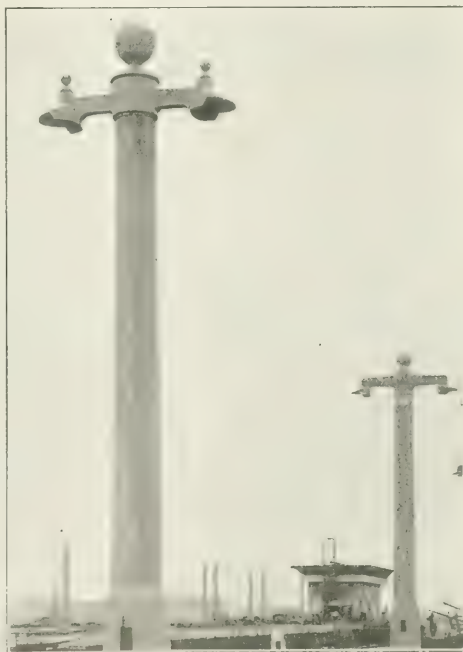


FIG. 7—TRIAL STANDARDS—BRACKET ON SECOND STANDARD APPROVED TYPE

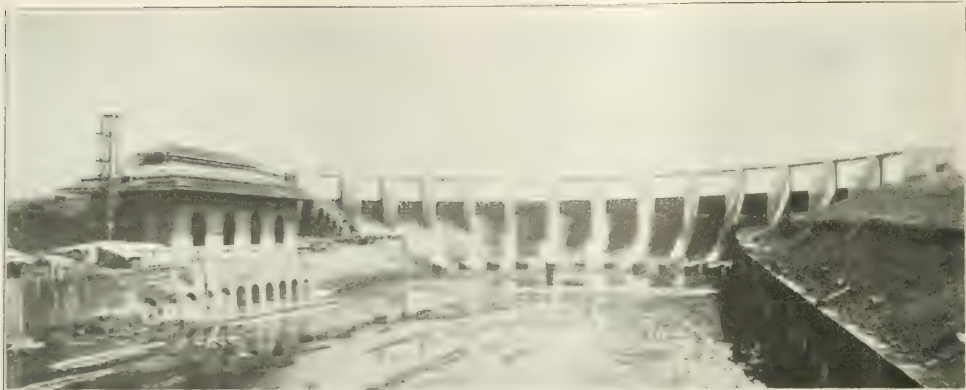


FIG. 8 GATUN SPILLWAY DAM, SHOWING FOURTEEN CREST GATES, OGEE DAM AND BAFFLE PIERS

placed a concrete shade which contains a semi-circular opening at the bottom. The shade is adjusted in a vertical plane to cut off the direct glare of the filament, permitting the light to sift through the opening and flooding the machines with an excellent illumination. The lamp recesses are placed so as to light all sides of the machines contained in the room.

There is a total of 4751 machine-room reflectors, 2101 being used at Gatun, 1524 at Miraflores and 1126 at Pedro Miguel.

The average unit cost of the interior lamp reflectors (tunnel and machine room), as shown by the manufacturing account up to and including December, 1913, is as follows:

	Unit Cost
Cement.....	\$0.0414
Sand.....	0.0051
Forms, cast, and labor.....	0.426
Mixing and placing.....	0.175
Repairs to forms and equipment.....	0.0066
Wages and expenses.....	0.0118
Administrative and general expenses.....	0.0250
<b>Unit cost reflector.....</b>	<b>\$0.5090</b>
Lamp (40-watt tungsten).....	0.2550
Socket.....	0.1500
Wiring, connecting, and miscellaneous.....	0.2420
<b>Total unit cost.....</b>	<b>\$0.9560</b>
Total reflectors manufactured to date.....	7,575
<b>Total cost.....</b>	<b>\$7,241.75</b>

The work of installing the system of lock illumination was a portion of that assigned to the first division, with Col. H. F. Hodges at the head and Mr. Edwin Schildhauer, electrical and mechanical engineer, in direct charge of the subdivision which designed and erected the exterior standards. The columns of the exterior lamps, including the majority of the pedestals, were manufactured by the former Atlantic and Pacific divisions, while the collars, brackets, balls and caps were cast at the Gatun locks by the lighthouse subdivision. The interior reflectors were manufactured by the first division at the Miraflores locks.

The foregoing information was supplied by Messrs. W. R. McCann and F. C. Clark.

#### Hydroelectric Development at the Gatun Dam

The permanent supply of electric energy for utilization on the Panama Canal is being generated in the hydroelectric station at the Gatun spillway dam. The tremendous amount of water stored in the artificial Gatun Lake, which is fed by the Chagres River, not only carries vessels the greater part of the way across

the Isthmus on a level about 85 ft. above the oceans and provides for raising and lowering them gently through the Gatun, Pedro Miguel and Miraflores locks but also affords an opportunity for the generation of electric energy to light the canal, to operate the gigantic gates and other locking machinery and to drive the locomotives towing ships through the locks.

Electricity will also be used for the coal-handling plants at both ends of the canal, machine shops, waterworks and dry-docks, and possibly in the future to haul trains on the Panama Railroad. To insure continuity of service in case of accident, a steam-electric station at Miraflores, erected a few years ago to supply energy for construction work, will be ready to assume the load when necessary.

The complete equipments for the generating and distributing system on the canal comprise the 7500-kva, 2200-volt hydroelectric plant at Gatun; the 4500-kva, 2200-volt Curtis turbo-generator plant at Miraflores for emergency; a double 44,000-volt transmission line across the Isthmus, connecting Cristobal and Balboa with the two plants; four 44,000/2200-volt substations, stepping down the emf at Cristobal and Balboa, and up or down at Gatun and Miraflores, depending on which of the two plants is supplying energy; thirty-six 2200-240-volt substations for motor service, traction and light at Gatun, Pedro Miguel and Miraflores locks; three 2200-220-110-volt transformer stations for the control boards at the locks, and stations at Cristobal and Balboa for the coal-handling plants, machine shops and dry-docks.

The Gatun hydroelectric station has a rating of 6000 kw, and provision has been made to increase this rating ultimately to 12,000 kw in case additional energy should be required later for the operation of the Panama Railroad. Three outlet pipes in the dam have been installed along with the original pipe lines to provide for this increase.

#### Operating Head and Intake

The gross head available from Gatun Lake to mean tide level of the Pacific Ocean varies from a maximum of 91 ft. in the extreme flood times to a minimum of 79 ft., to which level the lake may possibly drop toward the close of the dry season. The plant is designed, therefore, to develop the full water output when operating under an effective head of 75 ft. For three or four months of every year there is absolutely no rainfall on the Isthmus. During this period it is desirable to conserve the water as much as possible, and maximum efficiency was accordingly demanded for the apparatus of both the waterwheel and generator manufacturers.



Water is taken from Lake Gatun through passages 12 ft. wide, fitted with wrought-iron racks 29 ft. 7 in. high to prevent debris from entering the pipe lines. The water is admitted into the pipe lines through three headgates, 10 ft. 6 in. in diameter. These gates are of massive cast-iron construction, the seats where water tightness is required being made of bronze.

#### Details and Operation of the Gates

Each gate is equipped with two steel stems for raising and lowering. These stems are fitted with bronze nuts working in roller thrust bearings, and the nuts are fitted with steel bevel gears which are operated by a 15-hp, 220-volt alternating-current motor with a speed of 750 r.p.m. The motor is placed between the stems and has shaft extensions on each side which carry two bevel pinions that engage the bevel gears on the stem nuts. The stands which carry the stem nuts are equipped with a hand operating mechanism, which can be disconnected when the gate is operated electrically.

The gates are equipped with automatic control devices, consisting of a limit switch geared to one of the gate stems and a float switch actuated by the water in the pipe. When the gate has opened a sufficient distance so that the pipe line can be filled in about five minutes, the limit switch opens the circuit and stops the motor. The gate remains in this position until the pipe line is filled and the water rises in the 36-in.-diameter air-vent pipe just below the gate. A float switch is then actuated and the motor circuit is again closed. The gate is raised clear of the opening, when the limit switch again operates to prevent over-travel. The gate is closed by reversing the main switch at the power house, and the limit switch again stops the motor when the gate has reached the closed position. In case the circuit should be opened two men can operate the gates by hand.

Each of the gates is bolted to a pipe line having a diameter of 10 ft. 6 in. and an average length of 420 ft. The pipe lines are made of  $\frac{3}{4}$ -in. steel plates in courses 8 ft. long, each course being made of three sheets to form the circumference. The center of each course is fitted with a 3-in. by  $\frac{3}{4}$ -in. Z-bar ring, which is also made in three sections. After the pipe was riveted together at

the plant, the outside was covered with a layer of reinforced concrete to prevent rust.

The pipe lines are led down to the rear of the power house on a uniform slope from the spillway and are connected to the turbines in the power house through 90-deg. bends with radii of 70 ft. A Pitot-tube testing apparatus can be attached to each of the pipe lines while the unit which it serves is in operation. A pair of portable tubes for taking readings in planes of the pipe at 90 deg. from each other has been supplied for this service.

The hydroelectric station is 61 ft. wide and 137 ft. long and has an extreme height of 74 ft. The building is designed on the unit principle to admit of future extension, and consists of a single room open to the roof, exposing the trusses on which are laid the reinforced-concrete roof slabs, which, in turn, support the red Spanish tiles. The walls are of poured concrete and are 30 in. thick to the level of the crane rails near the cornice. The exterior overhang of the main roof is 13 ft. 2 in. and that of the monitor roof 4 ft. 8 in., the exceedingly large projections having been generally adopted for all the permanent buildings in the Zone as a shelter from tropic rains as well as from the heat of the sun. Beyond the general use of tile for flooring and an interior white enameled-brick wainscot 14 ft. high to relieve the coarseness of the walls, there is no difference in the finish of the concrete surfaces within and without.

The interior has four principal floors, namely, a pit for the three 2500-kva hydroelectric turbines, a main floor and two galleries. The turbine pit, with an area of over 2100 sq. ft., is 6 ft. below the level of the main floor and is reached by iron stairways descending alongside the turbines. From the pit other stairs lead down to the storeroom on the north side and to the air-compressor and oil-pump compartments at the ends. The pit is lined with white-enameled brick.

The main floor is divided into two parts, one being partitioned off and devoted to the use of the electrical equipment and the other forming an uninterrupted passage on the longitudinal axis of the building, terminating with two large entrance doors at either end. Easy access to railway cars is afforded by means of a track which enters this floor from grade through the



FIG. 9—HYDROELECTRIC INSTALLATION UNDER CONSTRUCTION, SHOWING PIPE LINES AND TURBINES ERECTED



northwest door, thus giving every facility for handling heavy machinery by the 30-ton electric crane running the length of the building overhead.

Concrete stairways at either end of the building give access to the mezzanine and second galleries, which are



FIG. 10—INTERIOR VIEW OF HYDROELECTRIC STATION

devoted to the switchboards, oil-switch compartments, reactance coils and other electrical equipment. Two such galleries extend the entire length of the station on the northeast side, and in the south corner are superimposed two smaller ones used as a machine shop and an office respectively. The sashes in the large side wall windows are operated in sections by a hand-gear system, and the continuous bottom-hinged sash in the roof monitor is operated by motors.

#### Details of the Installation

Each of the three 2000-kw main generating units in the hydroelectric station is driven by a 50-in. vertical, single-runner Francis turbine manufactured by the Pelton Water Wheel Company. Each turbine has a maximum rating of 3600 hp when operating under an effective head of 75 ft. and at a normal speed of 250 r.p.m. The turbines are at such a height that the center of the runners is 20 ft. above tailwater.

The water is discharged through steel-lined concrete draft tubes, which are 71 in. in diameter at the point where the water leaves the runners, and they increase in size until at the outlets they have an elliptical section of 9 ft. by 17 ft. Each of these tubes has 90-deg. bends so that the outlets are horizontal. The linings are made of  $\frac{1}{4}$ -in. steel plates, which were fitted together in the shop and shipped "knocked down."

The turbines are of the spiral-case type and are fitted with heavy cast-iron distance rings which carry the generators. The weight of the revolving parts of each generator and turbine is carried on a roller thrust bearing mounted on top of the generator. The turbine is designed so that the runner exerts an upward thrust of 20,000 lb. when working at its full rated output, thereby relieving the thrust bearing of that amount of load.

Oil for the thrust bearing is supplied by a small pump geared to the main turbine shaft, and a tank is provided below the pump to receive the overflow from the bearing. In this way a constant circulation of oil is maintained. As this oil returns to the suction tank it passes through the lower guide bearing on the main shaft and lubricates the shaft.

The runners of the turbines are made of a special bronze and weigh approximately 7000 lb. each. These runners are bored so that they taper, and are held in place on the lower end of the shaft by means of bronze

nuts. The surfaces of the runner vanes are hand-finished to reduce hydraulic losses.

The speed of the turbines is controlled by Pelton oil-pressure governors, which are mounted on the distance rings and are driven by bevel gearing from the main shaft. Tachometers are mounted above the governors on supports bolted to the distance rings. The tachometers are directly connected to the governor heads.

Small electric motors are connected to the governors and are used for varying the speed of the main units for synchronizing purposes. A device is also provided on each governor for varying the permanent drop in speed from no load to full load. This device can be adjusted for any variation from a 5 per cent drop in speed to absolutely constant speed and from friction load to maximum load. The governors are also fitted with a hand-control mechanism for adjusting the gates independently of the oil pressure.

The pressure oil for actuating the governors is supplied by two Pelton rotary pumping units, driven by 10-hp alternating-current motors at a speed of 375 r.p.m., each pump being capable of serving the governors on all three units. The governors work on an open system, no vacuum chambers being used. The discharge oil from the governors is led into oil sump tanks, from which it passes into the suction of the pumps. Each oil pump is connected to a steel pressure oil receiver with an air space above the oil. The oil sump tanks and pipe connections are installed in duplicate and valves are provided to enable one set to be cleaned while the other is in service.

The three main generating units are of the vertical revolving-field type, each being provided with a directly

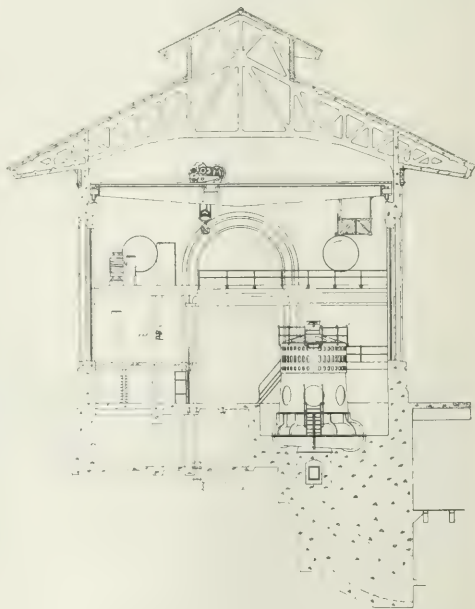


FIG. 11—CROSS-SECTIONAL VIEW OF GATUN STATION

connected exciter. The generators were manufactured by the General Electric Company, and are designed for three-phase, 2200-volt, twenty-five-cycle current with a continuous rating of 2000 kw at 0.8 power-factor.

The exciters are rated at 50 kw, with 125 volts pres-

sure and each is capable of furnishing exciting current for two generators under the maximum guaranteed load. The generator and exciter for each set weigh approximately 65 tons.

The generators are carried on heavy cast-iron dis-

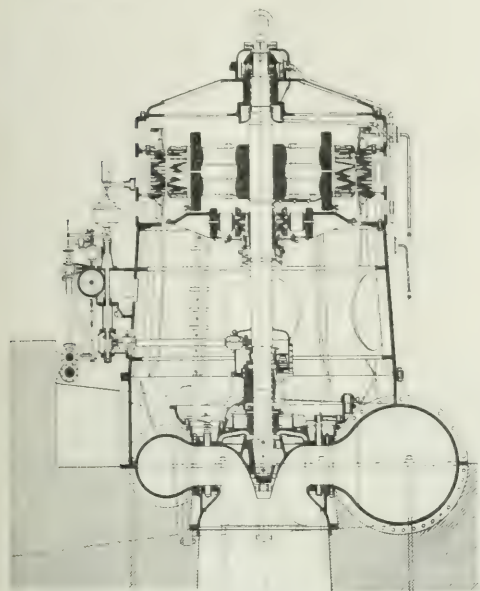


FIG. 12—CROSS-SECTION THROUGH WATERWHEEL, GENERATOR AND EXCITER

tance rings furnished by the Pelton Water Wheel Company, and the stationary armatures are bolted to these rings. The thrust-bearing and upper-guide-bearing support consists of a very rigid iron casting bolted to the top of the stationary armature.

The thrust bearings are of the roller type, manufactured by the Standard Roller Bearing Company, Philadelphia. These bearings carry the weight of the complete revolving element, consisting of the generator field, core exciter armature and turbine runner, which are mounted in the order given on a one-piece shaft. The weight thus suspended is 32 tons. The exciter magnet frame is supported by lugs cast on the stationary armature of the main generator.

The exciter is readily accessible through large holes in the distance ring, a platform being provided inside the ring from which the exciter commutator and generator collector rings may be reached. Provision is made for securing the magnet frame of the exciter to the revolving element of the generator, so that the complete rotating element, together with the exciter frame, is raised at once in disassembling. For inspection of the roller bearing it is necessary simply to remove a speed-limiting switch from the top of the shaft and the upper half of the bearing housing. There are two guide bearings, one immediately below the thrust bearing, furnished with the generator, and the other above the waterwheel, furnished by the waterwheel builder. The arrangement of the complete unit is shown clearly in the cross-sectional view.

The generators, under official tests, at 80 per cent power-factor, showed an efficiency of 95.1 per cent when taking 2000 kw, 94.3 per cent with 1500 kw, and 92.5 per cent with 1000 kw. The guaranteed temperature

rise of 40 deg. C. above room temperature, of 25 deg. C. under continuous operation at full load and of 55 deg. C. after two hours' run at 25 per cent overload was met with an ample margin.

Current-limiting reactors were provided to give 5 per cent reactive drop, with three-phase, twenty-five-cycle current at 2500 kva and 2200 volts. While the generator windings are sufficiently rigid to withstand the strain of a short-circuit under full load, these reactors will reduce the shock on the windings and will also make the operation of synchronizing the machines easier and safer.

In addition to the directly connected exciters, two motor-driven exciters are used. These consist of a 100-kw, 125-volt, 500-r.p.m. generator directly connected to a 150-hp, 2200-volt, twenty-five-cycle squirrel-cage induction motor. The set is mounted on a single base plate and is provided with three bearings. These exciters can also be used for charging the control battery.

On account of the great distance, covered energy is transmitted at a pressure of 44,000 volts from the stations to both ends of the canal. The step-up transformers are, however, not in the generating stations, but in substations in their vicinities; therefore the plants generate and distribute only 2200-volt energy.

The system of connection throughout is based on the double-bus, double-switch scheme, with provision for disconnecting any oil switch for cleaning or repairs without interrupting the circuit. This system was naturally selected for this station because it was considered the most flexible for the requirement of uninterrupted service.

The main switchboard is of the benchboard type, with vertical rear board for relays, watt-hour meters, graphic instruments and the control-battery equipment. The switchboard and all control apparatus were built by the General Electric Company. The space between the front and the rear boards is inclosed by grille work

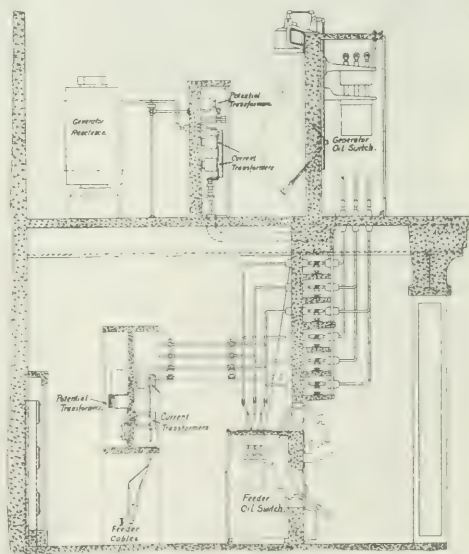


FIG. 13—ARRANGEMENT OF SWITCHING APPARATUS

with doors at both ends, and a metal molding extending along the floor and the top of the board gives a finished appearance to the whole. On the top of the switchboard is a second story, for the electrically controlled generator and exciter rheostats, and it is accessible by



means of a ladder inside the structure. The first panel from the left in the benchboard controls the exciters, the next three the generators and the remaining four the twenty-four feeder circuits. The system of connection is represented by dummy buses of polished copper on top of the bench. In the interior of the benchboard are the operating buses and fuses, potential buses, instrument resistors, and the channel-iron risers with distributing tubes which carry the instrument and control leads to their points of connection on the board.

A generator-voltage regulator, which is transferable to either of the two sets of buses, is installed on a separate pedestal which also carries the synchronism indicators and clock.

As mentioned above, the exciters are controlled from the benchboard, but the electrically operated exciter switches and field switches are mounted on a separate board placed so as to make the exciter connections as short as possible. This arrangement eliminates the exciter buses and the main connections from the control

vertical metal guides which carry the oil-switch operating mechanism and the slate base forming a section of the switchboard panel. On the guides a lever and toggle mechanism is mounted, by means of which the oil switch and slate base may be raised and lowered.

A stationary cast-iron base mounted on the pipe framework above the oil switch carries the disconnecting switch studs and insulators. The high-tension leads run to the tops of the disconnecting switch studs, and the bottom of each stud is equipped with contact fingers. On the top of each oil switch stud is mounted a contact blade. When the oil switch is raised these blades engage the contacts on the bottom of the disconnecting-switch studs, which thus in the closed position form extensions of the oil-switch studs. The disconnecting-switch contacts are surrounded by insulating shields which prevent accidental contact. When the oil switch is lowered it is completely isolated from the circuit. When the oil switch is raised it always goes to a fixed height where it is latched. An interlock prevents the

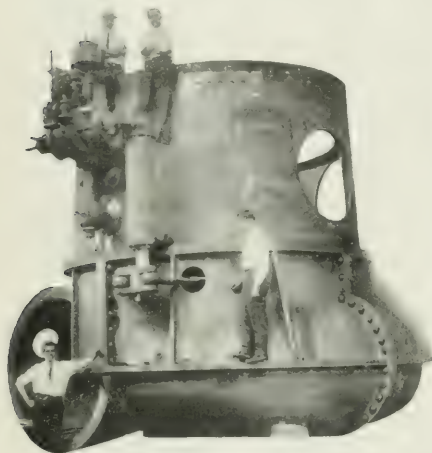


FIG. 14—3600-HP FRANCIS TURBINE FOR HYDROELECTRIC STATION

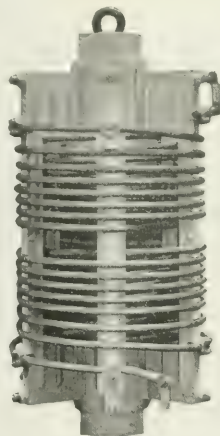


FIG. 15—CURRENT-LIMITING REACTOR WITH CONCRETE CORE

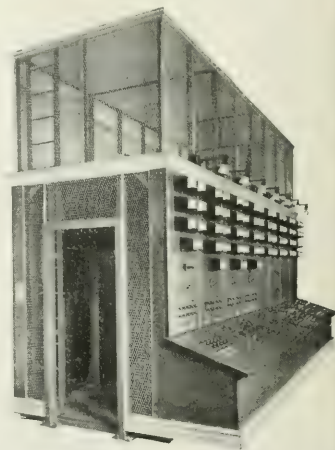


FIG. 16—2200-VOLT ALTERNATING-CURRENT INSTRUMENT AND CONTROL BOARD

board, but leaves the control of the whole equipment in the hands of the operator.

The bus and switch compartments are on two galleries. On the upper gallery are the control board, which is near the end of the station that may be extended, the generator reactances, a compartment for generator-current and generator-potential transformers, and the generator oil switches. From the oil switches connections are made through the floor to the buses on the gallery below, on which gallery are also the feeder oil switches and the compartment for the instrument transformers and cable bells. On the main floor just below this gallery is the cable vault with racks for the feeder cables.

All compartments are built of concrete with fireproof doors. The buses and connections are made of solid-copper rods of sufficient size to give a rigid construction even where the amount of energy carried is very small. After being installed, the buses and connections and all joints were heavily insulated with varnished cambric to make them perfectly safe.

All the 2200-volt oil switches are solenoid-operated and are provided with a mechanism for disconnecting them easily for cleaning or repairs. The live parts of these switches are completely covered. For the hand-operated switches a pipe framework is used to support

oil switch from being raised or lowered unless its contacts are open, thus precluding the possibility of the circuit being closed or opened by the disconnecting switch. In some instances another interlock makes two single-throw switches a double-throw switch and prevents both switches being closed at the same time.

For solenoid-operated switches the same form of disconnecting switch is used, but the solenoid is stationary, and the connecting mechanism to the oil switch has a vertical slotted link that allows the oil switch to be raised and lowered without being disconnected from the solenoid mechanism. A mechanical interlock prevents the raising or lowering of an oil switch while in the closed position.

The complete hydraulic equipment for this installation, including the racks, headgates, pipe lines, Pitot-tube testing apparatus, turbines, governors and oil-pumping units, was designed and built by the Pelton Waterwheel Company, and all the electrical apparatus, including the generators, switchboards, transformers, headgate motors, limit switches, float switches, accessories and motors for driving the oil pumps, was designed and built by the General Electric Company. The details of design and manufacture of all this apparatus were subject to the approval of the Isthmian Canal Commission's engineers.



# Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods, and Current Practice Among Successful Utilities

## Sweatshop Conditions Bettered by Electricity

Evidence of the progress made by the Joint Board of Sanitary Control in bettering the conditions existing in New York sweatshops is shown by the increasing rate at which these places are adopting electricity for lighting and machine drive. In July, 1911, only 199 of the 779 shops south of Houston Street, New York, used electricity, while in the next six months 310 were provided with electric service. Six hundred and fifty shops are inspected by the board biennially under summer and winter conditions. While electric light is fast replacing other forms of illumination, most of these shops are being remodeled so that artificial lighting is not needed in the daytime. The board has also performed a great service by revising the lighting of these shops to meet the requirements of operating conditions. Lamps and reflectors are prescribed which will give the proper intensity and distribution. Advice is also given as to the proper location of the units so that each worker will receive the proper amount of illumination.

## Two Exhibit Booth Novelties at North Adams, Mass.

At the recent electrical show given by the North Adams Gas Light Company, which supplies electrical energy in North Adams, Mass., two ingenious devices for attracting and holding the public's attention were used.

One was a graphical device demonstrating the cost of energy. The names of different household appliances were placed on a large board labeled "Cost Meters." Before and after the name of each appliance was a red lamp. On the bottom of the board were a "cost meter" and a demand wattmeter. As each appliance in the booth was used its red lamp was lighted and the two meters showed respectively the cost per hour and the watts demand of that appliance.

The other novelty display device was a large clock with a single hand, driven by a fan motor and having on the face numbers from 0 to 400. As the arm came opposite a number its corresponding lamp was flashed. The clock motor was automatically started, controlled and stopped by an Anderson time switch. To each per-

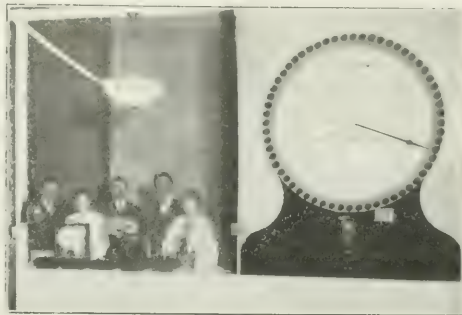


FIG. 2—MOTOR-DRIVEN CLOCK HAND

son entering the hall a number was given, and he was informed that the clock was set to stop at a given hour. The person holding the number showing the time at which the hand stopped was given his choice between two appliances and a table lamp.

## The Public Utility and the Newspaper

In the relation of the corporation to the newspaper is a power which may be made an asset and a valuable ally, said Mr. F. R. Slater in a broadly considered address on "The Public Policy of Public Utility Corporations" delivered before the Southwestern Electrical and Gas Association at Galveston, Tex.

"The reporter or news-writer," continued the speaker, "is the one who has the ability and the opportunity to put thoughts into the minds of thousands of men and women every day, the people from whom we derive our revenue; the people who select those who make the laws which govern us; the people who sit in judgment upon our acts and behavior. This is a power whose importance can hardly be overestimated. And when it is recalled that the average reporter who consciously or unconsciously wields this power must be a man of good character with a keen and analytical mind, and further that he must be possessed with the invaluable asset of being able to make friends, and that this same reporter in his every-day work is continually coming into contact with your manager and company representatives, and that he is actively interested in all live questions and occurrences, it would seem a serious error if he should not receive respectful attention, to the end that a bond of confidence may be established between him and you, and thus the story which he is preparing for the paper will give true conditions and facts.

"In the course of events you will have accidents on your system, affecting the public either through bodily injury or inconvenience. The attitude of your officers toward the press at this time is of the greatest importance to the welfare of your company. If the situation is handled from the viewpoint that the occurrence is purely a company affair, every mouthpiece of the cor-

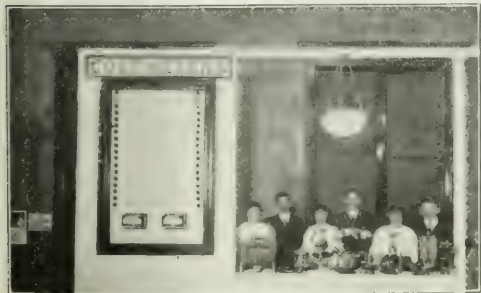


FIG. 1—METERS SHOWING COST OF OPERATING HOUSEHOLD APPLIANCES

poration may be closed to the newspaper. If, on the other hand, the situation is handled from the viewpoint of one who realizes that the public is entitled to at least a word of explanation, the reporter will be given such information in such a way that the account of the accident will be written in a spirit of fairness. He will not so shape what he says that everyone who reads it will instantly jump at a conclusion that the company wishes to avoid; he will not set in motion in 10,000 or 50,000 minds a current of thought that in the next year or the next decade will accumulate to proportions which will actually wipe out the company's dividends. The first impression is an all-powerful factor in all of the subsequent thinking that is done with reference to that event, and the company which does not improve the means to have these first impressions at least fair is missing a large opportunity.

"There is an inherent belief in everybody that where there is fear there is wrong, and thus the repeated statement that a company is keeping something under cover poisons the public mind against the company. Public opinion to-day may not be a newspaper opinion, but it is the creature of newspaper opinion. Public knowledge is disseminated through the press, and it is on the facts as they appear in the news columns of the country that public opinion is based. We may deny and decry the power of the press, but as long as people read newspapers, even newspapers whose policies they do not respect, they will be influenced by them. Do not forget that 'the mind is like a sheet of white paper in this—the impressions it retains longest are the blackest.'"

### Pumping Gravel from Riverbed to Railroad Cars

The Hattiesburg (Miss.) Traction Company has on its lines several gravel-pumping outfits which offer, from the central-station standpoint, a very desirable class of long-hour business. One of these installations is unusual in the respect that at a single operation it takes the gravel from the riverbed, washes it clear of smaller

particles, and loads it onto the railroad cars ready for shipment. The 10-in. centrifugal pump used is driven by a 100-hp slip-ring induction motor and conveys the

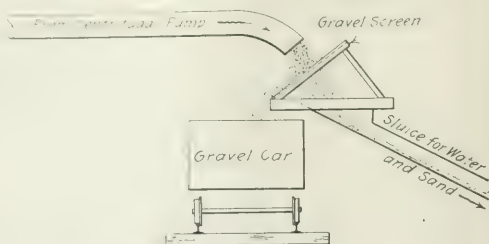


FIG. 3—PUMPING GRAVEL FROM RIVERBED TO RAILROAD CAR

dredged mixture (gravel 5 per cent, sand 10 per cent and water 85 per cent) over a horizontal distance of 450 ft. with a vertical lift of 35 ft. to 65 ft. measured from the riverbed. A sloping screen is mounted over the car, and against this the pipe-line spout discharges. The gravel is thus separated out and falls into the car, while the water and the smaller solid particles pass on through the screen and down a sluiceway. By means of a settling pond the sand is here recovered and is also sold for building purposes.

This gravel-loading plant runs twelve hours a day. About 3.5 kw-hr. is consumed for each ton of gravel handled. Forty to fifty minutes is required to load a car. The rate for this service is 2.5 cents per kw-hr.

### Short-Cut Accounting Methods for Small Central Stations

A number of short-cut methods are in use by the accounting department of the Vicksburg (Miss.) Light & Traction Company, where with a limited staff from 1200 to 1500 electric service bills are sent out monthly. About 80 per cent of the company's customers run mer-



FIG. 1—PUMPING GRAVEL OUT OF RIVER

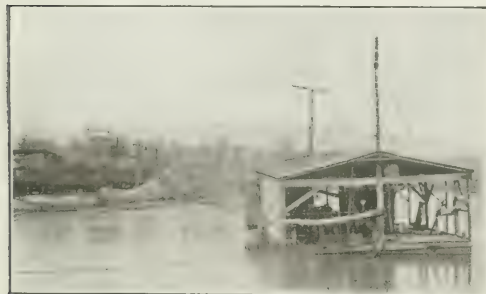


FIG. 2—FLOAT ON WHICH PUMP AND MOTOR ARE INSTALLED

Acct. No. ....	
No. ....	Street. ....
CUT IN	
Meter Order No. ....	Meter Order No. ....
Line Order No. ....	Line Order No. ....
Reason. ....	
CUT OUT	

FIG. 1—CUSTOMER'S APPLICATION CARD, CONTRACT ON REVERSE SIDE

chandise accounts in addition, a feature which has required the development of special methods to minimize the detailed labor usually accompanying this class of bookkeeping.

The card on which the customer makes application for service is of filing size (4 in. by 6 in.) and bears on its reverse the contract form. After having entered upon it the customer's address, account number, credit confirmation, etc., this card forms a part of the card index to the "consumers' ledger." This ledger is arranged geographically by street location and is of the loose-leaf form, being made up of three sheets to each ten accounts. The long sheet contains the customer's

account number, name, address, meter constant, rate, meter number and size, date cut in, etc. Each of the ten account spaces has five lines. The short sheets,

The statements are torn off and sent out, while the receipt and stub are filed in a cabinet at the cashier's window. If a merchandise account is pending against

FIG. 2—FORM OF CUSTOMER'S BILL

which fold into alignment with the original data on the long sheet, contain spaces for twelve months' accounts, three to each page. Each such space is divided into columns for meter readings, consumption, net charges, date of payment, amount brought forward, discount added and date of payment. The short sheets are replaced every twelve months, but the long sheets will last indefinitely, since they contain only data of record. In case such a long sheet becomes full it can be immediately replaced by a new sheet, in this way avoiding the necessity for transferring the whole ledger at the end of the year, as would be required with a bound ledger.

After the consumption and charges for a given month have been entered in the ledger, each page is totaled and these totals are entered in the "recapitulation book," which is ruled similarly to the short ledger sheet. This book aids in carrying out the balancing of the ledger and shows the total kilowatt-hours sold to customers, the total charges for this energy, the total collections during the month, and the total to be carried forward to the next month. When an error has been made the use of this book also makes the fault easier to locate and correct than if the totals are carried from one page to the next through the ledger. Only "live" accounts are kept in the consumers' card-index file. When a customer discontinues service his card is removed.

As soon as the ledger account has been opened a meter reader's slip, bearing the consumer's name, address, meter location, number, size, etc., is made out and put in the reader's book. The form of slip used has spaces for thirty-six months' or three years' readings, and the names of the months are printed in inverted order, beginning at the bottom of the sheet with January, in order to facilitate subtraction of dial readings.

The form of customers' bill used at Vicksburg has been especially designed to serve a central station handling a large merchandise business, as does the local company. The bill form is in three parts—the statement, the receipt and the cashier's stub. All three are filled out simultaneously on an addressograph. The statements are mailed in transparent-faced envelopes, reducing the work of addressing. If the customer owes a balance on merchandise purchased, the merchandise bill itself is held in the company's office until paid, but each month the balance due on this bill is entered on the lighting statement, so that the customer receives frequent reminders. The Vicksburg company saves much time during the billing period by making use of a set of calculating stamps. These consist of separate rubber markers, each showing the gross bill for a given kilowatt-hour consumption and also the discount and net bill if paid within the discount period. If, for example, the customer has used 25 kw-hr. during the month the accountant has only to pick up the stamp so marked and with it print directly on the statement the gross and net amount of the bill and the discount.

the customer, that bill is also pinned to the lighting receipt form. The receipts and stubs are easily found by the arrangement of numbered pigeonholes.

At the close of each day's business the cashiers' stubs are collected and assorted in numerical order.

Then under each class of collection the stubs are totaled on an adding machine, and in each case this printed listing is wrapped about the stubs under an elastic band, stubs and listing being filed together in a special clasp envelope. On the face of these envelopes blank forms are provided applying to the electric-service department of the company's business as follows: Accounts received, cash sales, meter deposits, suspense accounts and miscellaneous receipts. These totals are then copied into the cash book, while posting to the ledger is done from the cashiers' stubs. After having been posted, the stubs are filed away in their envelope for reference.

Mr. C. G. Johnson is manager of the Vicksburg Light & Traction Company and Mr. L. W. Wade is local auditor.

FIG. 3—METER READER'S SLIP



## Illumination and Wiring

### Installing Steel-Taped Cable Arc-Lamp Circuits Along Paved Streets

The work of installing Milwaukee's 200 new inverted flame-arc lighting standards has been completed, the entire system having been placed in operation for the

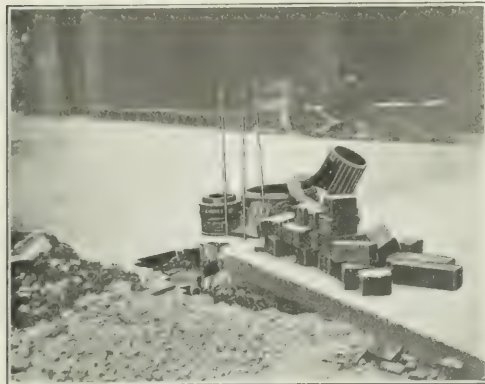


FIG. 1—FIRST OUTLET; RODS FOR STANDARD IN PLACE

first time on Jan. 30. These series lamps, mentioned in the Jan. 24 issue of the *Electrical World*, are recent products of the Adams-Bagnall Electric Company and are rated at 3500 cp each. When lighted, each lamp requires a current of 10 amp, operating with a potential of from 46 volts to 48 volts across the arc. Thus each unit takes approximately 480 watts for its operation. Sixty-cycle energy for the lamps is supplied at 2400 volts from constant-current transformers.

The accompanying construction photographs convey an excellent idea of the methods employed in carrying out the work incident to the erection of such a street-lighting installation where steel-taped cable instead of



FIG. 2—LAYING SINGLE-CONDUCTOR STEEL-TAPED CABLE

conduit is used to inclose the copper conductor. In this instance the cable contained a single No. 5 wire. Fig. 1 is a view taken after the rods which hold the ornamental lighting standard in place had been anchored to the concrete sidewalk. Where it was im-

possible to place bolts through the sidewalk, holes were drilled in the concrete somewhat larger than the ends of the rod, so that lead could be used for calking to hold the rods in place. The iron conduit shown in the excavation (Fig. 1) was laid when the original paving was put in, and through this the lead-covered cable was conducted from the first lighting standard of the circuit to the manhole near by. Using this type of manhole entrance saved the labor of constructing a new manhole joint for the steel-taped cable.



FIG. 3—REPLACING PAVING BLOCKS NEAR OUTLET

In Fig. 2 the construction crew is shown in the act of laying the steel-taped conduit. This picture also shows how very little of the pavement need be removed. Where there are no obstructions along the curb one line of paving block has been removed and the cable has been laid directly upon the concrete foundation of the street. Where catch-basins or other obstructions are encountered the cable is taken around these by removing as few paving blocks as possible and taking out the sand cushion, which rests on the concrete foundation of the pavement.

When the cable has been laid upon the concrete foundation and the sand cushion replaced the paving blocks



FIG. 4—SEALING OPENING WITH PITCH COMPOUND

are relaid alongside the curb. Fig. 3 shows a workman in the act of replacing these blocks and also illustrates the method used for taking the cable through the curb into the lighting standard. As will be seen, the concrete curb is chiseled away, permitting the entrance and exit

of the conductor at the level of the pavement occupied by the sand cushion. After the paving blocks have been replaced on top of the customary sand cushion, the opening which has been made is sealed by the use of a pitch compound poured between the creosote paving block and the curb line and also into the cracks between the blocks themselves. These operations render



FIG. 5—NIGHT SCENE. INVERTED FLAME-ARC LAMPS

the paving almost as good as new and are certainly an improvement over the older open-trench method, in which, in addition to the removal of the paving blocks, the concrete foundation of the street was uprooted, invariably leaving on replacement a low place in the paving to become wider and wider as the heavy traffic pounded the paving blocks at the edge of the depression.

Spacings of 50 ft. to 60 ft. have been used between the ornamental corrugated shafts which support the lighting units. The lighting effect produced by placing these lamps between the arc lamps on the street railway trolley poles and the ornamental tungsten lamp standards is shown in Fig. 5, a night view taken just after the installations were completed.

The entire expense of installing these units and the cost of their operation in the future will be borne by the merchants whose property fronts on the streets



FIG. 6—NIGHT ILLUMINATION, INVERTED FLAME-ARC LAMPS

which have been lighted. According to the terms of the plan on which the lamps have been placed in operation, the Commonwealth Power Company purchased the units, supplies energy for the lighting and maintains the lamps. In return, the electric service company collects 15 cents per month per front foot from each merchant on the improved thoroughfare.

## ILLUMINATION OF CLEVELAND ELECTRIC COMPANY'S BUILDING

A striking departure from the several prevailing types of exterior illumination has been adopted to light the exterior of the Cleveland Electric Illuminating Company's new office building. Previously it has been a general practice to make exterior illumination a part of the architectural scheme of buildings. In this installation, however, an effort has been put forth to conceal anything suggesting illumination, and, as will be seen from the accompanying picture (Fig. 1), a daylight view of this building reveals no electrical fixtures. In selecting this type of installation the officials of the company had in mind the fact that at some future date any particular type of lighting installation selected to-day might become obsolete. Such becoming the case, the operation of these lamps may be discontinued without affecting the architectural beauty of the structure, and if desirable another installation may be made of the type then in vogue.

### Exterior Lighting from Within

Referring to Fig. 3, the method of concealing the lighting fixtures in the terra-cotta cornice is shown in



FIG. 1—NEW BUILDING OF CLEVELAND COMPANY

cross-section. Each panel between the brackets supporting the cornice was left blank when the terra cotta was cast and was later closed by a metal sash containing two panes of translucent glass, each 0.375 in. thick. Placed above each metal sash are two reflectors, each inclosing two 100-watt tungsten lamps, energized from a plug socket in the upper part of the hollow cornice. The reflectors themselves are not fastened in any way, but may be picked up, removed through the 24-in. opening, and carried into the attic floor when lamp renewals or cleaning makes it necessary. The translucent-glass window may be cleaned on both sides by simply raising the sash about the hinge shown at the outer corner of the cornice. There are just 100 bays in the entire cornice, each bay being lighted with four 100-watt lamps, making the connected load of the entire installation 40 kw. It is said that the cost of the installation was but slightly more than what would have been the price of the solid terra-cotta casting. Of the lighting effect produced, it may be said that it is quite pleasing to the eye, and makes the red brick and white terra cotta of the



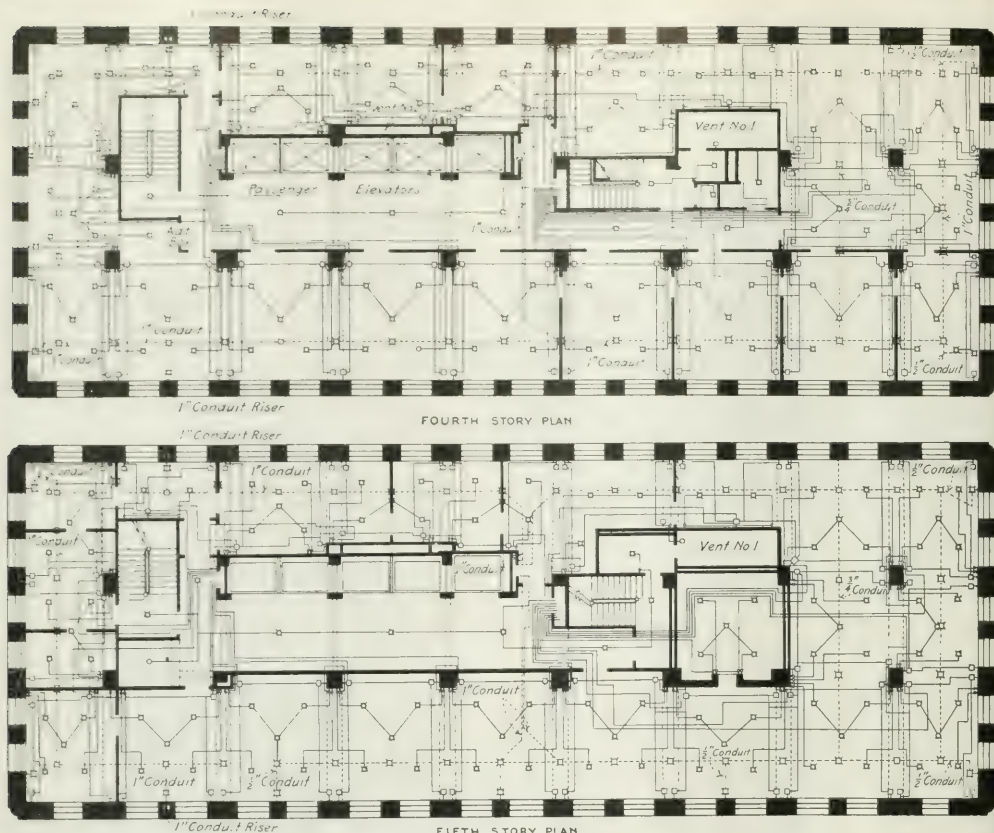


FIG. 2—TYPICAL FLOOR PLANS

building stand out against the black night in bold relief.

#### Arrangement of Offices and Wiring

Offices and a substation of the Cleveland Electric Illuminating Company occupy the first six floors of this fourteen-story building, while the remainder has been divided into office space for tenants. With the substation occupying a space three stories high extending from the basement to the third floor in the rear of the building, the remainder of the first-floor space is given over to offices of the contract department, and the main office, or customers' reception room. Being finished in white marble and illuminated by 100-watt lamps in indirect metal-bowl fixtures, this is perhaps the most attractive room in the building. The indirect units are hung in bays measuring 19 ft. by 16 ft.

The remaining five floors of the company's portion of the building are occupied respectively by the new-business department, the operating department, the combined drafting and billing department, general accounting and collection departments, and the executive offices. Throughout these five floors, as well as on the rentable floors, the average size of the bay is 16 ft. 9 in. by 19 ft., and in this space five ceiling outlets have been placed. With this arrangement it has been found unnecessary to install additional outlets when the bays are divided to suit the fancy of the office occupants. All ceiling lamps are controlled from push-button switches. Many favorable comments have been heard upon this wiring layout, as in the average office building addi-

tional outlets generally have to be installed to meet the special requirements of the tenants, while in this building a renter may divide his space however he chooses and still be able to secure sufficient illumination without additional wiring.

Instead of using a large red diffusing bowl, a 2-cp frosted-tip carbon lamp covered by a color hood such as is used on electric signs has been used to designate

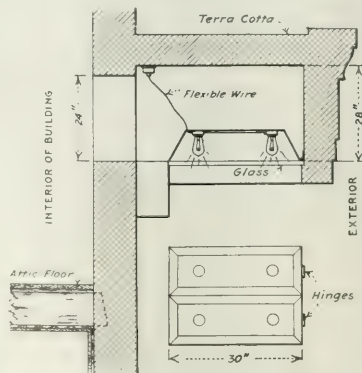


FIG. 3—SECTION THROUGH BAY USED FOR EXTERIOR LIGHTING



each exit to the fire escapes of the building. These lamps are unobtrusive and give sufficient illumination to serve their purpose.

### Recent Telephone Patents

Mr. Charles Adams-Randall, Boston, Mass., has approached the solution of clear, intensified speech transmission from one direction. In a patent issued to him recently he describes an enunciator similar to the sounding box of a musical instrument, attached to one side of which are the magnetic cores and energizing coil of a watchcase receiver. The diaphragm is omitted, however, and in its place is clamped a grid of steel strings under tension.

Mr. J. G. Cory, Coffeyville, Kan., has patented a transmitter antiseptic attachment in the form of a metal collar which can be inserted between the mouthpiece and transmitter casing. The collar contains a receptacle for the disinfectant.

The antiseptic telephone attachment designed by Mr. A. C. Gaynor, Bridgeport, Conn., consists of an antiseptic-soaked fiber attached to a guard ring supported by arms several inches in front of the mouthpiece.

Another antiseptic device, the patent on which is held by Mr. T. Duquette, Sr., North Grosvenor Dale, Conn., consists of an absorbent pad supported in a hinged cap attached to the transmitter mouthpiece.

## Letters to the Editor

### The Determination of Glare

*To the Editors of the Electrical World:*

SIRS:—On account of my absence from America, Dr. P. G. Nutting's criticism, in your issue dated May 23, of my article on an instrument for glare measurement, in your issue of March 21, has only recently come to my attention.

The main considerations pointed out by Dr. Nutting are almost obvious to one who has worked in this field. I had them in mind during the development of the instrument and when I wrote the article, and I hoped—but apparently without good reason—that I had put the matter in such a way as to forestall such criticism. The question turns upon the quantitative definition of glare, or "percentage glare," as I have called it. I have defined and used this expression in the sense of the fraction of the total light entering the instrument (under the given conditions of illumination) which is specularly reflected from the paper. This is quite equivalent to the ratio of the apparent brightness caused by specularly reflected light to the apparent brightness caused by both specularly and diffusely reflected light, and this is just what Dr. Nutting himself says that I have measured.

As I see it, the only "serious error" of which Dr. Nutting has convicted me is the definition and use of a word in a somewhat different sense from that to which he is accustomed. For this I shall gladly apologize and seek another expression. But, by whatever name its operations may be called, the instrument nevertheless furnishes a convenient and accurate means of measuring the "glossiness," or "glaze," or "shininess," of paper on an arbitrary scale which is characteristic of the instrument. If it should eventually be desirable to reduce the readings to the scale suggested by Dr. Nutting, this can be readily done as he has pointed out. Personally I am inclined to doubt the desirability of such reductions, although I am quite

willing to accede, if possible, to any preference Dr. Nutting or the Illuminating Engineering Society committee on glare from reflecting surfaces may have in the matter.

Rothenburg, Germany.

L. R. INGERSOLL.

### Resistivity on Trial

*To the Editors of the Electrical World:*

SIRS:—In his letter on "Resistivity on Trial," published in the June 6 issue, Mr. T. D. Waring presents a rather vigorous indictment of the term "mass resistivity," and it seems necessary that a friend of the accused should be heard in order that the unbiased public may reach a just verdict. The victim of the attack has been a valuable and proper member of the electrical community for many years. Mr. Waring's antagonism was known to us at the Bureau of Standards through recent correspondence, and we supposed that we had already by letter made sufficient rebuttal of the charges brought. In view of the public opening of the case a summary of the points at issue is herewith presented.

It is gratifying to note that Mr. Waring makes no argument against the *quantity* itself called mass resistivity, but only against the name used for that quantity. The property described by this name is such a practical convenience and is so universally employed in the wire-producing industry that there are people who are familiar with no other kind of resistivity. Its advantages and its extensive use depend on the fact that the mass of a wire is more accurately and easily determinable than the average cross-section, and on the further fact that for many engineering purposes (since conductors are sold by weight rather than by volume) the quantities directly concerned are the ohms, mass and length, rather than the ohms, cross-section and length. Of course, the same information is obtained from the volume resistivity (requiring measurement of cross-section), plus the density. The practical advantage of the mass resistivity is that it combines in one the two variables, volume resistivity and density. A quantity such as this must have a name, and the issue now under consideration is whether it is properly called "resistivity."

Questions of nomenclature may be viewed from any or all of the three standpoints—the philosophical, the utilitarian and the historical. That is, one may consider: (a) what is the essence of the reality designated by the term in question; (b) what will be the practical advantages or disadvantages if the term is given the meaning desired; (c) what is the meaning accepted for the term in past and current usage. Mr. Waring adduces arguments in all three classes, and they will be considered in this grouping.

Approaching the question of the essential meaning of "resistivity," Mr. Waring objects to a definition in terms of the resistance of a unit specimen. (In the second edition of Bureau of Standards Circular 31, Jan. 1, 1914, the statement was made: "Resistivity is definable in the most general way in terms of the resistance of a unit specimen"; in the first edition "as" was used instead of "in terms of.") He fears that resistivity is not thus sharply set off from resistance, and he then defines resistivity as "an innate property of the substance which determines the resistance." As a scientific definition, is not this rather loose? As a philosophical attempt to portray the real idea involved, it is perhaps more satisfactory, and yet we have not done much toward the definition of a property of a substance when we have declared it to be "innate."

If a precise definition is wanted, setting forth the

heart of the idea, and not too constricted on the one hand nor too vague on the other hand, we may say that resistivity is that property of a substance in virtue of which electric energy is converted into heat when an electric current flows in the substance. Quantitative experiments have furnished us with relations by which we can show how resistivity varies with quantities which are directly measurable. To be sure, the most familiar mode of expressing a numerical measure of resistivity is through the equation.

$$R = \frac{l}{\rho s} \quad (1)$$

where  $\rho$  is the common or volume resistivity and  $s$  is the cross-section. But this relation is not more valid than

$$R = \frac{l}{m \delta} \quad (2)$$

where  $\delta$  is the mass resistivity and  $m$  is the mass. Certainly both  $\delta$  and  $\rho$  are "innate properties" and can not therefore violate Mr. Waring's general definition. Indeed Mr. Waring admits that one is *a priori* as good as another for linear circuits, and even describes a third possible kind of resistivity. As the latter is nowhere used, it will not be discussed here.

The limitation to linear circuits is quite unnecessary, and the statement that the analogy between the kinds of resistivity breaks down for other forms of circuits is incorrect. The generalized defining equations of the two kinds of resistivity hold equally well for more complex conductors, and, furthermore, the simple relation between the two is unchanged. Equation (2) is true only for a uniform conductor, but it must not be forgotten that equation (1) is likewise true only for a uniform conductor. For example, if the cross-section is variable, equation (1) does not give correct results if the average cross-section be substituted in the formula. Therefore (1) is not superior to (2), and in fact the following relation holds in any case ( $d$  being density):

$$\delta = \rho d \quad (3)$$

For the general case of conduction in a non-homogeneous lump of material (letting  $I$  = current,  $E$  = potential, and  $ds$  = differential cross-section),

$$I = \int \frac{1}{\rho} \frac{\partial E}{\partial l} ds$$

We can strictly define resistivity for the element only, in the general case; throughout the elements  $\rho$  and  $d$  are constant, so we may write:

$$I = \frac{1}{\rho} \frac{\partial E}{\partial l} s$$

Letting  $V$  = volume, since  $s = \frac{V}{l}$ ,

$$I = \frac{1}{\rho} \frac{\partial E}{\partial l} \frac{V}{l} = \frac{1}{\rho} \frac{\partial E}{\partial l} \frac{m}{d}$$

By the definition of resistance, these equations become:

$$R = \frac{\rho l}{V} \quad (4)$$

$$\delta = \rho d = \frac{\rho l}{\frac{V}{l}} \quad (5)$$

The relation (3) thus still applies. While the equations (4) and (5) may look a little strange, they are really helpful in conceiving of the "innate" nature of either kind of resistivity. In words, they correspond to the following symmetrical quantitative definitions: Volume resistivity = product of resistance per unit length into volume per unit length, and mass resistivity = product of resistance per unit length into mass per unit length. In either case one thinks of an actual

lump of the material, and surely the quantities in the second definition are not less "innate" in the material than the quantities in the first definition.

Another point regarding the conception of resistivity. By writing mass resistivity as  $\rho d$ , one may be misled into discrediting mass resistivity as not being a fundamental property but the mere combination of two other quantities. But, of course, volume resistivity has no superiority in that respect, since we can

write it as  $\frac{\delta}{d}$ . As a matter of fact, in practice the

advantage of  $\delta$  is that it does combine two variables in one, as stated before. Since in measuring resistivities of wires  $\delta$  is commonly determined directly (as it is easier to determine the mass than the cross-section),  $d$  is needed in addition to  $\delta$  in order to get  $\rho$ .

From the pragmatic standpoint, there seems little question of the desirability of the term "mass resistivity." We may ask critically: Does the existence of this expression cause considerable confusion or even errors, and if so is there a better term to substitute for it? We should answer both questions in the negative. Except in the technique of wire calculations, "resistivity" is generally an abbreviated expression for volume resistivity, and no one is led into error. Where the word is used in the more general sense, it will usually be found that either it designates simply the general "innate resistance-determining property," so that one may safely think of either kind of resistivity, or else the units are stated or known. For cases where it is desired to indicate clearly which kind of resistivity one is using, the terms "mass resistivity" and "volume resistivity" are aptly descriptive. It would be difficult to secure their advantages by other names. For instance, "resistation" bears absolutely no suggestion to the mind of what it might stand for. There will be much hesitation in accepting "resistation."

As to the third point of view, custom and usage, there can be no question of the good standing of mass resistivity. In his classical researches of fifty years ago on resistivity Matthiessen gave his results in terms of the resistance of a wire 1 m long weighing 1 gram. The American Institute of Electrical Engineers for the past twenty-one years, and the British engineering standards committee for the past fourteen years, have defined the standard resistivity of copper in the same terms. The definition given in the 1893 wire table of the American Institute is: "The data from which this table has been computed are as follows: Matthiessen's standard resistivity—Matthiessen's standard 1 meter-gram of hard-drawn copper = 0.1469 B. A. U. at 0 deg. C. Ratio of resistivity hard to soft copper, 1.0226." The American Society for Testing Materials likewise bases its copper-wire specifications on units of mass resistivity. While the copper standards recently adopted internationally by the International Electrotechnical Commission were under discussion, the Bureau of Standards received a most emphatic protest from a leading wire manufacturer because the bureau gave its sanction to putting the unit of volume resistivity before the unit of mass resistivity in the definitions.

From the various viewpoints in the light of which the question has been examined, it appears that a name is necessary for the quantity known as mass resistivity, and that the advantages of the name "mass resistivity" preponderate to such an extent that a substitute would be extremely difficult to establish. As yet no satisfactory substitute has been proposed.

J. H. DELLINGER,  
Assistant Physicist, Bureau of Standards.  
Washington, D. C.



# Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects Questions and Answers

## A Good Place for the Fire Extinguisher

In the generating station of the Muncie (Ind.) Electric Light Company Pyrene fire extinguishers are hung from lugs on the front of the switchboard at about the height of an ordinary man's hand. When questioned about this practice, one of the engineers of the company recently said that, although the fire extinguishers somewhat detracted from the neat and clean appearance of the board, they are nevertheless in the best position possible. When there is trouble in the station, operators almost instinctively run to the switchboard and there, having disconnected the apparatus in trouble, they find the extinguisher at hand so that they can return to the source of interruption if need be prepared to meet the emergency.

## Cost of Energy for Electric Steel Casting

The accompanying data from an electric steel casting plant at Easton, Pa., were given in a paper by Mr. C. A. Hansen, Schenectady, N. Y., delivered before the meeting of the American Electrochemical Society held in New York recently. The plant has normally been operated on the one-heat-per-day basis, requiring seven or eight hours to turn out a charge from a cold furnace.

The primary energy that was consumed per ton of steel in the ladle averaged 1050 kw-hr. When two or three heats were run per day the necessity of starting with a cold furnace was eliminated after the initial charge, and the subsequent heats lasted only four and one-half hours, with an energy consumption of 630 kw-hr. to 640 kw-hr. per ton. The load curve and power-factor of this furnace are better than with any other load of similar magnitude in the same shops. The following data were appended to the paper:

### DATA ON EASTON PLANT

Average number of heats per week.....	15
Average weight per heat, lb.....	4600
Average energy consumption per 2000 lb., in kw-hr.....	900
Average repair costs per 2000 lb.....	\$2.50
Average electrode costs per 2000 lb.....	\$2.50
Average weight castings made, lb.....	9
Percentage ratio of cleaned castings, risers, etc., to charged weight.....	92-95
Percentage of finished castings to charged weight, approximate.....	60
The furnace lining is repaired after thirty-five heats.	
Note.—High energy cost and maintenance expense due to running very high heats.	

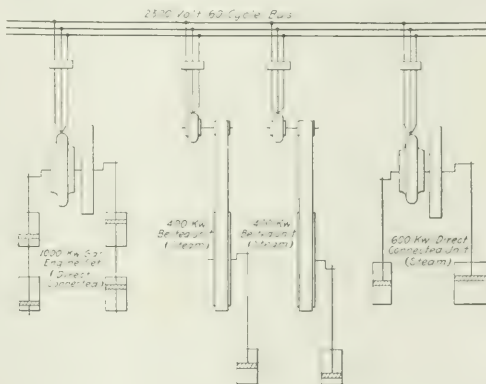
Records on the operation of a similar furnace pouring somewhat colder metal are as follows:

	Kw-hr
Energy consumption per 2000 lb.....	725
Repair costs per 2000 lb.....	\$1.30
Electrode costs per 2000 lb.....	\$2.15

The latter furnace, also operating on a fifteen-heat-per-week basis, is pouring castings of 15-lb. average weight, and repairs are made to the furnace lining about every eight to ten weeks. In the latter case the repair charges include upkeep of the bottom-pour ladles used.

## Paralleling Steam and Gas-Engine Sets

The Shreveport (La.) plant of the Southwestern Gas & Electric Company contains a 1000-kw horizontal four-cylinder gas-engine-driven set, a 600-kw Corliss steam-driven set, and two 400-kw belted units. The large steam-driven and gas-engine sets are directly connected, but ever since the latter was installed it has proved impossible to operate these units in parallel under load unless one or both of the belted sets are at the same time in service across the bus. The gas-engine set can be run successfully in parallel with the steam set at half the latter's full rated load (secured by lowering the smaller unit's field excitation), but if the load on the steam set be increased beyond this point marked fluctuation of the lamps begins and grows rapidly worse as the division of load is shifted more and



ARRANGEMENT OF GAS-ENGINE AND STEAM SETS IN SHREVEPORT PLANT

more onto the steam-driven generator. As soon as one or both of the belt-driven machines are added to the line this "pumping" ceases, the slippage of the belts apparently providing for the absorption of the exchange energy due to the angular variation of speed of the two directly connected sets. The gas-engine set runs at 100 r.p.m. and the directly connected steam unit at 120 r.p.m. Experiments have been made in varying these speeds within a range of 15 r.p.m. fast and slow, but still without practical solution of the problem of parallel operation.

Recently one side of the large gas engine was dismantled for repairs, and the other half was continued in service to drive its generator during the peak load. To the surprise of the engineers, under this unbalanced condition the gas unit paralleled nicely with the directly connected steam set, without even the assistance of the belt-connected sets.

The directly connected steam set is at present equipped with a 36-ton flywheel. This is to be replaced by a wheel of the same size as that on the gas-engine set, 24 tons, and with this change it is hoped that



straight parallel operation will be possible with the two directly connected units.

In connection with the same station it is also of interest to note that the gas-fired boilers and non-condensing steam-engine sets consume about three and one-half times as much gas per kilowatt-hour produced as does the large internal-combustion engine above referred to.

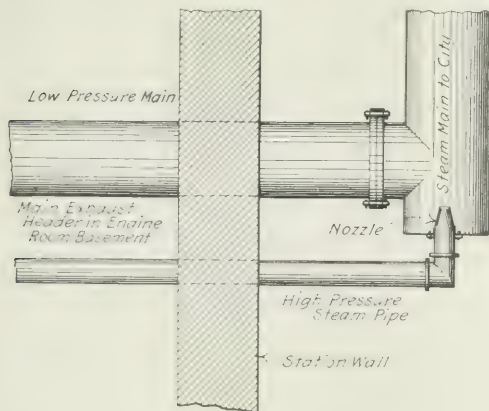
### Hold-Off Card and Guard for Switches

Accidents are sometimes caused by switchboard attendants closing switches while repair or construction work is being done on the circuits they control. This is likely to occur at the beginning of a shift when the new man is unfamiliar with what has happened during the previous shift.

To guard against this condition the Wichita Falls (Tex.) Electric Company has adopted the practice of placing a wooden guard box and "hold-off" card over the switch handle so that it cannot be closed. The card has a black surface in the middle of which is a red circle. Over the circle is printed "Safety First," and underneath the circle are the words "Do not close this switch." On the opposite side of the card is the heading "Reasons," with several blank spaces which can be filled in. Similar warning cards may also be employed in tagging disconnecting or oil switches when work is being done on the circuits which they control. Such cards may also be placed in various parts of the generating station where accidents are likely to occur or where extra precaution is required.

### "Booster" for Low-Pressure Steam-Heating System

Low-pressure steam for the heating system in Springfield, Ill., is supplied from the station of the Springfield Light, Heat & Power Company, situated well out of the business center of the city. On cold days when the heating load is heavy live steam has to be introduced



STEAM-PRESSURE "BOOSTER"

into the mains to keep the pressure at the proper point.

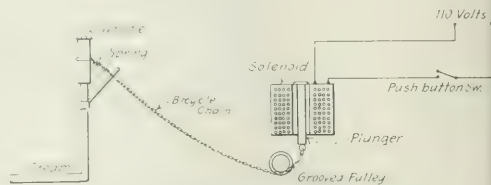
Under the direction of Mr. R. E. Hagenah, superintendent and chief engineer for the company, a nozzle was installed in the head of a T-joint outside the station wall where the city main starts. A 3-in. pipe leading to the nozzle is equipped with a valve so that live steam may be added when it is needed.

The effect of opening the live-steam valve can be noticed immediately on the pressure gages in the busi-

ness center of the city and in the operation of the engines supplying low-pressure steam to the system. When the demand for steam is great both the heating system and the engines can be operated more efficiently with the "nozzle booster" in operation. Plans are now under way for laying several pipes of different sizes so that the live-steam flow may be controlled more accurately according to the needs of the heating system.

### Solenoid-Operated Engine-Room Whistle

Nearly every generating station of any size is equipped with some sort of signal for informing employees when engines are to be placed in operation or are to be stopped. The solenoid-operated whistle shown in the accompanying sketch was installed in the plant of the Springfield (Ill.) Light, Heat & Power Company to save time and labor for the man in charge at the operat-



SOLENOID-OPERATED ENGINE-ROOM SIGNAL

ing desk and has amply paid for the effort required to devise and erect it.

As will be seen from the drawing, the circuit controlling the actuating solenoid is carried from its 110-volt supply terminals through a push-button switch near the engineer's desk and thence to the solenoid in a distant part of the room. Closing the switch at the desk energizes the coils of the solenoid, creating an upward pull on the iron core of the plunger. This force, transmitted through a discarded piece of bicycle chain, opens the valve in the steam line beneath the whistle. A spring returns the whistle lever to its normal position when the electric circuit is broken at the push-button.

### Making Permanent Steel Magnets

How can I magnetize steel bars or files so that they can be used to lift screws out of holes? I have magnetized several bars of this kind on the poles of an electroplating generator carrying 500 amp, but the bars did not remain magnetized. J. C. G.

A simple method of magnetizing steel bars which is used in the factory of a magneto concern is to wrap a few turns of lamp cord or ordinary No. 14 wire around the bar to be magnetized. The low-resistance coil thus formed is then connected in series with a 30-amp or 40-amp fuse and the switch closed to a 110-volt direct-current source of supply. The resulting sudden heavy rush of current will thoroughly magnetize the bar and also blow the fuse before any damage can result from the large short-circuit current. The use of the fuse secures a large magnetizing current for a brief interval, and bars of good steel magnetized in this way should hold their magnetism permanently. Jarring, vibrating and rough handling will, of course, cause a permanent magnet to lose its magnetization, and when such a magnet is not in use it should be provided with a soft-iron "keeper" to afford a return path for the flux between its poles. The short-circuit method above described should not be used, of course, on a circuit of small cross-section where damage might result from the momentary heavy current flow.

# Digest of Current Electrical Literature

## Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

### Generators, Motors and Transformers

**Low-Hysteresis Silicon Steel.**—A note on a recent British patent (No. 11,370, 1913) of the British Thomson-Houston Company and the General Electric Company of this country for the manufacture of silicon steel having a very low hysteresis coefficient. Silicon-steel sheets are assembled in packs and placed between graphite heaters in an electric furnace. The latter is then connected to an evacuator, and the internal pressure is reduced to a pressure equal to 2 mm of mercury while the temperature is raised to about 1325 deg. C. All the oxides present in the silicon steel are thus reduced. The duration of the heating process depends upon the amount of steel to be treated. Whereas a charge of 500 lb. requires a run of five hours, 100 lb. can be treated in about two hours. The resulting product has a peculiarly large granular structure, and low hysteresis-factor.—*London Elec. Eng'ing*, June 11, 1914.

**Three-Phase Generators in Parallel.**—FRANKLIN PUNGA.—A mathematical article in which the author calculates and determines experimentally the critical value of the moment of inertia for three-phase generators of equal capacity and number of revolutions but driven by different prime movers. A simple formula for the calculation of the frequency of oscillations of alternators of different design is also given.—*Elek. Zeit.*, June 11, 1914

### Lamps and Lighting

**"Marble Light."**—W. VOEGE.—A translation in abstract of his German article abstracted some time ago in the Digest on the use of marble as a medium for the distribution of light. Marble plates are ground on both sides and then impregnated with various oils at high pressures and temperatures.—*London Electrician*, May 29, 1914.

**Electric and Gas Lighting.**—E. RONZANI.—A paper on the relative hygienic effects of electric and incandescent gas lighting. The author discusses the chemical and physical changes in the surrounding air, the purification of the air, ventilation, and the relative effects of gas and electric lighting on animals.—Abstracted from *Annali d'Igiene Sperimentale*, Vol. XXIII, No. 3, 1913, in *London Electrician*, May 29, 1914.

**Lighthouse.**—M. WOLF.—An illustrated description of recent progress in lighting appliances for lighthouses.—*Zeit. f. Beleucht.*, May 10, 20 and 30, 1914.

### Generation, Transmission and Distribution

**Norwegian Water-Powers.**—NORBERG SCHULZ.—The author gives tables and diagrams of the fluctuations of the volume of water available in Norwegian water-powers and discusses the calculation of the capacity of steam-reserve power plants to be operated in connection with the water-power plants.—*Elek. Zeit.*, June 4, 1914.

### Installations, Systems and Appliances

**Improving the Power-Factor.**—An article illustrated by diagrams in which the effect of wattless current is first discussed. In a system having 70 per cent power-

factor little may be gained by removing entirely the wattless component of the load; it is sufficient to reduce the wattless load to one-third. For instance, if the useful load is 1000 kw, the total resultant load is 1400 kw, and if the wattless load is reduced to one-third the resultant load is reduced to 1055 kw. The various advantages of improving the power-factor are discussed. A description is given of the installation of a large synchronous condenser in one of the substations of the Sheffield municipal system, and it is then pointed out that where the conditions are such as to render a synchronous motor undesirable, or an induction motor is already installed, the British Thomson-Houston phase advancer offers great advantages. This is described and discussed at some length.—*London Electrician*, May 22, 1914.

**Power-Factors of Alternating-Current Circuits.**—G. M. BROWN AND N. SHUTTLEWORTH.—A discussion of the power-factor problem from the standpoint of the central-station manager. Formerly the question of power-factor was no problem because the loads were chiefly lighting or railway. However, the past ten years has seen a rapid industrial development. For all classes of this work the induction motor has taken the lead until now on many systems the induction motor load is larger than the lighting load. The authors deal with English practice in particular. In America both the synchronous condenser and the phase advancer are in successful use.—*Gen. Elec. Rev.*, May, 1914.

**By-Products of Gas Power Plants.**—H. R. TRENKLER.—The author investigates whether the high thermal efficiency of gas engines permits their more general use in central stations. He concludes that the efficiency of the gas producer and the cost of operation of the whole gas plant are also to be taken into account and that for this reason gas engines become economical in ordinary central stations only for exceptionally low cost of fuel. The situation becomes different if the production of by-products is taken into account, as for instance in Mond gas plants. The results are given in a table for different fuels. The author discusses especially the use of lignite and peat, and calculates the cost of gas obtained from peat. His calculation shows a very considerable reduction of the cost of gas and electricity due to the manufacture of by-products.—*Elek. Zeit.*, June 11, 1914.

**By-Products of Central Stations.**—HAROLD GRAY.—The author recommends the use of gas engines for central stations and emphasizes that the recovery of by-products, and particularly of sulphate of ammonium, is worth considering. For the present he recommends the combination of gas engines with steam turbines. The gas engine must do extremely arduous work, viz., run twenty-four hours per day six days a week, in order to show a substantial gain over the turbine. That is to say, the gas-engine plant should not be required—and, in fact, must not be used—to take the extremely irregular load common in the winter months on an ordinary electrical system. It can deal with the twenty-four-hour load more efficiently than any other prime mover. The rest of the load, which is of an irregular character, should be taken by steam turbines until the big gas



turbine has become a reality. The author points out that one of the most important considerations to-day in a power-station is the provision of sufficient clean water, and that a gas-engine plant requires less than 20 per cent of the water at a given temperature required for a steam plant. This consideration is one which is becoming of increasing importance.—*London Electrician*, June 12, 1914.

#### Electrophysics and Magnetism

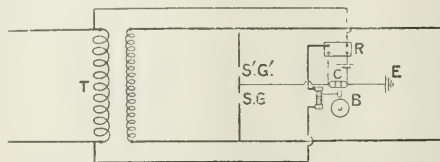
**Wave-Length of the Soft Gamma Rays from Radium B.**—SIR ERNEST RUTHERFORD AND E. N. DA C. ANDRADE.—An account of an experimental investigation, the chief results of which are as follows: The gamma-ray spectrum of the soft radiations from radium B has been examined by reflection from the cleavage faces of crystals and found to consist of a number of well-marked lines. The gamma-ray spectrum of radium B is found to be of the same general type as that found for platinum and other heavy elements when bombarded by cathode rays. Attention is directed to the structure of the spectral lines using an emanation tube as the source of radiation, and also to the imperfections of the crystals employed. Evidence is given indicating that the spectrum of the soft gamma rays spontaneously emitted from radium B is identical within the limits of experimental error with the spectrum given by lead when the "L" characteristic radiation is excited by the bombardments of beta rays. The bearing of these results on the structure of the atom is discussed.—*Philos. Mag.*, May, 1914.

**Photoelectricity.**—HERBERT E. IVES.—A brief note on an American Physical Society paper on the relation between illumination and photoelectric current in potassium cells. Voltage-current and illumination-current curves were taken for one particular cell at four stages. The voltage-current curves show various stages between one extremely convex to the voltage axis and one extremely concave thereto. The illumination-current curves correspondingly change from being convex to the illumination axis to being concave thereto. The author's results confirm his former conclusion that the photoelectric current is not as yet proved to be a linear function of illumination.—*Physical Review*, May, 1914.

**Reflection of Roentgen Rays on Crystals.**—W. H. BRAGG.—An account is given of experiments in which the intensities of reflected X-ray pencils of various orders are compared with each other, and the results are considered in reference to the recent theoretical discussion by Debye. It appears that there is a striking agreement between theory and experiment in the case of rock salt. The difficulties of experiments with the diamond are also discussed. The existence of an X-ray absorption band in the diamond is demonstrated. The experiments give opportunity for an accurate determination of the wave-length of the rhodium X-rays.—*Philos. Mag.*, May, 1914.

**Smoke Monitor.**—W. W. STRONG.—The smoke fume monitor and recorder is a new instrument for indicating and recording when the density of the fumes or smoke emitted by a furnace exceeds a certain predetermined density. Many furnaces are situated in places so that the top of the smokestack is invisible to the fireman. The arrangement of the new instrument is shown in the cut. *T* represents a small step-up transformer of from 75 watts to 150 watts rating. In practice the transformer operates on a 110-volt alternating current, sixty-cycle circuit, stepping up to about 26,000 volts. The high-tension side is connected to two sets of spark-gaps, which are placed in parallel, *S''G''* being placed in the smokestack and *SG, S'G'* being placed under standard conditions. Under normal conditions

the gases coming from the incandescent fuel bed are intensely ionized, the ions consisting largely of electrons (near the fire bed if this is sufficiently hot) and thermions of molecular size. This results in the resistance of *S''G''* being relatively low, so that the discharge takes place at this gap, and consists of a quiet arc-like brush. When dust or fumes are present in these gases the ions combine readily with the suspended solid and liquid particles. For this reason the resistance of *S''G''* is increased, so that when the density of the smoke or fume particles exceeds a certain value (depending on the setting of *S''G''*, *S'G'* and *SG*) the discharge is driven to *SG* and *S'G'*, and under these conditions it is oscillatory. The remainder of the apparatus is essentially the same as that used in wire-



ARRANGEMENT OF SMOKE MONITOR

less telegraphy a few years ago. The oscillatory discharge is represented as taking place at *SG* and *S'G'* to an electrode grounded through the coherer. The smokestack, if made of iron, may be used as an antenna. The coherer operates the relay *R* through a small dry battery. The relay operates an alternating-current bell, *B*, and any other signaling device which can be controlled by an electric circuit. These devices may even include dampers, fans, steam jets, various parts of mechanical stokers, etc.—*London Electrician*, June 5, 1914.

**Zero Method of Testing Vibration Galvanometers.**—S. BUTTERWORTH.—A brief note on a (British) Physical Society paper. The methods usually employed in the determination of the constants of a vibration galvanometer involve measurements of a deflection under three different conditions. Two of these deflections can be obtained only very approximately. By extending the theory of the vibration galvanometer it is shown how the constants may be determined by methods which involve only the measurement of one deflection. The remaining measurements are carried out on an alternating-current bridge, and the results obtained are practically independent of the wave-form of the source. The principle of the method depends on the fact that a vibration galvanometer behaves as a parallel combination of a conductance, a capacity and an inductance, in series with a resistance.—*London Electrician*, June 5, 1914.

**Cold-End Compensator for Thermocouples.**—CHARLES B. THWING.—A brief note on an American Physical Society paper. The method of compensating for variations in the temperature of the cold ends of a thermocouple used in connection with a direct-reading indicator or recorder consists in placing in series with the couple at the cold end a Wheatstone bridge of low resistance. Three arms of the bridge are of manganin, the fourth being of nickel. The current through the bridge is so adjusted by resistance in the battery circuit as to give direct readings of temperature at the bridge when the thermocouple is not in circuit. When couple and bridge are connected in series the readings of bridge and thermocouple are combined to give true temperature readings. Otherwise expressed, the bridge automatically sets the zero of the indicator to cold-end temperature.—*Phys. Review*, June, 1914.



### Telegraphy, Telephony and Signals

**German Long-Distance Telephone Cable.**—F. BREISIG.—After a discussion of the advantages of a long-distance telephone cable over an overhead bare line, the author gives a greatly simplified theory of the Pupin system of loading telephone lines with inductances and explains the principles by which a Pupin line can be calculated. He then discusses the requirements of the new telephone cable connecting Berlin with the Rhine province and gives the results which were obtained in the official tests of the completed partial line from Berlin to Magdeburg. In conclusion the author presents a comparison of this new German cable with other known cables, especially the large ones in the United States.—*Elek. Zeit.*, June 4 and 11, 1914.

### Miscellaneous

**German Association of Electrical Engineers.**—ZERME.—The twenty-second annual meeting of the German Association of Electrical Engineers was held in Magdeburg from May 25 to 28. The board of directors adopted unanimously the new draft of regulations for the equipment and operation of "heavy-current" electric installations, to be placed in force beginning with July 1, 1915. A memorial tablet in honor of Werner Siemens was unveiled. The attendance at the reception on the first evening was 800. In the first general meeting President W. Christiani gave a review of the developments of electrical engineering during the past year. Prof. F. Foerster presented a paper on the applications of electrochemistry in the chemical and metallurgical industries. In the business meeting which followed Geheimrat E. Rathenau was made an honorary member of the association. The secretary, G. Dettmar, presented the business report for last year, according to which the association has more than 6000 members and assets of \$57,250. In the second general meeting Professor Dieselhorst read a paper on progress in wireless telegraphy, Dr. Guggenheim a paper on electric steel, Prof. E. Josse and Professor Klingenberg papers on modern condensation plant. The city of Magdeburg gave a lawn party in the Herrenkrug in the evening. In the third general meeting O. Krell read a paper on electricity on shipboard. Various visits and excursions were made. Professor Klingenberg is the new president. The next annual meeting will be held in Strassburg.—*Elek. Zeit.*, June 11, 1914.

**British Municipal Electrical Association at Birmingham.**—The nineteenth annual convention of the (British) Incorporated Municipal Electrical Association will be held in Birmingham, with additional meetings in Coventry and Stratford-on-Avon and visits to Worcester, Rugby and Malvern. Reviews are to be given of municipal and private electrical developments in Birmingham. The municipal electricity department has now two generating stations. The Water Street station generates three-wire direct current for the supply of the immediate district, while at Summer Lane three-wire energy is also generated for the use of lighting and motor customers in the immediate neighborhood of that station; continuous current at 500 volts is, moreover, generated for traction purposes, while three-phase alternating current is generated at 5000 volts and a frequency of twenty-five cycles for transmission to a number of substations in the outlying parts of the area. The two generating stations are connected together by a number of trunk feeders. Notes are added on the Witton Works of the (British) General Electrical Company and of the Bellis & Morcom Engine Works, also on electrical engineering progress at Coventry and Rugby, and an interesting historic water-power station at Worcester.—*London Electrician*, June 12, 1914.

**Psychology.**—DUECK.—A discussion of some psychological problems which are of importance in the selection of men for electrical engineering work, with reference to psychological tests.—*Elek. Zeit.*, June 4, 1914.

## Book Reviews

**ELECTRIC ARC PHENOMENA.** By Ewald Rasch. Translated from the German by K. Tornberg. New York: D. Van Nostrand Company. Illustrated. Price, \$2.

This book contains a large amount of excellent information concerning the physics of arc phenomena to which the author, by his endeavor to express it in mathematical terms, has given a rather formidable appearance. The subject is viewed from the standpoint of the research and mathematical physicist and, while adapted to use of the engineer, will not attract the general reader. One chapter is devoted to the carbon arc and the external phenomena connected with it. In another are brought together many data of unquestionable value concerning electrode materials and their characteristics, particular stress being placed upon the alkaline earths, which are, at ordinary temperature, non-conducting. In the two chapters devoted to electrical discharges through gases the author discusses the concordance of break-down voltages in a sphere spark-gap and those calculated according to laws expressing the latest hypothesis in electronic theory. These chapters should be of the greatest value to those interested in research of this character. A portion of the book is devoted to an analysis of the current, voltage and power relations in the arc, and the causes and conditions of hissing and stability, couched largely in mathematical terms. A chapter on the underlying causes of arc efficiency and inefficiency concludes the book.

**CONTINUOUS AND ALTERNATING CURRENT MACHINERY.**

By Prof. J. H. Morecroft. New York: John Wiley & Sons, Inc. 466 pages, 288 illus. Price, \$1.75.

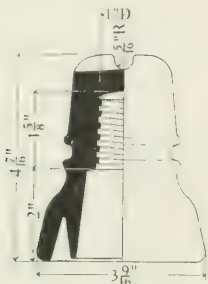
As an elementary textbook for use in technical high schools and similar institutions this book has many excellent features. The matter is well arranged, the explanations are clear, and the illustrations are good. The photographs have been carefully selected, and the line drawings fulfil their purpose admirably. Professor Morecroft has clearly realized the advantage of presenting and explaining his subject without introducing mathematical proofs except where no other method suggests itself, and the equations used are of so elementary a nature that they should present no difficulties to the class of reader for which the book is intended. The subjects covered include elementary principles of continuous currents, descriptions of dynamo machines, theory and calculation of continuous-current generators and motors, elementary principles of alternating currents, alternating-current generators and synchronous motors, transformers, induction motors, commutating alternating-current motors, and the synchronous converter. There are also short chapters treating of power in polyphase circuits, switchboard apparatus, and notes on the operation and care of electrical machinery. The diagrams on pages 296 and 302 showing leakage-flux paths in transformers are exceptionally good; they give the student a correct idea of the manner in which magnetic leakage causes loss of pressure. These will be far more readily understood by the student than the reference on page 214 to the coefficient of self-induction of a coil. This is always a difficult subject, and rather more space might perhaps have been given to an explanation of the physical meaning of reactance in alternating-current circuits.

# New Apparatus and Appliances

An Illustrated Descriptive Record of Recently Developed  
Manufactured Products of Interest to Electrical Readers

## Glass Insulator

The glass insulator shown in the accompanying illustration, which is being placed on the market by the Brookfield Glass Company, 2 Rector Street, New York, was first designed for the Pacific States Telephone & Telegraph Company's mountain lines. Two right-angled



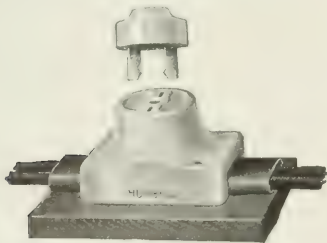
GLASS INSULATOR

grooves are provided on the top of the insulator. In the groove parallel to the line the line wire is placed. A fastening wire is passed over this wire in the other groove and is tied around the insulator in the groove provided below.

This insulator by reason of its design is especially well adapted for use on lines which are installed in hilly districts of the country.

## Plug Receptacle

The plug receptacle shown herewith is designed for use with metal molding. Two styles of this receptacle are being made—one for the end of a circuit and known as a terminal-base receptacle, and the other for at-



PLUG RECEPTACLE DESIGNED FOR USE WITH METAL  
MOLDING

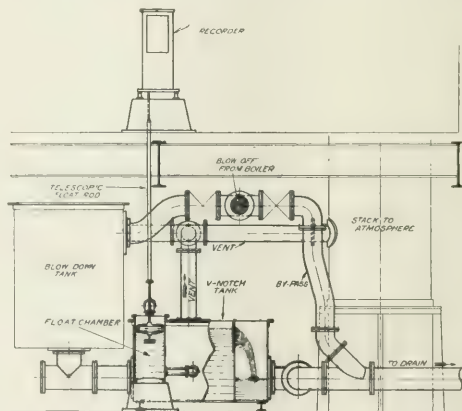
taching to the molding at any desired point and known as the two-way-base receptacle. Contacts are made for either 10-amp or 20-amp circuits, the latter being of the polarized type.

This receptacle is being manufactured by Harvey Hubbell, Inc., Bridgeport, Conn.

## V-Notch Water-Flow Meter

In determining the amount of water evaporated by a boiler it is necessary to measure not only the boiler-feed input but also the intermittent blow-off discharge and leakage. The amount of water discharged through the blow-off valve and that leaking from the valve may be measured by means of a V-notch recording meter. In the accompanying illustration is a diagram showing how such V-notch meters are installed in the 201st Street station of the United Electric Light & Power Company, New York, and the Waterside station of the New York Edison Company.

This meter consists of a closed tank into which the water to be measured flows; the water passes out of the tank through a V-notch. The head of water on the V-notch is measured by means of a float which is in a separate chamber where it is unaffected by disturbing



V-NOTCH RECORDING LIQUID METER FOR MEASURING  
BLOW-OFF DISCHARGE

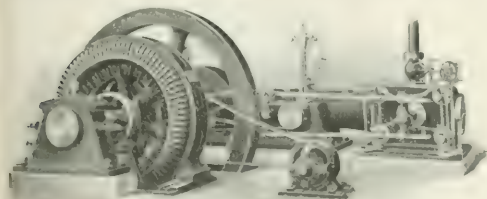
currents. A spindle attached to the float passes through a stuffing box in the upper part of the tank and through the bottom of the case which contains the recording apparatus. A rack is cut upon the spindle, which gears into a small pinion on the axis of a drum in the instrument box. A groove is cut spirally along the surface of this drum so that as a pin which fits in it is made to move forward or backward its movement corresponds to the rate at which water flows through the notch.

The pin is connected to a slider bar that is supported on pivoted rollers. A pencil point or pen, which is in contact with a paper chart, is also attached to this slider bar. This chart is mounted on a clock-driven drum, which revolves once in twenty-four hours. The chart will give, it is claimed, the exact flow of water through the tank.

The so-called Lea V-notch meter described above is being made by the Yarnall-Waring Company, Chestnut Hill, Philadelphia, Pa.

### Alternator Operated by Corliss Engine

In the illustration herewith is shown a 150-r.p.m. Corliss engine directly connected to a Westinghouse alternating-current generator. The engine is equipped with four rotating valves, dash-pots, releasing gear and fly-ball governor. The stator of the alternator consists

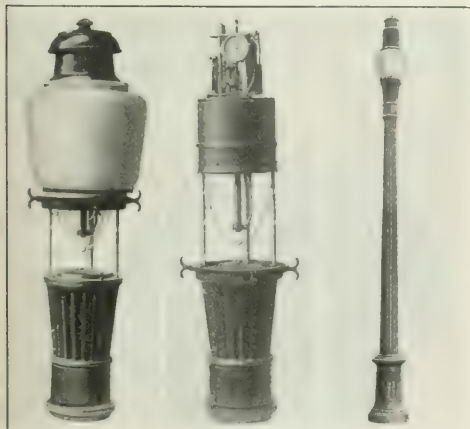


CORLISS ENGINE DIRECT-CONNECTED TO ALTERNATOR

of an iron casting into which soft-steel punchings are dovetailed. Form-wound, mica-insulated, interchangeable armature coils are held in open slots in the punchings by means of hard-fiber wedges. The alternator is designed to generate sixty-cycle, three-phase energy, and is built in sizes rated at 50 kva, 75 kva and 100 kva. The exciters used for these units are rated at 4.5 kw, 6 kw and 7 kw respectively. The Corliss engines for the above sets are manufactured by the Murray Iron Works Company, Burlington, Ia.

### Flame-Carbon Lamp for Street Lighting

An arc lamp of the flame-carbon type for ornamental street lighting is being placed on the market by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. A feature of this new lamp is its adaptability to practically all standard commercial circuits, since the lamps are available for operation on sixty-cycle alternating-current 10-amp, 7.5-amp or 6.6-



FIGS. 1, 2 AND 3—ORNAMENTAL FLAME-CARBON LAMP

amp series circuits, 110-volt alternating-current multiple circuits and 110-volt direct-current multiple circuits.

Either white or yellow light can be produced, depending upon the carbons used. The standard glassware consists of an Alba outer globe and a clear inner

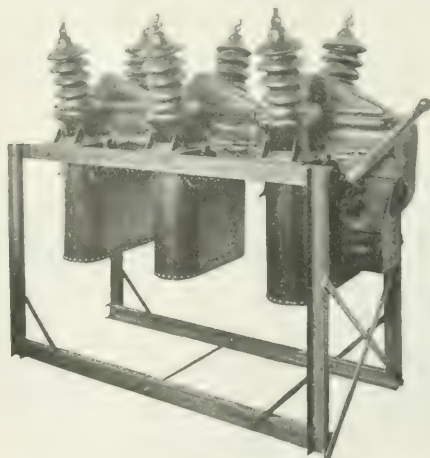
globe. The globe is so designed that, while most of the light is thrown downward where it is needed, enough is thrown upward to illuminate the fronts of buildings to a considerable height. This produces an agreeable effect in the lighting of "white ways." The mechanism is in an upright position above the globe and is held firmly by three small upright rods. Because of the diffusing glassware used, these rods, it is claimed, do not throw any shadows on the surrounding buildings or street. The outer globe can be readily raised and locked in that position, to facilitate trimming the lamp and cleaning the globes.

This lamp is adaptable for use on a large number of ornamental standards and brackets now being made by various manufacturers. While commonly mounted at a height of 14.5 ft. above the pavement, a somewhat better distribution and one more free from glare is obtained by means of mounting the lamp at a height of 18 ft. above the pavement.

### High-Voltage Outdoor Oil Switches

The oil switches illustrated herewith are built in single-pole elements and are designed for hand, solenoid or air operation. The mechanism for each element is self-contained and is mounted on the top of a steel tank. The switches trip free from the operating mechanism, so that the contacts cannot be held closed on overload or short-circuits.

The insulating bushings are inserted through the cover at an angle and converge at the lower end, extending below the oil level down to the stationary contacts of the switch. The contacts are of the "sliding-wedge" type, two contacts in series being provided for each phase. The stationary contact consists of flared fingers and long arcing tips of drop-forged copper. The movable element of the contact is a wedge-shaped copper blade. This blade moves in a vertical plane, being drawn up by the switch mechanism when the switch is closed and dropped by gravity assisted by springs



HAND-OPERATED 22,000-VOLT OIL SWITCH

when the switch opens. By the use of the sliding-wedge contact, the arcing set up by opening the switch under load occurs between the extended portion of the stationary contact fingers and the upper extremity of the movable blade, which sections are not in contact when the switch is fully closed.



These switches have been developed by the General Electric Company, Schenectady, N. Y., and are designed for utilization with pressures of 22,000 volts and upward.

### Electrically Heated Incubator and Hover

From the central-station point of view the character of load derived from operating electrically heated incubators and hovers is ideal. About twenty-one days are required to hatch chicks, and of course during that time the incubator must be in continuous operation. After the chicks are hatched it is necessary to keep them in continuously heated hovers for a number of weeks.

The case of the electric incubator shown in Fig. 2 is built of 2-in. cork board; it is reinforced with steel corners and the top is entirely covered with steel. The base, on which the egg tray stands, is made of well-seasoned cypress covered with a thick felt pad. The egg tray is of galvanized steel and has a removable wire mat on which the eggs repose. A hole in the center allows the chicks when hatched to fall into a wire basket hung on runners under the egg tray. This chick basket can be removed from the machine by raising the cover to the first notch on the trigger provided; in the event of a straggling hatch the operator can therefore remove the chicks without exposing the still unhatched eggs. The heavy felt pad covers a base that has small slits in it. Air is filtered through this pad. A ventilating tube extending through the roof and attached to the cover leads down through the hole in the egg tray into the nursery chamber. The amount of air is varied by means of a sliding cap on the tube.

The front of the case is provided with a small glass window to show the interior and allow the thermometer to be read. The heating units are contained in the roof and slip into spring clips, making them interchangeable and removable. These units are of the cartridge type and are so arranged that the heat is equally distributed over all parts of the egg tray. The supply of heat is automatically controlled by means of a thermostat. A signal lamp indicates when the heating circuit has been opened.

In Fig. 1 is shown an electrically heated hover. An automatic heating system similar to that used in the

just under the roof and are protected from injury by a heavy wire screen.

The electrically operated incubator and hover described above are being placed on the market by the United Electric Manufacturing Company, New Orleans,

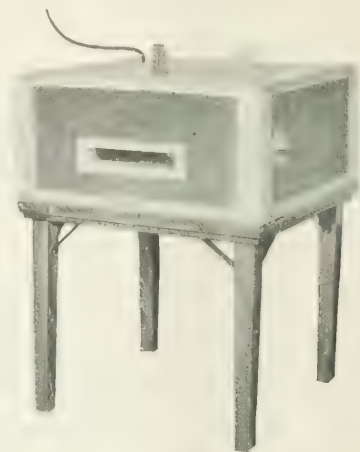


FIG. 2—EGG "STANDARD"

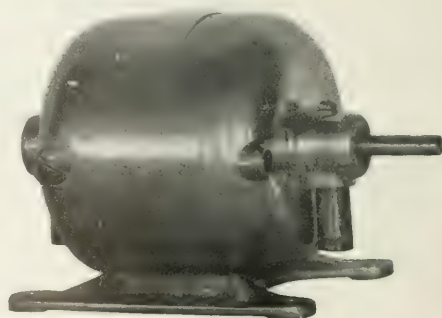
La., which builds incubators in sizes to contain 24, 40, 70, 120, 250 and 500 eggs and hovers to accommodate 15, 30, 50, 75 and 200 chicks.

### Small Inclosed Motor

The motor shown in the accompanying illustration is equipped with a one-piece die-cast shell and detachable end covers which are also die-cast. Metal-screw brush-holder caps, all-metal oil cups inserted beneath the bearing, and substantial die-cast feet extending beyond the length of the body, but well within the over-all reach of the bearing housings, add to the general stability of the machine. The frame is without angles or projections and has all the "fit-in" qualities demanded of small motors. The field frames are composed of laminations. This small motor is for general power usage and may be equipped with or without feet as desired.



FIG. 1—CHICK HOVER



FRACTIONAL-HORSE-POWER INCLOSED MOTOR

incubator described above is employed. The top of this hover is made of 2-in. cork board which is covered with sheet steel. The curtains are double and of heavy canvas duck provided with a layer of 0.5-in. felt in between and above the slits. The heating coils are placed

It is rated at 1/20 hp when operating at 2500 r.p.m. on direct current and at 1/30 hp when operating at 2500 r.p.m. on alternating current. This motor is being made by the Diehl Manufacturing Company, Elizabeth, N. J.

### Ozone Air-Purifying Apparatus

The ozone air purifier illustrated herewith is equipped with a rotary converter for transforming direct current to alternating current and a transformer which steps the voltage up to the high pressures re-



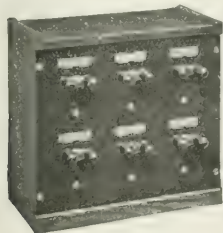
APPARATUS FOR PURIFYING AIR BY OZONE

quired in this service. An electric fan is mounted within the transformer case to blow the ozone out into the room. To eliminate the production of metallic oxides due to the ozone coming in contact with the metals of the outfit, all wiring is hermetically sealed in glass tubes. The design is also such as to prevent any heating, thereby avoiding the production of nitrous oxides.

This machine is being used successfully in moving-picture theaters. It is also widely utilized in the refrigerators of abattoirs and meat markets where it is claimed that a saving in ice is made as well as an improvement in the refrigeration. It is stated for example that fish can be kept three times as long with this system as when ice alone is used, and the odors are practically eliminated. This machine is being placed on the market by the Neel-Armstrong Company, Akron, Ohio. The fan and the rotary converter used with it are the product of the Robbins & Myers Company, Springfield, Ohio.

### A General Alarm for Telephone Systems

In manufacturing plants, public buildings, schools and other institutions which have private telephone systems there is frequently need for a device which will



SIGNALING SET

ring a number of bells or buzzers simultaneously. Such a device is being placed on the market by the Western Electric Company, New York, for use with so-called general-alarm or code-signaling sets.

These sets are designed to call to the nearest tele-

phone any one of a number of men by an arbitrary selective code, to sound an alarm in case of fire or other emergency, or to sound bells for recess or recitation periods. The sets may be used independently of the telephone systems. The signaling set can be mounted at any central point and bells and buzzers scattered wherever signals are to be given. A turn of a key handle will sound a call simultaneously on all the bells and repeat the call four times, each key sending out a different code signal.

The signal sets described are connected to the telephone or inter-telephone system together with an auxiliary resistance and condenser box. These sets are made in any size that may be desired, ranging from two up to ten different signals.

### Electric Vaporizer Designed for Gasoline Engines

An electric vaporizer, which will facilitate the starting of gasoline engines in cold weather, has been added to the growing list of electrical accessories for gasoline vehicles. Heretofore in cold weather it has generally been necessary to "strangle" the intake air to the carburetor before a gas mixture rich enough to explode when ignited could be obtained. If the carburetor intake was not provided with a throttling device, the engine usually had to be cranked several times before it



FIG. 1—ELECTRIC HEATER FOR GAS INTAKE ON LARGE ENGINE



FIG. 2—GAS MANIFOLD HEATER FOR SMALL ENGINE

would start. Equipped with this new electrical device, however, the engine will start as readily in cold weather as on a warm day.

The accompanying illustrations show two forms of vaporizers, one applicable to small engines and the other to higher-powered engines. The first consists of a hollow spiral of resistance wire connected between two insulated terminals in the intake manifold. The device for the larger engines is more elaborate, consisting of a cylindrical case in which are three asbestos disks with resistance coils wound around their peripheries. These coils are supported on a single spindle and are connected in series between two insulated terminals passing through the cylindrical case of the vaporizer. The vaporizer is interposed between the carburetor and the air intake which may surround the exhaust pipe. With this arrangement 6 volts need be applied across the terminals of the vaporizers only to start the engine, after which the intake air is heated by passing around the exhaust pipe.

This device, it is asserted, makes electric cranking more practicable, as the engine starts more quickly, thereby reducing the period of high-current demand on the storage battery. As a result a smaller battery can be used for starting and the troubles attending high rates of discharge are diminished.

Both forms of electric vaporizer described herewith are handled by the H. W. Johns-Manville Company, New York.

## Jobber, Dealer and Contractor

### Missouri Contractors' Association

The Electrical Contractors' Association of Missouri will hold its annual meeting in St. Louis on July 11, 1914. Mr. A. J. Burns, 318 West Kent Street, Kansas City, Mo., is secretary of the association.

### Contractors at Detroit

Final arrangements have been made for the annual convention of the National Electrical Contractors' Association in Detroit, July 15 to 18. Both as an educative force and from the viewpoint of entertainments, it is believed that the convention will break all records among electrical contractors. Rather elaborate decorative effects have been worked out, and Mr. Ernest McCleary, as chairman of the convention, is putting forth every effort in directing the final details to have this convention one long to be remembered. For July 17, which is the thirteenth birthday of the association, an enjoyable program has been arranged. The steamer *Pleasure* has been chartered for an outing, and all in attendance will be taken 15 miles down the river to the island park "Bob-Lo." Special entertainers have been engaged for the boat trip. A large attendance is anticipated.

### Oregon Electrical Contractors

At the second annual meeting of the Oregon Electrical Contractors' Association, held at Portland, June 8 and 9, President R. G. Littler referred to the importance of the campaign for a state license law for electrical contractors. He stated that some irresponsible contractors preyed upon the public by collecting money for work never completed. He held that a state license law would guarantee that first-class work would be done and would increase the desirability of credit risks which jobbers have to carry. Mr. F. C. Green, secretary of the association, submitted the proposition of amalgamating the State Association of Contractors and the Portland Electrical Contractors' Association, and a committee was appointed to prepare a report on the matter. Mr. J. R. Tomlinson, who was elected director, will represent the association at the convention of the national body in July, at Detroit. Election of officers was postponed because of the proposed consolidation of the state and city contractors' associations.

### Contractors Enlisted in Iron Campaign

The United Electric Light & Power Company, New York, has been conducting a sixty-day flatiron campaign in which it has enlisted the services of electrical contractors to sell 2500 three-and-one-half-dollar irons at \$2.49. To excite widespread interest in the campaign, illustrated pamphlets were distributed describing the comforts and conveniences of ironing with electricity. Each picture suggests the ease of operation.

Window display cards were furnished the contractors to inform the public that they were agents of the electric-service company in this campaign. These agents have also been stocked with irons which they are permitted to sell at the reduced price and retain a 10 per cent commission thereon. The campaign has created considerable interest, more than 1100 irons having been disposed of in one district during the first three weeks of the special sale.

### Closer Co-operation in Chicago

During a recent visit to Chicago Mr. G. B. Muldaur, field representative of the Society for Electrical Development, Inc., began the formulation of plans for the closer co-operation of central stations and electrical jobbing and contracting interests in the Middle West. In the near future Mr. Muldaur hopes to hold a conference with representatives of these interests and to work out a practical line of action.

### National Electrical Credit Association

The fifteenth annual meeting of the National Electrical Credit Association was held at Hotel Statler, Buffalo, on June 27, at which time there were representatives present from the New England Electrical Credit Association, New York Electrical Credit Association, Electrical Credit Association of Philadelphia, Electrical Credit Association of Chicago and Electrical Credit Association of the Pacific Coast. President Charles M. Wilkins, of Partrick, Carter & Wilkins, Philadelphia, presided.

Total membership of the five local associations comprising the National Association, as of June 1, 1914, was 500 electrical manufacturers and jobbers, and those engaged in allied and kindred lines covering the entire country. The summary of Mr. Vose, the secretary, showed that there were 15,723 names reported during the year to the five allied associations in the aggregate amount of \$1,218,624.20; that the association generally showed a marked increase in activity in the use of the service, with a larger average of benefit accruing to each member than at any time in the history of the organization. The treasurer's report showed that the affairs of the association have been conservatively managed, with a comfortable balance in the treasury. A number of the operative resolutions were slightly modified, not in any way, however, changing the standard method of procedure. Telegrams of greeting were received from the Society for Electrical Development and from other friends. The association indorsed the campaign of the National One-Cent Letter Postage Association. It also gave favorable consideration to the invitation of the Panama-Pacific International Exposition to hold the next annual meeting at San Francisco in June, 1915, but before definite action could be taken on the invitation it was necessary to refer it to the several local associations.

These officers were elected: President, Mr. Frank M. Pierce, Manhattan Electrical Supply Company, Chicago; vice-president, Mr. Allan R. McDonald, Stewart-Howland Company, Boston; secretary-treasurer, Mr. Frederic P. Vose, Marquette Building, Chicago. Upon the retirement of Mr. Wilkins from the chair, which he previously occupied in 1899 and again in 1908, he was presented with a loving cup in recognition of his continuous service on the board of managers of the national association from its organization in 1898 to and including the date of this annual meeting. Secretary Vose, in presenting the cup, reviewed the service of Mr. Wilkins and not only credited him with being the originator of the principle of co-operative credit protection through an interchange of ledger experiences cleared through the local organizations covering the electrical and allied industries but also said that Mr. Wilkins was responsible for the organization of the Pacific Coast and Canadian associations, and that since the organization of the national association he had not missed a meeting of that body. In accepting the loving cup Mr. Wilkins made an appropriate response.



# Industrial and Financial News

## Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

**Business in Ignition Accessories Good.**—The Connecticut Telephone & Electric Company, Meriden, Conn., has for several months been operating its factory night and day to keep step with orders.

**Electric Hoist for Sand Pit.**—The Patterson Sand Company, 2615 Crop Street, Louisville, Ky., is equipping its sand pit with an electric hoist to replace two mule teams and two drivers in getting the loaded wagons out of the pit. This pit is 50 ft. deep and the incline is 500 ft. long. Central-station energy will be used.

**Large Number of Orders for Turbines.**—In point of orders received, the past month has been one of the best in the history of the Terry Turbine Company, Hartford, Conn. Properly to take care of the increased business, additional machine tools have had to be installed, and the capacity of the plant has been increased 25 per cent.

**Experimental Electric Oven for Navy Department.**—One of the large units now being built in the factory of the Hughes Electric Heating Company is a 200-loaf baker's oven. This stove will be installed at one of the United States navy yards for experimental purposes, preparatory, it is thought, to equipping all battleships with electric ranges.

**Semi-Direct Lighting for Office Building.**—The Lathrop Building, Kansas City, Mo., is being equipped throughout with so-called "brascelite" fixtures made by the Luminous Unit Company, St. Louis, Mo. The fixtures for the lobby are hand-chased cast-bronze units with white enamel reflectors and inverted white glass bowls of artistic design. For the rooms and corridors fixtures with a white reflector fitting close to the ceiling, and with an ornamental white bowl suspended from the reflector on short brass spindles, are being used.

**Vision Tests in Textile Mills Under Mercury-Vapor Lamps.**—Experiments recently conducted in the Brighton Mills at Passaic, N. J., show that the average loom operator can see a white cotton-thread at a distance of 17 ft. in daylight. Under the rays of a mercury-vapor lamp, however, the same employees are able to see the same thread 24 ft. distant. Inasmuch as the continuity of the textile material produced depends upon quick observance of broken threads by loom operators, the mercury-vapor lamp has increased the efficiency of employees. There are 181 mercury-vapor lamps made by the Cooper Hewitt Electric Company in use at the Brighton Mills.

**Duncan Company Building Testing Laboratory.**—The Duncan Electric Manufacturing Company, Lafayette, Ind., has recently broken ground for a new meter-testing laboratory from which the daily output will be approximately 700 meters. All standard instruments used for testing are to be mounted on concrete piers extending 15 ft. below the floor level, so that all danger of the instruments being affected by tremors or vibration from trains on an adjacent track will be eliminated. Commenting upon industrial conditions, Mr. Thomas Duncan says that, although business is not at present up to its former standard, it is expected that the fall and winter seasons will see the company doing a larger volume of business than has hitherto been attained.

**Demand for Electric Fans at Louisville.**—More and better electric fans are being sold to householders in Louisville this season than ever before, according to reports from dealers in the city. The case of the Federal Electric Sign System as recounted by Mr. R. E. Brian, manager of the Louisville office, is typical. All last season the best this office could do was to sell 750 fans. This year, up to June 10, the same office had already sold more than a thousand fans. Preference is being shown for costlier, larger and

more elaborate types than have been in demand in Louisville heretofore for domestic uses. The 12-in. and 16-in. oscillating types and also the slow-speed, six-blade types are in demand, whereas a year ago the 8-in. and 12-in. fans were getting the call.

**New Electric Trucks for Boston Edison Company.**—The Edison Electric Illuminating Company of Boston, Mass., is placing in service six new 2-ton electric trucks, the equipment having been specially designed for cable work. Each truck is equipped with an electrically driven winch and can easily raise a load of 1 ton from the ground to the floor of the truck in loading. The bodies are unusually rigid, the entire floor being lined with 8-in. steel. A double-throw switch prevents the truck from being started when work is being done with the winch. The controllers, switches, meters and other electrical equipment are assembled in a fireproof steel compartment, and the batteries are guaranteed to operate the truck at a speed of 40 miles per charge. The trucks will be used in pole erection as well as in cable construction, and were supplied by the General Vehicle Company.

**Isolated Plants Discontinued in Chicago.**—During the early part of June the owners of the Western Union Building and of the Transportation Building in Chicago signed contracts for electric service to be supplied by the Commonwealth Edison Company, discontinuing the operation of their isolated plants. The installation at the Western Union Building is interesting as indicating the confidence shown by the Western Union Company in the reliability of central-station service for operating its entire plant. The hydroelectric-elevator equipment in this building will be remodeled and the old steam pumps will be replaced by modern motor-driven turbine pumps. The Transportation Building, a twenty-three-story structure, with an equivalent of 1700 offices, presents a connected motor load of 700 hp and is lighted by about 4000 lamps. Up to the present this building has been receiving its energy from one 175-kw and two 200-kw direct-current machines, driven by reciprocating engines receiving steam from three 300-hp drum-type boilers. The building is owned by Mr. L. W. Hill and Mr. Watson P. Davidson, officials of the Northern Pacific Railroad, residing in St. Paul, Minn.

**Electric Dumb-Waiters for Department Store.**—Fifteen electric dumb-waiters are being installed in Altman's department store, New York. These dumb-waiters are operated from a single station. If the dumb-waiter is wanted at a certain floor, a button is pressed and the operator at the central station is signaled. The operator presses a button designated for the floor signaled, and the dumb-waiter is conveyed to that floor. As soon as the dumb-waiter arrives at its destination a signal lamp is turned on and the light can be seen from the outside through a small window in the sliding door. The operator also presses a button which causes a bell to be rung at the floor to which the dumb-waiter is bound. Buttons are provided inside the dumb-waiter for signaling to the operator at the central station to which floor the dumb-waiter is to be conveyed. The operation described above is then repeated. A signal lamp at the central station burns whenever the dumb-waiter is stationary and the hatchway door is unopened. The floor bell can also be used as a signal for the operator to the floor attendant to close the hatchway door or to hasten the use of the car. These dumb-waiters were made by the Burdett-Rowntree Manufacturing Company, 119 West Fortieth Street, New York. Ten electric dumb-waiters have also been installed by the above company in the McAlpin Hotel, New York, and sixteen have been placed in the Biltmore Hotel, in the same city.

**Business in Electric Ranges Good.**—The Simplex Electric Heating Company, Cambridge, Mass., is reported to be receiving a number of orders for its electric ranges. Among the noteworthy installations recently made by this company is that for the Rupert High School, Rupert, Idaho, which was described in the *Electrical World* May 23. Large-sized ranges have also been supplied to the Stanley Hotel, Estes Park, Col., and to the welfare department of the Edison Electric Illuminating Company, Boston, Mass.

**A Million-Dollar Motor-Service Contract.**—The American Manufacturing Company, the largest maker of bagging and cordage in the world, has signed a contract with the Edison Electric Illuminating Company of Brooklyn, N. Y., whereby the cordage company will abolish its 5500-hp isolated plant and use central-station service. This agreement is believed to be the largest contract for commercial electrical service ever signed by a central station. The contracted load is 4000 kw, the guarantee being for at least 3000 kw of demand, not more than 15 per cent of which is to occur during the central-station peak. The contract involves a change from direct-current motors to three-phase, twenty-five-cycle motors in the factory and the scrapping of a three-hundred-thousand-dollar plant. The change-over will require an outlay of approximately \$80,000, and the contract, which is made for a term of years, will give the Brooklyn Edison Company a gross aggregate income of between \$1,000,000 and \$2,000,000. To secure the contract Mr. T. J. Jones, commercial agent of the company, recently made a trip to London, England, where the consulting engineers of the American Manufacturing Company are located. In addition to its magnitude, the present contract is also interesting as instancing a change made in the labor schedule of a large manufacturing concern solely to avoid crossing the central station's peak, thus enabling the customer to earn a lower rate. To facilitate central-station service the concern, which employs 2000 men at its Brooklyn plant, has agreed to close during November, December, January and February at 4.30 p. m. instead of at 5.30 p. m., making this radical change in its labor schedule to take advantage of the central-station off-peak schedule.

**New England Central Station Business.**—As was shown in the last two issues of the *Electrical World*, April returns from the central stations in the Atlantic and the Central States show a better rate of increase over last year than was indicated by the March returns. April reports from the New England companies confirm this finding. In the table herewith are shown the gross earnings from the sale of energy and the total station output of eight large New England companies, complete reports from which are available for the months of February, March and April. It is

COMPARISON OF EARNINGS AND OUTPUT FOR FEBRUARY, MARCH AND APRIL, 1913, AND 1914, OF EIGHT LARGE NEW ENGLAND COMPANIES

	GROSS EARNINGS FROM THE SALE OF ENERGY			TOTAL ENERGY OUTPUT IN KILOWATT-HOURS		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
February	\$1,197,777	\$1,079,490	11.0	30,095,621	27,217,230	10.6
March	1,093,302	1,020,796	7.1	32,316,426	30,192,934	7.7
April	1,063,880	977,530	9.0	29,818,976	27,236,993	9.5

difficult to see why the expansion coefficient for March should be as low as it is. It is an easy matter to explain the falling off in published income for that month compared with February, even while the station output for the calendar period showed an increase, but it is certainly singular that the actual rate of increase over the previous year should fall so far below the constant provided by the February and April returns. By way of confirmation it should be noted that a similar condition was reflected by the figures from the Middle Atlantic States, where April returned an increase over 1913 of 9.8 per cent on earnings and 10.1 per cent on output, against 6.1 and 7.5 for March, and by the South Atlantic States, where the rates for April

were 12.7 and 26.1 against 10.7 and 25 for March. The Central States showed a similar condition of affairs. Since publication of the March New England data the *Electrical World* has canvassed the remainder of that field pretty thoroughly and has now received the April figures from twenty-five additional electric-service companies. These for the most part supply energy to the smaller communities—10,000 to 40,000 population—where the income is somewhat less than \$20,000 per month. In the aggregate these additional returns show that gross earnings from the sale of energy increased from \$406,725 in April, 1913, to \$437,893 in April, 1914, or at a rate of 7.8 per cent; while total output increased in the same period from 11,944,995 kw-hr. to 13,567,648 kw-hr., or at a rate of 13.7 per cent. Combining these figures with the data already received for April from the eight larger utilities, the totals for thirty-three New England companies reporting to the *Electrical World* are as follows: Gross earnings, \$1,501,773 for April, 1914, against \$1,384,255, increase 8.5 per cent; total output, 43,386,624 kw-hr. against 39,181,988, increase 10.8 per cent. These results may be taken as being fairly representative of the New England territory, since it may be shown from the official census figures that in April, 1913, the gross earnings from the sale of energy for the whole area were around \$2,750,000, while the total station output was in the neighborhood of 85,000,000 kw-hr. The *Electrical World* returns, therefore, cover some 45 per cent of the whole industry in New England, the major portion of the reports having been furnished by the Massachusetts companies.

**Electrical Equipment for Steel and Iron Industry.**—A number of orders have been received recently by the General Electric Company for equipment in steel and iron mills. The Cambria Steel Company, Johnstown, Pa., will install two 500-kw rotary converters and six 175-kva transformers. The American Bridge Company, Pittsburgh, Pa., has ordered a 4-ton storage-battery industrial locomotive. The Aluminum Ore Company, East St. Louis, Ill., recently ordered twelve 15-hp induction motors and compensators. The Forged Steel Wheel Company, Butler, Pa., will add to the electric-drive equipment of its plant eight 105-hp mill-type motors. The Hartford Machine Screw Company, Hartford, Conn., has ordered four additional 75-hp induction motors for electric drive. The Riter-Conley Manufacturing Company, Pittsburgh, ordered six centrifugal gas compressors. The Bourne-Fuller Company, Cleveland, Ohio, will add to the equipment of its power station a 200-kw motor-generator set and switchboard. The Southwark Foundry & Machine Company, Philadelphia, Pa., recently ordered a 425-hp induction motor and controller. The Dobbie Foundry & Machine Company, Niagara Falls, N. Y., will install for electric drive in its plant thirteen induction motors ranging in rating from 5 hp to 50 hp, three 2300-volt transformers, and accessories. The Cambria Steel Company, Johnstown, Pa., recently purchased a 375-hp induction motor and compensator. The American Iron & Steel Manufacturing Company, Lebanon, Pa., will install three 200-hp, five 300-hp and one 400-hp motor.

#### NEW YORK METAL MARKET PRICES

	June 23		June 30	
	Bid	Asked	Bid	Asked
Copper	13.30	13.70	13.50	13.50
Standard spot*	Selling Prices		Selling Prices	
	£ s d	£ s d	£ s d	£ s d
London, standard spot*	61	0 0	60	1 3
Prime Lake	14.00	to 14.25	13.75	to 14.00
Electrolytic	13.70	to 13.80	13.40	to 13.50
Casting	13.50	to 13.60	13.25	to 13.35
Copper wire base	14.62½	to 14.75		to 14.37½
Lead		3.90		3.90
Nickel	40.00	to 45.00	40.00	to 45.00
Sheet zinc, f.o.b. smelter		7.00		7.00
Spelter, spot	5.05	to 5.15	5.00	to 5.10
Tin, spot	30.75	to 31.25	30.35	to 30.50
Aluminum:				
Prompt delivery	17.75	to 18.00	17.50	to 17.75
Future	17.75	to 18.00	17.50	to 17.75
*OLD METALS				
Heavy copper and wire		12.50		12.75
Brass, heavy		8.25		8.50
Brass, light		7.25		7.37½
Lead, heavy		3.70		3.75
Zinc, scrap		3.75		3.85
*COPPER EXPORTS				
Total tons to June 30				

From daily transactions on the New York Metal Exchange.



## Corporate and Financial

**Commonwealth Edison Company.**—Under the ordinance of March, 1908, the Commonwealth Edison Company has paid to the city of Chicago \$518,295 as its 3 per cent share in the gross receipts of the company for the year ended May 31, 1914. Last year the city received \$473,010.

**United Properties Corporation.**—The agreements for the dissolution of the two-hundred-million-dollar United Properties Corporation are now on file with the California Railroad Commission. These agreements call for the segregation and separate financing of the corporations controlled by the merger. When this has been accomplished it seems to be the intention of the controlling interests to pay off the corporation's debts and then dissolve the corporation. The agreements further state that Messrs. Tevis and Hanford feel morally obligated to satisfy the numerous claims against the United Properties Corporation.

**Southern Sierras Power Company Bonds.**—Boettcher, Porter & Company, Denver, are offering at 99 and interest first mortgage sinking-fund 6 per cent gold bonds of the Southern Sierras Power Company. These bonds are unconditionally guaranteed as to principal and interest by the Nevada-California Power Company. The Southern Sierras Power Company owns steam and hydroelectric plants aggregating 15,666 hp, interconnected with the generating plants of the Nevada-California Power Company. The company also has 238 miles of double steel-tower high-tension transmission line and 630 miles of distributing system.

**Adopts Stock Profit-Sharing Plan.**—The National Carbon Company has announced a profit-sharing plan whereby \$500,000 common stock is to be set aside for sale to employees. The shares will be sold at par in instalments, taking not less than three years or more than five years. The subscriptions will be governed by the yearly salary. Dividends will be credited to each stockholder from the date payments begin, and interest will be charged on unpaid payments at the rate of 4 per cent. A bonus of \$5 a year will be paid to each shareholder. It is figured that the bonus and dividends with a monthly payment of \$1 will pay for one share in four years and eight months. The plan will go into effect on July 15, 1914.

**Texas Power & Light Company Escrow Bonds.**—Messrs. Harris, Forbes & Company, of New York, are offering \$700,000 of Texas Power & Light Company first mortgage 5 per cent gold bonds. These bonds are part of an authorized issue of \$30,000,000, of which \$4,790,000 are now outstanding. The remaining escrow bonds may be issued from time to time to the par value of 80 per cent of the cash cost of permanent extensions and additions to the property, provided that the net earnings for the preceding twelve months have been equal to at least twice the interest on all bonds outstanding, including those bonds to be issued. The company does the entire commercial lighting and power business in thirty-one cities and towns in a prosperous and thickly settled section of Texas, besides doing a gas business in five of these communities. The total population served is estimated to be over 190,000.

**Michigan Railway Company Notes.**—The National City Company, New York; Hodenpyl, Hardy & Company, New York, and E. W. Clark & Company, Philadelphia, have purchased the five-million-dollar issue of first-lien 6 per cent five-year gold notes of the Michigan Railway Company. These notes are secured by first mortgage through the pledge of the entire outstanding first-mortgage 5 per cent bonds on the entire property of the company and also through the pledge of all the outstanding obligations and stocks, excepting directors' shares, upon the property of the Springville Land Company. In addition, these notes have the unconditional guarantee of the Commonwealth Power, Railway & Light Company, of Jackson, Mich. The Michigan Railway Company owns a hydroelectric plant rated at 1000 hp, water rights on the Manistee River capable of development to the extent of 16,000 hp, and water rights on the Grand River in the city of Grand Rapids capable of developing 3000 hp.

**Central Mexico Light & Power Company.**—In a recent circular Curtis & Hine, general managers of the Central Mexico Light & Power Company, said that the directors voted to suspend payment of dividends on the cumulative

preferred stock for the present. While the company has suffered no material loss and has succeeded in keeping all the plants in operation, the increasing disorder has reduced earnings and increased operating expenses, and the great depreciation of Mexican currency has involved serious losses in the transfer of funds to this country. The occupation of Vera Cruz by the American forces in April caused so much anti-American feeling that the American employees had to be withdrawn and Mexicans and foreigners substituted in their places. Arrangements have been made for the payment of all bond interest, sinking funds and other fixed charges for a considerable time to come, and it is stated that the company will probably be able to meet current operating expenses out of earnings so long as present conditions continue.

**Suspends Dividend to Provide for Improvements.**—The West Penn Traction & Water Power Company has suspended dividends on the \$6,500,000 of preferred stock. This suspension was not caused by any decrease in the earnings of the operating properties, for these show substantial gains over last year. Under the indenture securing the recent issue of \$6,000,000 notes by the West Traction Company the West Penn Traction & Water Power Company is required to expend in 1914 and 1915 at least \$4,000,000 out of a part of the proceeds of these notes for improvements. Against these expenditures first-mortgage bonds, pledged as security for these notes, will be issued. Under the terms of the mortgage and note indenture the company must spend at least 28 per cent of the cost of such improvements before drawing upon the funds from the sale of the notes. This means that this year and next the company must take from its income more than \$700,000 for improvements, and, therefore, in order to conserve the income of the company and maintain proper reserve, the dividends on the preferred stock were suspended. These dividends being cumulative will be paid back as soon as the cash reserves are built up to a proper point.

**Washington Railway & Electric Company's Progress.**—Owing to frequent inquiries in relation to the company's history, President Clarence P. King, in his annual report, has shown the growth of the company from the time of its founding up to the present. In 1899 there were eleven street railways, excluding the Capital Traction Company, and two electric-lighting companies operating in the District of Columbia and in adjacent portions of Maryland, each having its own organization and operating equipment. Then the idea was conceived of bringing them all under one management. The owners of the two electric-lighting plants therefore organized the Washington Traction & Electric Company, acquiring control of the following railroad companies: Anacostia & Potomac River Railroad Company, Brightwood Railway Company, Capital Railway Company, City & Suburban Railway of Washington, Columbia Railway Company, Georgetown & Tennyaltown Railway Company, Metropolitan Railroad Company, Washington & Glen Echo Railroad Company, Washington & Rockville Railway Company and Washington, Woodside & Forest Glen Railway & Power Company. The organization erected a central up-to-date power station, rebuilt lines and installed new machinery and equipment. The venture did not prove a success, but, rather than go back to the old independent company system and all the attending discomforts, the Washington Railway & Electric Company was authorized by Congress to take over the Washington Traction & Electric Company. The new company by many economies has grown and thrived until it occupies its present position. To do this the smaller power houses were gradually abandoned, and now the company relies entirely on the Benning station of the Potomac Electric Power Company, a subsidiary company. The business of this power company has shown a satisfactory growth during the year. Its connected load has in the past thirteen years increased from 270,080 to 1,080,000 16-cp equivalents, and the number of meters installed from 2953 to 22,483. After making substantial additions to the Benning plant, its capacity is now 37,000 kw. The added load has been largely day load, thereby making a material improvement of load-factor. The Washington Railway & Electric Company, with a view toward efficiency and welfare of employees, has adopted several important measures.



## Business Notes

**Colgate, Parker & Company,** of 2 Wall Street, New York, announce that they have admitted F. H. Davis to general partnership in the firm.

**The Wagner Electric Manufacturing Company,** of St. Louis, Mo., has opened a sales office in Suite 524, University Block, Syracuse, N. Y. J. W. Bryant will be in charge of this office.

**Santo Manufacturing Company,** Twenty-first Street and Allegheny Avenue, Philadelphia, Pa., is the new name of the Keller Manufacturing Company, manufacturer of the "Santo" vacuum cleaners.

**Percival Robert Moses,** 366 Fifth Avenue, New York.—R. L. Vaniman, formerly with Starrett & Van Vleck, has been appointed associate engineer and Western representative of Percival Robert Moses. His office will be in Vancouver, B. C.

**The Adapt Manufacturing Company,** Cleveland, Ohio, manufacturer of outlet boxes, has moved to larger quarters at 919 West Street, where the company will occupy an entire three-story building after July 1. The change in location has been made necessary by the recent increase in the company's business.

## New Industrial Companies

**The E. J. Bett Lighting Company,** of East Liverpool, Ohio, has been incorporated by E. J. Bett and others. The company is capitalized at \$10,000 and proposes to deal in lighting fixtures.

**The Alday Manufacturing Company,** of Cleveland, Ohio, has been incorporated with a capital stock of \$10,000 by H. A. Hauxhurst, M. T. Flanagan, F. X. Cull and others. The company proposes to manufacture motors and engines.

**The Dunlap Electric Truck Company,** of Columbus, Ohio, has been chartered with a capital stock of \$20,000 to build electric trucks and manufacture accessories for electric vehicles. The incorporators are T. C. Dunlap, George R. Hedges, Stewart A. Hoover, Herman R. Tingley and M. E. Beasley.

**The Premier Electrical Manufacturing Company,** of Bridgeport, Conn., has been incorporated with a capital stock of \$50,000. The company proposes to manufacture electrical wiring devices. The officers of the company are: President, F. A. North; vice-president, E. E. Forstom; secretary, W. E. French; treasurer, H. J. French.

## Trade Publications

**Trade-Mark.**—The Lombard Governor Company, Ashland, Mass., announces through a circular that it has adopted a trade-mark.

**Link Belts.**—Section A of Catalog No. 110, issued by the Link Belt Company, Chicago, Ill., contains information on a detachable link belt.

**Tachometers.**—A magneto-type tachometer is described in Bulletin No. 100, issued by the Electric Tachometer Company, Philadelphia, Pa.

**Trolley Wire.**—Advantages of Phono-Electric wire are outlined in a folder issued by the Bridgeport Brass Company, Bridgeport, Conn.

**Talking Signs.**—Electric talking signs are described and illustrated in Bulletin No. 210 of the National Electric Sign Company, Jersey City, N. J.

**Motor Starting Switch.**—The Allen-Bradley Company, Milwaukee, Wis., has issued Bulletin B-531, describing induction-motor starting switches.

**Friction Clutches.**—A folder stating the advantages of its friction clutch is being distributed by the Moore & White Company, Philadelphia, Pa.

**Circuit-Breaker.**—A booklet issued by the Sangamo Electric Company, Springfield, Ill., describes a storage-battery circuit-breaker for electric vehicles.

**Telephone Bracket.**—A telephone bracket attachable to any telephone is described in the folder issued by the Gee Electric Company, Wheeling, W. Va.

**Cable Hangers.**—Cable hangers and the method of installing them are illustrated in the leaflet sent out by W. N. Matthews & Brothers, St. Louis, Mo.

**Flexible Duct.**—A folder sent out by the Tubular Woven Fabric Company, 97 Warren Street, New York, refers to Duraduct, a flexible insulating tubing.

**Steel Tubing.**—Bulletin No. 17 A of the National Tube Company, Pittsburgh, Pa., contains an extract from an engineering article on seamless steel tubing.

**Boiler Scale Removal.**—"Scale Removal in Fire-Tube Boilers" is the subject of a bulletin recently issued by the Lagonda Manufacturing Company, Springfield, Ohio.

**Arckless Indicating Fuses.**—A leaflet issued by the Detroit Fuse & Manufacturing Company, Detroit, Mich., describes and illustrates its "Arckless" indicating inclosed fuses.

**Wire Pick-Up.**—A leaflet describing and illustrating a clamp for holding trolley wire temporarily, has been issued by the Electric Service Supplies Company, Philadelphia, Pa.

**Textile Machinery.**—Quarterly No. 7, recently issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., relates to electrical equipment for textile mills.

**Heating Devices.**—A curling-iron heater and heating pad are described and the prices listed in the leaflet distributed by the Simplex Electric Heating Company, Cambridge, Mass.

**Table Appliances.**—A short one-act play entitled "Cooking Breakfast at the Table" has been printed by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

**Cutout Lamp Hangers.**—Single-cord lamp hangers which will open the circuit when the lamp is lowered are described in a folder issued by the Thompson Electric Company, Cleveland, Ohio.

**Rubber-Insulated Conductors.**—Results of resistance and dielectric tests on rubber insulation are contained in a pamphlet distributed by the Hazard Manufacturing Company, Wilkes-Barre, Pa.

**Electric Dumb-Waiters.**—An illustrated cloth-bound catalog describing electrically operated dumb-waiters has been issued by the Burdett-Rowntree Manufacturing Company, 119 West Fortieth Street, New York.

**Adjustable Fixture Hanger.**—The "Knight" fixture hanger, which is adjustable for all ceiling outlets, is described in an illustrated catalog recently issued by the Empire Engineering & Supply Company, 227 Fulton Street, New York.

**Plugs.**—Harvey Hubbell, Inc., Bridgeport, Conn., has published a leaflet setting forth briefly the features of the new "fifty-8-fifteen" plug. This plug is small, so that when it is inserted in a socket the cap projects only a trifle more than 0.5 in.

**High-Speed Printing Telegraph.**—A twenty-three-page illustrated booklet printed in German has been sent out jointly by Siemens & Halske and the Siemens-Schuckertwerke, Berlin, Germany, describing a new high-speed printing telegraph.

**Connectors and Plugs.**—A large poster issued by the Universal Electric Stage Lighting Company, 240 West Fiftieth Street, New York, shows its line of connectors and plugs. These are especially adapted for temporary connections, such as are used in stage work.

**Electric Vehicles.**—The Buffalo Electric Vehicle Company, 1219 Main Street, Buffalo, N. Y., has published a four-page folder in which are illustrated three types of lamp trimmers' or meter wagon for use by electric-lighting companies. Specifications are also given.

**Testing of Coal.**—The Electrical Testing Laboratories, Eightieth Street and East End Avenue, New York, have published an instructive booklet on "The Value of Coal for Power Purposes." Reference is made to the company's readiness to conduct any of the customary tests and analyses of coal.

## Personal Mention

**Mr. Wilmer F. Shauck** has resigned as superintendent of the municipal lighting plant at Kendallville, Ind.

**Mr. H. T. Willett** has resigned as secretary of the Springfield (Ill.) Gas & Electric Company owing to ill health.

**Mr. E. Shibley** has been appointed secretary of the Archbold (Ohio) Electric Light & Power Company, to succeed Mr. G. DeVries, who recently resigned.

**Mr. Frank J. Duffy**, president and manager of the Southern Railway & Light Company, Natchez, Miss., has been elected president of the local chamber of commerce.

**Mr. H. Whitford Jones**, city electrical engineer, Cleveland, Ohio, has been retained by the City Council of Sandusky to assist the city in fixing rates for commercial and street lighting.

**Mr. Thomas E. Murray**, vice-president of the New York Edison Company, was elected a member of the board of trustees of the Emigrant Industrial Savings Bank at the last meeting of the board.

**Mr. B. W. Lynch**, formerly general auditor of the Consumers' Power Company of Minneapolis, Minn., has been appointed assistant to the general auditor of H. M. Bylesby & Company, to succeed Mr. N. P. Zech, resigned.

**Mr. Aldus C. Higgins**, secretary of the Norton Company, Worcester, Mass., has been awarded the John Scott Medal by the Franklin Institute of Philadelphia in recognition of his invention of electric-furnace methods for the production of aluminum.

**Col. Merritt M. Smith** has been appointed chief engineer of the Department of Water Supply, Gas and Electricity of New York City, succeeding Mr. I. M. De Varona, who resigned recently after twenty-two years' connection with the department.

**Mr. George W. Dunlap** has been appointed superintendent of power stations of the International Railway Company, Buffalo, N. Y., in addition to his duties as superintendent of equipment. Mr. Dunlap was formerly superintendent of power for the Worcester (Mass.) Consolidated Street Railway Company.

**Mr. William A. Bole** has been appointed vice-president of the Westinghouse Machine Company, East Pittsburgh, Pa., in charge of production and erection. Mr. Bole has been continuously in the employ of the company since August, 1882, having filled successively the positions of general shop foreman, superintendent, manager of works and consulting engineer.

**Dr. William McClellan** has been appointed confidential engineer to the Public Service Commission of the First District of New York in connection with the valuation of the New York Telephone Company's property. Mr. McClellan was formerly chief of the division of light, heat and power for the commission, but for the last year has served as assistant to the president of the Buffalo General Electric Company.

**Mr. Edwin Jowett** has resigned as assistant to the chief constructing engineer of the Commonwealth Edison Company, Chicago, to become chief operating engineer of the Fort Worth (Tex.) Power & Light Company. He had been associated with the Chicago company since 1906, having spent the first six years as assistant to the chief engineer of the Fisk Street station. In 1912 Mr. Jowett was sent to England to inspect the construction of the new 25,000-kw Parsons turbo-generator set now installed in the Fisk Street station.

**Mr. E. A. Quinn**, of San Francisco, has assumed the position of general superintendent of the San Joaquin Light & Power Corporation, Fresno, Cal., succeeding the late Lloyd N. Pert, who was recently drowned in the San Joaquin River. Mr. Quinn was for several years general superintendent of the California-Nevada Power Company at Goldfield, Nev.; later he was connected with the Westinghouse Electric & Manufacturing Company at San Francisco, and for the last four years he has been general superintendent for the Allis-Chalmers company at San Francisco.

**Mr. Samuel F. Dibble**, who has been manager of the small motors department of the General Electric Company, Chi-

cago, has been made manager of the Duluth office of the same company. Mr. Dibble graduated from Michigan University in 1893 and during the summer and fall of the next year had charge of a portion of the exhibition made by the General Electric Company at the World's Fair. For the four succeeding years he served in the capacity of chief electrician at the Detroit municipal lighting plant, and for the last seventeen years he has been employed with the General Electric Company in Chicago.

**Gen. George H. Harries**, president of the Louisville (Ky.) Gas & Electric Company, received the honorary degree of doctor of laws at the forty-sixth annual commencement of the University of Kentucky at Lexington on June 4. In conferring the degree President Barker of the university referred to General Harries' military career and concluded with complimentary allusions to the work accomplished by the Louisville Gas & Electric Company and to "the fine public spirit which has been made apparent in the organization and conduct of the company—a high example worthy of complete imitation and all commendation."

**Dr. William David Coolidge**, assistant director of the research laboratory of the General Electric Company, Schenectady, N. Y., has received the Rumford Medal of the American Academy of Arts and Sciences for his invention of ductile tungsten and its application in the incandescent lamp and X-ray tube. Dr. Coolidge was born at Hudson, Mass., in 1873. He received the degree of bachelor of science from the Massachusetts Institute of Technology in 1896 and the degree of doctor of philosophy from Leipzig in 1899. Prior to going abroad, and again on his return, he was assistant in physics at the Massachusetts institute. Later he became instructor, then research assistant in theoretical and physical chemistry, and was assistant professor of physico-chemical research at the time of his transfer to the Schenectady laboratories. The Rumford Medal was established in 1839 by Benjamin Thompson (Count Rumford), a native of Woburn, Mass., who donated a fund the interest on which still provides for periodic awards of medals and money for pre-eminence in research work. Among those who have received the Rumford Medal are Capt. John Ericsson, Prof. Henry A. Rowland, Prof. Samuel P. Langley, Dr. Albert A. Michelson, Mr. Thomas A. Edison, Dr. Charles Francis Brush, Dr. Edward G. Acheson, Mr. Charles Gordon Curtis and Dr. Herbert E. Ives.

**Col. William H. Chapman**, who on July 1 retired as president and general manager of the Houston (Tex.) Lighting & Power Company after serving nearly seventeen years at the head of that organization, is one of the pioneers of the



COL. W. H. CHAPMAN

electrical industry, despite the fact that he entered this field in 1888 at an age when many less energetic men feel themselves entitled to a relaxation of active duties. Colonel Chapman was born Feb. 3, 1838, and for a number of years was superintendent of machinery at the Boston Navy Yard. In 1888 he joined the staff of the old Thomson-Houston Company and in this connection supervised the construction of power plants at Cleveland, Ohio; Mott Haven, N. Y.; Hoboken, N. J.; Natick, Mass.; Salem, Mass.; Gloucester, Mass., and other Eastern cities. Later he became engineer for the United Electrical Securities Company, which was closely identified in a financial way with the Thomson-Houston Company. In 1895 Colonel Chapman was appointed general manager of the Louisiana Electric Company, New Orleans, a position which he held three years. Early in 1898 he joined the Houston Lighting & Power Company as general manager, and a few years later he was elected president as well. Colonel Chapman's son, Mr. W. H. Chapman, Jr., is district turbine inspector in the New York office of the General Electric Company. Colonel Chapman has returned to his native city of Boston to live, but will visit New Orleans and Houston during the winter months of each year.



## Construction

### New England

**BOSTON, MASS.**—Plans are being considered for the construction of a central power plant on Deer Island to furnish power to operate all the shops on the island.

**LOWELL, MASS.**—The plans for the construction of the new electric-power station to be erected on land owned by the canal company, near the highway bridge, it is reported, has been awarded to R. J. Ryder and J. J. Ryan.

**MALDEN, MASS.**—A movement is under way among the city officials and the Board of Trade to secure the equipment of the Sausage branch of the Boston and Maine railroad for electrical operation.

**SPRINGFIELD, MASS.**—Bids will be received at the office of the commanding officer, Springfield Army, Springfield, Mass., until July 21, for furnishing about 26,000 pounds of mottin, soft and hard brass wire and 38,000 braided tubes.

**WORCESTER, MASS.**—The Worcester El. Co. will soon submit the proposal to increase the capital stock from \$1,300,000 to \$1,400,000 to the stockholders, the proceeds to be used to pay for improvements being made at the Webster Street station and for extensions contemplated.

**HOWARD, R. I.**—Bids will be received at the office of the Board of Control and Supply, Room 18, State House, Providence, R. I., until July 15 for construction of laundry building, including plumbing, heating and electric wiring, for the State Hospital for the Insane at Howard. Plans and specifications may be seen at the above office and at the office of Eleazer B. Homer, architect, 87 Weybosset Street, Providence; heating plans may be seen at the office of Richard D. Kimball Co., 6 Beacon Street, Boston, Mass.

### Middle Atlantic

**BATH, N. Y.**—Plans have been prepared for the installation of a municipal electric-light plant in Bath by Engineer Larrowe, of Cohocton. The plans provide for two steam-driven generating units; 117 tungsten lamps of 200 cp. and 87 boulevard lamps for use in the business section, parks and other places.

**BINGHAMTON, N. Y.**—The City Council has engaged Douglas Sprague, consulting engineer, 39 Cortlandt Street, New York, to take charge of the construction of the proposed municipal electric-light plant, for which \$148,000 in bonds was recently voted.

**BROOKLYN, N. Y.**—Bids will be received by Robert Adams, first commissioner, headquarters of the Fire Department, Municipal Building, New York, until July 13 for furnishing all material, establishing and equipping an extension of the fire-alarm telegraph system in the borough of Brooklyn. Blank forms and further information may be obtained at the above office.

**BUFFALO, N. Y.**—Bids will be received by the commissioner of public works, Room 5, Municipal Building, Buffalo, until July 10 for the erection of a series of one-story stalls, sidewalk canopies, lavatories, ice boxes, offices, etc., for the city. Bids include repairs and improvements to present main buildings on the Broadway market grounds, on Broadway, between Gibson and Lombard Streets, Buffalo, and on Broadway, between concrete, carpentry, etc.; (B) steel work, structural iron, etc.; (C) roofing, metal work, etc.; (D) insulation of ice boxes, refrigerator doors, etc.; (E) plumbing, drainage and fifty-ninth Street New York, until July 13 as follows: (1) for additions, alterations and repairs to electric

equipment in Public Schools 2, 10, 27 38 and Morris High School, borough of the Bronx; (2) for installing a new equipment in Flushing High School, on Broadway, Whitestone Avenue and State Street, Flushing, borough of Queens. Blank forms, plans and specifications may be seen at the office of the superintendent, Park Avenue and Fifty-ninth Street, borough of Manhattan, and also at branch office, 69 Broadway, Flushing.

**ESTERLY, N. Y.**—Within the next two months the Electric Light Commissioners expect to purchase one 75-kva and one 100-kva, three-phase, 60-cycle, 2400-volt Westinghouse alternator (with a driven), and one 90-hp Lozier gas engine. Harry Mettenford is superintendent.

**BARBOURVILLE, W. VA.**—The City Council is considering the question of installing a municipal electric-light plant, to cost \$1,000 to \$2,000.

**GARY, W. VA.**—The Tug River Pwr. Co., recently incorporated with a capital stock of \$10,000, is planning to construct a hydro-electric power plant on the Tug River. The incorporators are J. J. Barker, G. W. Egle, J. W. Barker, G. V. Kanode and H. N. Evenson, all of Gary.

**SOUTH BOSTON, VA.**—The electric plant of the South Boston El. Lt. & Pwr. Co. was destroyed by fire recently, causing a loss of about \$100,000.

**WASHINGTON, D. C.**—Bids will be received at Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until July 7 for furnishing at the various navy yards and navy stations supplies as follows: Brooklyn, N. Y. Schedule 6940—580 ft.  $\frac{1}{2}$ -in. brass conduit. Philadelphia, Pa. Schedule 6940—5000 ft.  $\frac{1}{2}$ -in. steel electrical conduit. Bids will also be received until July 14 as follows: Annapolis, Md. Schedule 6946—3000 ft. silk-braid incandescent lamp cord. Brooklyn, N. Y. Schedule 6946—one lubricating oil-testing device. etc.; Schedule 6952—5700 lb. soft-rolled, flat-sheet copper; Schedule 6975—680 lb. soft-sheet copper; Schedule 6952—680 lb. brass seamless drawn seamless outer diameter, 0.402 in. inner diameter; Schedule 6976—miscellaneous drawn seamless copper tubing; Schedule 6951—700 ft. drawn seamless steel tubing (1 in. outer diameter, 0.635 in. inner diameter). Bids will also be received until July 23 as follows: Mare Island, Cal. Schedule 6969—one motor-driven, slip roll, forming machine, 14 horizontal single and double pumps, etc. one motor-driven, four-plunger, hydraulic pump; Schedule 6968—one universal bench saw, complete with motor. Bids will also be received until Aug. 1 for furnishing winches and one compound-gear electrically operated capstan with spare parts to be delivered at Brooklyn, N. Y., as per Schedule 6981. T. J. Cowie is paymaster-general, U. S. N.

**WASHINGTON BARRACKS, D. C.**—Bids will be received at the office of the engineer depot, United States Army, Washington Barracks, Washington, D. C., until July 13 for furnishing 40 ft. of 2-in. circ. mil, stranded single-conductor, lead-covered cambric-insulated armored cable. For further information address Lt.-Col. Joseph Kuhn.

### North Central

**DECATUR, MICH.**—At an election held recently the proposal to issue \$15,000 in bonds for a new municipal electric-light plant was carried. About \$5,000 has already been expended on the project.

**DETROIT, MICH.**—The contract for general electrical work for the 19-story building to be erected by David Stott at Wayne and Michigan Streets, Detroit, has been awarded to the John D. Templeton Co. of Detroit.

**DETROIT, MICH.**—Bids will be received by Charles A. Gadd, secretary of board of education, Detroit, until July 7 for construction of Kennedy and Harper Avenue buildings; alterations and improvements to the Palmer School, and for equipment of power plant for Central High School Building. Bids will also be received until July 21 for construction of the Northern High School Building.

**GRAND RAPIDS, MICH.**—The new Young Men's Christian Association Building, it is reported, will be equipped with an electric generating plant.

**LANSING, MICH.**—The Reo Motor Car Co. which is erecting a new power plant, will purchase an electric generating unit, of about 500 kw. No other machinery of any importance will be needed. R. E. Olds is president.

**CATAWBA, OHIO.**—The village of Catawba is contemplating the installation of a municipal electric-lighting system. The

cost of wiring the village and making the necessary connections with the high-tension transmission lines of the Ohio St. Co. at South Vienna, a distance of 5 miles, will come to about \$5,000. An election will be held Aug. 1 to submit the proposal to the voters.

**COLUMBUS, OHIO.**—Bids will be received by S. A. Kinneer, director of public service, City Hall, Columbus, until July 14 for furnishing two 150-kw outdoor-type, self-contained generating units. Plans and specifications and blank forms may be secured from the superintendent of the division of electricity.

**COSHOCTON, OHIO.**—Within the next two months the Fayette El. Lt. & Pwr. Co. of Coshocton expects to erect a transmission line from New Comerstown to Dennison (33,000-volt, three-phase, 60-cycle). All material has been purchased.

**GREENVILLE, OHIO.**—The Public Utilities Commission has granted the Greenville El. Lt. & Pwr. Co. permission to issue \$28,000 in capital stock, the proceeds to be used for improvements to its plant and equipment. The company has also purchased addition to power house, purchase of 1000-kw Curtis turbine, with switchboard instruments and exciter, one Wheeler condenser steam line and condenser connections, one Sterling boiler, coal dump.

**NORWALK, OHIO.**—At a special election held June 22 the proposal to issue \$120,000 in bonds to erect a municipal electric-light plant was carried.

**SAUNDERSVILLE, OHIO.**—The City Council has engaged H. Whitford, owner of Cleveland, consulting engineer, to assist the city in fixing rates for commercial and street-lighting. It is expected that in this connection the city will enter into a scheme for an ornamental lighting system for the business section.

**SEVILLE, OHIO.**—All bids received June 22 for an electric distribution system in Seville have been rejected. New bids will be received until July 6. S. D. Hall is village clerk.

**SIDNEY, OHIO.**—Within the next two months the Sidney El. Lt. Co. expects to purchase a 500-kw, 60-cycle, three-phase, 2300-volt generating unit (probably turbine), exciter for above, surface condenser and generator and exciter panels. F. D. Elwell is manager.

**SPRINGFIELD, OHIO.**—The Springfield Ry. Co. as it is reported, is planning to increase the boiler capacity of its power house in Springfield, bids for which will soon be asked for.

**WARREN, OHIO.**—The Trumbull Pub. Ser. Co., of Warren, is planning to increase the output of its steam generating plant to consist (possibly) of a 3000-kw steam turbine, 600 hp or 700 hp in additional boilers, new feed-water heaters, the rearrangements of high-voltage transmission line and building of substations. This work will be done under the supervision of the construction department of the Doherty Operating Co. Equipment and material will be purchased immediately. J. J. Trumbull is general manager of the Trumbull Public Ser. Co.

**LOUISVILLE, KY.**—Plans are being prepared by the Federal Chemical Co., owner of the Globe Fertilizer Works, for building a new plant, to replace the one recently destroyed by fire. A large part of the machinery will be operated by electricity.

**WINCHESTER, KY.**—Work has begun on the construction of a garage for William Day, electrician, which will be equipped for storage of electric batteries and other electrical apparatus.

**KNOX, IND.**—The Public Service Commission has authorized Thomas A. Grist, proprietor of the Knox El. & Pwr. Co., to borrow \$25,000 to make improvements to its system. The improvements to be accomplished when improvements are completed.

**TELL CITY, IND.**—Bids will be received by the city clerk, Tell City, until July 14 for new equipment for power plant, consisting of a 300-hp turbine and condenser with auxiliary apparatus. The plant is a motor-driven centrifugal pumps for pumping city water supply, together with necessary switchboard and accessories. For details and specifications apply to the city engineer. Bids may be obtained from Robert M. Cass, consulting engineer, 318 American Life Building, Indianapolis.

**ASHLAND, ILL.**—The Abbott El. & Pwr. Co. of Ashland is erecting two substations in Ashland, the equipment to include one constant-current regulator and two 75-kva, 16,500-2300-volt transformers. Poles, wires and insulators are needed for 6 miles of line. Electricity for operating the system will be obtained from the generating station in Petersburg.

**HAVANA, ILL.**—Plans are being prepared for the restoration of an ornamental street-lighting system to the city by a special plant to be installed by the city.

Direct current will be used. Specifications not yet completed for plant. Plans for lighting system provide for 44 posts, 14 ft. high, to correspond with the Horsfield & Paper Co. Planting, now equipped with 100-watt lamps and one 60-watt lamp, maintained by underground wires (three-wire system will be used). The cost of the system is estimated at \$2,500. Bids for job will soon be advertised.

**JOLIET, ILL.**—Bids will be received by the Board of Inspectors of the City Schools of Joliet and the Board of Education of a new grade school, separate proposals to be submitted as follows: General construction, heating and ventilation, heat distribution, plumbing, sewerage and outfitting and electric wiring. Drawings and specifications may be seen at the office of the Board of Inspectors, Joliet, at the south end of Union St. Clubb, architect, 110 North Dearborn Street, Chicago, Ill., and also at the Builders' Exchange, Milwaukee, Wis.

**KANKAKEE, ILL.**—Bids will be received until July 23 for the construction of a new lodge and club house for the order of Elks. Plans and specifications may be seen at the office of H. L. Crawford, secretary, at Kankakee. Separate bids will be invited for work for plumbing and electrical work. Charles F. Rawson, of Chicago, is architect.

**LEE, ILL.**—The local electric-light plant, owned by John Maumburg, was recently destroyed by fire, causing a loss of about \$50,000.

**URBANA, ILL.**—Bids will be received at the office of the state architect, Room 348, 29 South La Salle Street, Chicago, Ill., until July 25 for construction of additional machinery Building and Administration Building. Separate bids will be received for plumbing, heating and ventilation and electrical work. Plans and specifications may be seen at the office of J. B. Dibelka, 29 South La Salle Street, Chicago, upon deposit of \$10, which will be refunded upon return of same. J. M. White is supervising architect for the University of Illinois.

**BURLINGTON, WIS.**—The Burlington El. Lt. & Pwr. Co. is contemplating the installation of a new street-lighting system. The company, it is reported, would like to receive estimates for both electric lamps and tungsten lamps (750 to 1,000 watts).

**MILWAUKEE, WIS.**—The City Council has confirmed the appointment of F. A. Vaughn, of Milwaukee, an engineer, to make a survey of the streets for the purpose of improving the street-lighting system.

**RACINE, WIS.**—Bids will be received by the Board of Public Works until July 15 for the installation of electric lamps on the streets and bridges.

**BAGLEY, MINN.**—The Council has engaged J. F. Bruar, consulting engineer, Commercial Building, St. Paul, to prepare plans for rebuilding the municipal electric-light plant in Bagley.

**BIRD ISLAND, MINN.**—The Renville County El. Co., of Bird Island, is planning to erect a transmission line to Buffalo Lake, passing through the village of Hector, where the company will furnish power. It also proposes to build a line to the village of Olive, where energy will be supplied at wholesale. The local power plant will be enlarged to take care of the increased load, plans for which are not yet completed, but will probably include the following equipment: One 150-hp to 200-hp return tubular boiler, one 175-hp Corliss or non-releasing Corliss engine, one 75-kw and one 150-kw, three-phase, 60-cycle, 2300-volt generator; three switchboard panels, with necessary instruments, switches, etc.; 15 to 20 2300-volt transformers (10 to 15 kw); 15 to 20 outdoor transformer stations (13,200-volt line); 45 miles of wire, insulators, etc.; 150 Westinghouse meters; all supplies to be furnished by the company, which will contract for power installations and house wiring. J. H. Yarnell is manager.

**LITTLE FORK, MINN.**—The contract for installing an electric-light plant in Little Fork for S. S. Hapelle has been awarded to H. E. Durey, of Moorhead. None of the material has been purchased as yet, with exception of poles, which are now being erected. Alternating-current 60-cycle system is to be installed.

**OWATONNA, MINN.**—Bids will be received by the State Board of Control, State Capitol Building, St. Paul, until July 14 for the erection and completion of recreation building and dining, including the main main dining room and fireproofing south wing of main building, and addition to cow barn at State Public School, Owatonna, including the new kitchen, heating, plumbing, ventilating, plumbing and electrical work.

in accordance with plans and specifications furnished by C. H. Johnston, architect, 715 Capitol Bank Building, St. Paul. Bids will be received collectively and separately. Copies of above plans and specifications may be seen at the Builders' Exchanges at St. Paul and Minneapolis, at the office of the superintendent at the above institution, and at the office of the State Board of Control, St. Paul.

**DENISON, IA.**—Plans are being prepared by J. B. Hill, of Iowa City, consulting engineer, for construction of a municipal electric-light and power plant in Denison.

**LORIMOR, IA.**—The Council has engaged Gilbert Johnson, of Osceola, a franchise to construct and operate an electric-light plant in Lorimor. It is understood that a temporary plant will be installed to furnish electrical service until a transmission line is erected from a power plant in some other city.

**ST. JOSEPH, MO.**—Plans are being considered by the City Council to enlarge and improve the municipal electric-light plant.

**WESTBY, N. D.**—Preparations, it is reported, are being made for the installation of an electric-light plant in Westby.

**PARKER, S. D.**—Plans and specifications are being prepared by J. F. Bruar, consulting engineer, Commercial Building, St. Paul, Minn., for the installation of an electric-light plant and extensions to water-works system, to cost about \$27,000.

**NELIGH, NEB.**—Plans are being considered, it is reported, for remodeling the local electric-light plant.

**CANTON, KAN.**—The city of Canton will install a small electric-light plant in the near future. The equipment required will consist of a 35-kw, three-phase, 60-cycle, 2300-volt generator, 150 kw, 375-volt, 60-cycle line material, series street-lighting system, meters, etc. Philip R. Duntun, of McPherson, is engineer in charge.

**OTTAWA, KAN.**—The erection of an electric transmission line between Ottawa and Marais des Cygnes is reported to be under consideration by the electric company in the latter place. The Bushong Electrical Co., of Ottawa, it is said, is interested in the project.

**POWATTAN, KAN.**—The City Council has engaged G. E. Johnson, engineer, to take charge of erecting transmission line and distributing system, for which \$10,000 in bonds has recently voted. L. C. Christensen is city clerk.

## Southern States

**FITZGERALD, GA.**—Within the next three months the Fitzgerald Water, Light & Bond Commission expects to install one 500-hp automatic four-valve Harrisburg engine for direct connection to alternating-current generator, 150 kw, 375-volt, 60-cycle, 2300-volt generator, one 15-kw, 125-volt exciter, one marble switchboard, equipped with necessary instruments, one Cochrane open feed-water heater, one Platt Iron Works boiler-feed pump and accessories. W. A. Green is superintendent.

**HAWKINSVILLE, GA.**—The city of Hawkinsville is planning to erect the municipal electric-light plant and will purchase a 75-kw, 60-cycle, 2000-volt generator and engine, directly connected. E. L. Wilson is superintendent.

**LA GRANGE, GA.**—Bids will be received by J. D. Edmundson, Mayor, until July 21 for furnishing materials and constructing water-works system with all appurtenances, including filters, two brick stations, reinforced concrete, conduits, 15 to 20 2300-volt transformers (10 to 15 kw), 15 to 20 outdoor transformer stations (13,200-volt line); 45 miles of wire, insulators, etc.; 150 Westinghouse meters; all supplies to be furnished by the company, which will contract for power installations and house wiring. J. H. Yarnell is manager.

**REYNOLDS, GA.**—The Town Council has engaged an engineer connected with the B. B. McCrary Co., of Atlanta, Ga., to make surveys and prepare plans for a municipal electric-light plant in Reynolds. As soon as plans are completed bids will be asked. G. L. Conner is clerk.

**MEMPHIS, TENN.**—Bids will be received at the office of C. C. Pasby, city clerk, until July 14 for furnishing material and erecting pumping station, 60 ft. by 160 ft., with high-pressure pumping discharge basin; also for furnishing and installing electrical machinery and auxiliaries as follows: Four 750-hp wound-rotor induction motors; four 300-hp wound-rotor induction motors with vertical shaft; one switchboard, complete for control of above

motors with all wiring connections; three 667-kva, single-phase transformers and other auxiliaries. Bids will also be received at the same time and place for four double-suction horizontal-shaft centrifugal pumps, each having a capacity of 300 cu. ft. per second against a normal head of 15 ft.; two vertical-shaft single-suction, centrifugal pumps, each having a capacity of 80 cu. ft. per second, against a normal head of 22 ft.; complete suction and discharge pipes for above pumps; one 20-ton motor-hoist hand-operated traveling crane; two 20-ton vacuum pumps, two rotary motor-driven vacuum pumps of 400 cu. ft. per minute each, together with necessary piping and valves. Contracts for electrical machinery, pumping and machinery buildings will be let separately or collectively. Plans and specifications may be obtained from J. H. Weatherford, city engineer, Court House, Memphis.

**JACKSON, ALA.**—Plans are being considered for the installation of a municipal electric-light plant and water-works system. It is proposed to operate the plant with a gas engine.

**JENNINGS, LA.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until July 21 for construction, complete, including mechanical equipment, interior lighting, heating and ventilation, of a United States post office at Jennings, La. Drawings and specifications may be obtained from the above office or from the custodian of site at Jennings. O. Wendroth is supervising architect.

**ST. MARTINSVILLE, LA.**—The installation of an electric-light plant in St. Martinsville is under consideration.

**DEVOL, OKLA.**—The City Council is contemplating the installation of an electric-light system in Devol.

**FAIRLAND, OKLA.**—The Fairland Lt. & Pwr. Co. expects to install within the next two months a 60-hp boiler and a 50-hp engine (already purchased). The company will purchase a 30-kw to 50-kw alternating-current generator. L. H. Long is manager.

**MCCLLOUD, OKLA.**—The City Council has engaged the Benham Engineering Co., American National Bank Building, Oklahoma City, to prepare plans for the erection of a transmission line from Shawnee to McCloud and to construct a distributing system for street and commercial lighting in McCloud.

**CHILDRESS, TEX.**—The local electric-light and ice plants were destroyed by fire recently, causing a loss of about \$30,000. The city will be without electrical service until the plant is rebuilt.

**CUERO, TEX.**—The Texas Southern Electrical Co., Boston, Mass., it is reported, has engaged the Scofield Engineering Co., Commercial Trust Building, Philadelphia, Pa., as consulting engineer. The Texas company recently purchased the public utilities in Cuero, Victoria, Kingsville, Bishop and Beeville. It is understood that the plants will be consolidated and improvements made, involving an expenditure of about \$1,000,000 in the project.

**DAYTON, TEX.**—The Dayton Lt. & Pwr. Co., recently organized, with a capital stock of \$20,000, is planning to construct an electric-light plant here. A. E. Kerr is interested in the project.

**HANDLEY, TEX.**—Plans are being considered by the Handley Commercial Club to secure the installation of an electric-lighting system here.

## Pacific States

**ASTORIA, WASH.**—Arrangements are being made by the Northwest Electric Co., of Portland, for the construction of a large hydroelectric plant on the White Salmon River, 12 miles from Astoria. Orders for electrical equipment, which is understood, have not yet been placed.

**BREMERTON, WASH.**—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until July 25, for furnishing and installing one 40-kw turbine-driven exciter in the central power plant at the navy yards, Puget Sound, Wash. Plans and specifications may be obtained on application to the bureau or to the commanding officer of the plant named. H. R. Stanford is chief of bureau.

**SEATTLE, WASH.**—The finance committee of the City Council has approved an appropriation of \$10,000 to construct a 76-in. penstock from dam to power house at the Cedar River plant. When penstocks are completed the second unit can be installed in the power house, increasing the output by 10,000 kw.



**AUMSVILLE, ORE.**—Work will soon begin on the construction of an electric light and power plant for the Aumsville Flour Mills Co. which will furnish electricity for lamps and motors in Aumsville and surrounding territory.

**MAPLETON, ORE.**—The contract for the construction of a hydroelectric plant near Mapleton has been awarded by Richard Clough to C. A. Elkins and Frank Shelley, of Eugene. The plant when completed will supply electricity in Mapleton and vicinity.

**TILLAMOOK, ORE.**—The City Council has granted a franchise to F. D. Small and D. C. Urie to install an electric-light plant. Under the terms of the franchise not less than \$30,000 must be expended on the project within 18 months.

**COALINGA, CAL.**—The Midland Counties Pub. Ser. Corp., successor to the Coalinga & E. R. Co., has petitioned the State Railroad Commission for authority to issue \$500,000 in capital stock, the proceeds of \$410,000 to be used to take up floating indebtedness and the remainder for new construction work. The present plans provide for the erection of a transmission line from San Miguel to San Lucas, a distance of 20 miles; from San Miguel to Jolon, 35 miles; San Luis Obispo to Cambria, 35 miles; San Miguel through Natrona, Chelame and Stone Canyon Valleys, 30 miles; Santa Maria to Lompoc, 60 miles, and from Port San Luis to Avila, 7 miles, together with distributing system, transformers and meters for service in the towns of Morros, Cayucos, Cambria, Bradfield, Jolon, Santa Ynez, Solvang, Orcuta, Los Clivos and Los Alamos.

**ORVILLE, CAL.**—The substitution of the Pacific Gas & El. Corp. on High Street was recently destroyed by fire, causing a loss of about \$10,000.

**VICTOR, ILL.**—The installation of an electric-light plant to furnish electricity for the Victor and adjacent territory is under consideration by the City Council.

**OGDEN, UTAH.**—The Board of City Commissioners has authorized the extension of the ornamental street-lighting system on three more streets in the business district of the city. The city engineer has been instructed to take up the matter with the Utah Lt. & Pwr. Co. and the Ogden Rapid Transit Co. and the Weber Club immediately.

**CHOTEAU, MONT.**—Extensive improvements are contemplated by the Choteau Lt. & Pwr. Co. to be system this summer, including the installation of a new generator and other electrical equipment.

**LIVINGSTON, MONT.**—Plans are being prepared for the installation of an ornamental street-lighting system in Livingston.

mental street-lighting system in Livingston, which provide for the erection of 616 ornamental lamp standards, of which 462 will be mounted with 100-watt lamps, with 12-in. Albia globes, and 154 with 300-watt lamps with 16-in. Albia globes (not yet decided whether tungsten or nitrogen lamps will be used), maintained by underground wires, of which 35,000 ft. will be required. The cost of the work is estimated at from \$40,000 to \$45,000. Not yet decided when contracts will be awarded. William S. Hartman is city engineer.

**WARM SPRINGS, MONT.**—Within the next two months the Montana State Hospital for the Insane expects to erect 1 mile of distribution line for alternating-current motor circuit and 1 mile of line for alternating-current lamp circuit. E. Pascoe is electrician.

**LOVELAND, COL.**—Plans have been filed by the Great Western Land, Granite, Lumber & Mfg. Co., 2200 10th St., with the county recorder for the construction of a pipe line (to cost \$5,000) which will furnish water to operate a large plant to be situated in the mountains west of this city. Victor L. Arenschield is president of the company.

## Canada

**CASSETON, N. B.**—Within the next two months Lloyd Lynch and Chester Hallett, owners of the local electric-light plant, expect to install a 25-hp Fairbanks-Morse oil engine and 200-volt, 2-wire system with generator to take care of the day load. Ten additional street lamps are being installed.

**ORILLIA, ONT.**—Tenders will be received by the secretary of the Orillia Water, Light and Power Commission until July 27 for furnishing the following apparatus: Contract (E) furnishing and erection of (A) turbine pumps and equipment; (F) furnishing and erecting Diesel oil engine and appurtenances; (G) furnishing and erection of mechanical pressure-type filtration plant. Plans and specifications may be seen at the office of the commissioner, at Orillia. W. K. Greenwood is engineer, and E. Long chairman of commission.

**MONTREAL, QUE.**—The Montreal Lt. & Pwr. Co. is reported to have decided to accept the conditions of the tentative agreement for lighting St. Catherine and Bleury Streets, under which the company will furnish the energy and part of the equipment at \$72 per lamp per annum.

**MONTREAL, QUE.**—The report of the Electric Service Commission recommending

that tenders for the construction of underground conduits on portions of Craig, Notre Dame and St. James Streets be called for has been adopted by the Montreal Board of Control. Bids for the above will be received until July 10.

## Miscellaneous

**FAIRBANKS, ALASKA.**—Plans are being considered by John L. Timmins, John H. Hughes and others, of Fairbanks, for the construction of a large hydroelectric power plant on the Toklatanka River, 60 miles from Fairbanks, and a short distance from the Nenana coal fields, work on which, it is understood, will begin next spring. The proposed plant will have an output of 10,000 hp and will furnish electricity for the entire mining region of central Alaska.

## New Incorporations

**HARTFORD, CONN.**—Articles of incorporation have been filed with the Secretary of State by the Manila Pwr. Co. of Hartford. The company is capitalized at \$1,000,000 and proposes to own and operate transmission lines to distribute electricity for lamps, heaters and motors; also gas, water, refrigerating and bottling plants. The incorporators are William Waldo Hyde, Alvan Waldo Hyde and Arthur L. Shipman, all of Hartford.

**PORTLAND, MAINE.**—The Maine Rys., Lt. & Pwr. Co. has filed articles of incorporation under the laws of the State of Maine, capital at \$1,000,000, for the purpose of dealing in securities of all kinds. The officers are: Hugh J. Chisholm, president; Frank H. Bradford, treasurer, and Josiah H. Drummond, clerk, all of Portland.

**CLARKSTON, MICH.**—The Oakland Pwr. Co. has been incorporated to furnish electricity and gas in Clarkston, Waterford, Drayton, Palms and other villages.

**ANNAR, NEB.**—The Nebraska El. Lt., Pwr. & Ry. Co. has been incorporated with a capital stock of \$300,000 to do a general light and power business and operate a railroad. The officers are: Hugh O'Neill, president; C. L. Keeler, vice-president; Carl W. Grant, secretary, and John Korab, treasurer.

**WINDOM, TEX.**—The Windom Lt. & Pwr. Co. has been incorporated with a capital stock of \$5,000 by A. L. Clark, J. J. Cappleman and E. P. Price.

# Directory of Electrical Associations

**ALABAMA LIGHT AND TRACTION ASSOCIATION.** Secretary-treasurer, H. O. Hanson, Mobile Gas Co., Mobile, Ala.

**AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.** Permanent secretary, L. O. Howard, Smithsonian Institution, Washington, D. C.

**AMERICAN ELECTRIC RAILWAY ACCOUNTANTS' ASSOCIATION.** Secretary-treasurer, E. B. Burritt, 29 West 39th St., New York.

**AMERICAN ELECTRIC RAILWAY ASSOCIATION.** Secretary, E. B. Burritt, 29 West 39th St., New York.

**AMERICAN ELECTRIC RAILWAY ENGINEERING ASSOCIATION.** Secretary, E. B. Burritt, 29 West 39th St., New York.

**AMERICAN ELECTROCHEMICAL SOCIETY.** Secretary, Prof. J. W. Richards, Lehigh University, South Bethlehem, Pa. Fall meeting, Niagara Falls, N. Y., Oct. 1-3.

**AMERICAN ELECTRO-THERAPEUTIC ASSOCIATION.** Secretary, Dr. J. Willard Travell, 27 East 11th St., New York.

**AMERICAN INSTITUTE OF CONSULTING ENGINEERS.** Secretary, Eugene W. Stern, 101 Park Ave., New York City.

**AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.** Secretary, F. O. Hutchinson, 23 West 39th St., New York. Board of directors meets monthly. Sections and branches in the principal electrical centers throughout the country.

**AMERICAN PHYSICAL SOCIETY.** Secretary, Prof. A. D. Cole, Ohio State University, Columbus, Ohio.

**AMERICAN SOCIETY OF REFRIGERATING ENGINEERS.** Secretary, William H. Ross, 154 Nassau St., New York City.

**AMERICAN SOCIETY FOR TESTING MATERI-**

**ALS.** Secretary-treasurer, Edgar Marburg, University of Pennsylvania, Philadelphia.

**AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS.** Secretary, Edwin A. Scott, 29 West 39th St., New York.

**AMERICAN WATER WORKS ASSOCIATION.** Secretary, J. M. Diven, 47 State St., Troy, N. Y.

**ARKANSAS ASSOCIATION OF PUBLIC UTILITY ENGINEERS.** Secretary, W. J. Tharp, Little Rock, Ark.

**ASSOCIATION OF EDISON ILLUMINATING COMPANIES.** Secretary, Geo. C. Holberton, Pacific Gas & Electric Co., San Francisco, Cal. Annual meeting, Sept. 14, Greenbrier Hotel, White Sulphur Springs, W. Va.

**ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS.** Secretary, W. T. Snyder, McKeesport, Pa.

**ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.** Secretary-treasurer, Jos. A. Andreuetti, Chicago & Northwestern Railway, Chicago.

**ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.** Secretary, P. W. Drew, 112 West Adams St., Chicago.

**CALIFORNIA ELECTRICAL CONTRACTORS' ASSOCIATION.** Secretary, W. S. Handbridge, 1408 Merchants' National Bank Building, Los Angeles, Cal.

**CANADIAN ELECTRICAL ASSOCIATION.** Affiliated with N. E. L. A. Secretary-treasurer, Allan Sullivan, 610 Confederation Life Bldg., Toronto, Can.

**COLORADO ELECTRIC CLUB.** Secretary, C. F. Oehlman, Meets every Thursday at Albany Hotel, Denver, Col.

**COLORADO ELECTRIC LIGHT, POWER AND RAILWAY ASSOCIATION.** Secretary-treasurer, T. F. Kennedy, 900 15th St., Denver, Col.

**COMMERCIAL SECTION, N. E. L. A. Secretary, J. F. Becker, 1170 Broadway, N. Y.**

**EASTERN NEW YORK SECTION, N. E. L. A. Secretary, C. S. Van Dyck, Schenectady, N. Y.**

**ELECTRIC CLUB OF CHICAGO.** Secretary, Fred M. Rosseland, Monadnock Block, Chicago. Meets every Thursday noon at Hotel Sherman.

**ELECTRICAL CONTRACTORS' ASSOCIATION OF GREATER BOSTON.** Secretary, R. S. Hale, 39 Boylston St., Boston.

**ELECTRICAL CONTRACTORS' ASSOCIATION OF MASSACHUSETTS.** Secretary, H. D. Temple, 30 Foster St., Worcester, Mass.

**ELECTRICAL CONTRACTORS' ASSOCIATION OF NEW YORK STATE.** Secretary, Geo. W. Russell, Jr., 25 West 42d St., New York.

**ELECTRICAL CONTRACTORS' ASSOCIATION OF THE CITY OF CHICAGO.** Secretary, M. N. Blumenthal, 179 West Washington St. Meets at noon on the second and fourth Wednesday of each month at 424 South Wabash Ave.

**ELECTRICAL CONTRACTORS' ASSOCIATION OF STATE OF MISSOURI.** Secretary, A. J. Burns, 315 West Tenth St., Kansas City, Mo.

**ELECTRICAL CONTRACTORS' ASSOCIATION OF WISCONSIN.** Secretary, Albert Petermann, 628 Lake St., Milwaukee, Wis.

**ELECTRICAL CREDIT ASSOCIATION OF CHICAGO.** Secretary, Frederic P. Vose, 1343 Marquette Building, Chicago.

**ELECTRICAL CREDIT ASSOCIATION OF PHILADELPHIA.** Secretary, John W. Crum, 1324 Land Title Building, Philadelphia, Pa.

**ELECTRICAL ENGINEERS' ASSOCIATION.** Secretary, Francis Raymond, 125 Michigan Ave., Chicago, Ill.

**ELECTRIC SUPPLY JOBBERS' ASSOCIATION.** General secretary, Franklin Overbaugh, 411 South Clinton St., Chicago, Ill.

**ELECTRIC TRADES ASSOCIATION OF CANADA.** Secretary, William R. Staveloy, Royal Insurance Building, Montreal, Can.

**ELECTRIC TRADES ASSOCIATION OF THE PACIFIC COAST.** Secretary, Albert H. Elliott, Harding Building, 34 Ellis St., San Francisco, Cal. Meeting, San Francisco, second Thursday of each month.

**ELECTRIC VEHICLE ASSOCIATION OF AMERICA.** Executive secretary, A. Jackson Marshall, 29 West 39th St., N. Y. Sections in New England, Chicago, Philadelphia, Washington and Los Angeles.

**EMPIRE STATE GAS AND ELECTRIC ASSOCIATION.** Secretary, Charles H. E. Chapin, 29 West 39th St., New York.

**FARADAY ELECTRICAL ASSOCIATION.** Secretary, W. J. Collins, 1129 Masonic Temple, Chicago. Meets at noon on the first and third Wednesday of each month at Planters' Hotel.

**FRANKLIN INSTITUTE.** Secretary, Dr. R. B. Owens, Philadelphia, Pa.

**GAS, ELECTRIC AND STREET RAILWAY ASSOCIATION OF OKLAHOMA.** Secretary-treasurer, Prof. H. V. Bozell, Norman, Okla.

**GEORGIA ELECTRICAL CONTRACTORS' ASSOCIATION.** Secretary, J. M. Clayton, Atlanta, Ga.

**HYDROELECTRIC SECTION, N. E. L. A. Secretary, S. A. Sewall, 29 West 39th St., N. Y.**

**ILLINOIS STATE ELECTRICAL SOCIETY.** Secretary, H. C. Chubbuck, Peoria, Ill.

**ILLUMINATING ENGINEERING SOCIETY.** General secretary, J. D. Israel, Engineering Societies Building, 29 West 39th St., New York. Sections in New York, New England, Philadelphia, Chicago and Pittsburgh. Annual meeting, Cleveland, Sept. 21, 1914.

**INDEPENDENT ELECTRICAL CONTRACTORS' ASSOCIATION OF GREATER NEW YORK.** Secretary, A. Newburger, 1153 Myrtle Ave., Brooklyn, N. Y.

**INDEPENDENT TELEPHONE ASSOCIATION OF AMERICA.** Secretary, W. S. Vivian, Grand Rapids, Mich.

**INDIANA ELECTRIC LIGHT ASSOCIATION.** Secretary, Thomas Donahue, Lafayette, Ind.

**INDIANA STATE ELECTRICAL CONTRACTORS' ASSOCIATION.** Secretary, George Skilman, Indianapolis, Ind.

**INSTITUTE OF OPERATING ENGINEERS.** Secretary, L. Houmiller, 29 West 39th St., New York.

**INSTITUTE OF RADIO ENGINEERS.** Secretary, E. J. Simon, 71 Broadway, New York.

**INTERNAL COMBUSTION ENGINEERS' ASSOCIATION.** President, Charles Kratsch, 416 West Indiana St., Chicago. Meeting second Friday of each month at Lewis Institute.

**INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS.** Secretary, C. R. George, Houston, Tex. Annual meeting, Atlantic City, N. J., Sept. 15-18.

**INTERNATIONAL ELECTRICAL CONGRESS.** Secretary-treasurer, Preston S. Millar, 80th St. and East End Ave., New York. Congress, San Francisco, Sept. 13-18, 1915.

**INTERNATIONAL ENGINEERING CONGRESS.** Secretary-treasurer, W. A. Cattell, Foxcroft Building, San Francisco, Cal. Congress, San Francisco, September, 1915.

**INTERNATIONAL ELECTRICAL COMMISSION.** International body representing various national electrical engineering societies contributing to its support).

General secretary, C. le Maistre, 28 Victoria St., Westminster, London, S. W., England. Meeting at San Francisco, Sept. 9-11, 1915.

**IOWA ELECTRICAL ASSOCIATION.** Affiliated with N. E. L. A. Secretary, W. H. Thomson, Des Moines, Ia.

**IOWA ELECTRICAL CONTRACTORS' ASSOCIATION.** Secretary, M. T. Humphrey, Waterloo, Ia.

**LOWA STREET AND INTERURBAN RAILWAY ASSOCIATION.** Secretary, H. E. Weeks, Dayton, Ia.

**JOVIAN ORDER.** Jupiter (president), W. N. Matthews, St. Louis, Mo.; Mercury (secretary), E. C. Bennett, Syndicate Trust Building, St. Louis, Mo.

**KANSAS GAS, WATER, ELECTRIC LIGHT AND STREET RAILWAY ASSOCIATION.** Secretary-treasurer, Ivor Thomas, 237 South Main St., Wichita, Kan.

**LOUISIANA ELECTRICAL CONTRACTORS' ASSOCIATION.** Secretary, J. J. Ziegler, 227 Bourbon St. Meeting every Wednesday, Audubon Building, New Orleans.

**MAINE ELECTRIC ASSOCIATION.** Secretary-treasurer, Walter S. Wyman, Waterville, Maine.

**MICHIGAN ELECTRICAL ASSOCIATION.** Affiliated with N. E. L. A. Secretary, Herbert Silverster, 18 Washington Boulevard, Detroit, Mich.

**MINNESOTA ELECTRIC ASSOCIATION.** Secretary-treasurer, F. A. Otto, St. Paul Gas Light Company, St. Paul, Minn.

**MISSISSIPPI ELECTRIC ASSOCIATION.** Affiliated with the National Electric Light Association. Secretary - treasurer, H. F. Wheeler, Hattiesburg, Miss. Next annual meeting, Hattiesburg, April 12-14, 1915.

**MISSOURI ELECTRIC GAS, STREET RAILWAY AND WATER WORKS ASSOCIATION.** Secretary-treasurer, F. D. Beardslee, Union Electric Light & Power Co., St. Louis.

**NATIONAL ARM, PIN AND BRACKET ASSOCIATION.** Secretary, J. B. Magers, Madison, Ind.

**NATIONAL ASSOCIATION OF ELECTRICAL INSPECTORS.** Secretary-treasurer, Wm. L. Smith, Concord, Mass.

**NATIONAL DISTRICT HEATING ASSOCIATION.** Secretary, D. L. Gaskill, Greenville, Ohio.

**NATIONAL ELECTRIC LIGHT ASSOCIATION.** Executive secretary, T. C. Martin, Engineering Societies Building, 33 West 39th St., New York.

**NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION OF THE UNITED STATES.** Secretary, George H. Duffield, 41 Martin Building, Utica, N. Y. Annual meeting, Detroit, July 15-18.

**NATIONAL ELECTRICAL CREDIT ASSOCIATION.** Secretary, Frederick F. Vose, 1343 Marquette Building, Chicago.

**NATIONAL FIRE PROTECTION ASSOCIATION.** Secretary of electrical committee, Ralph Sweetland, 141 Milk St., Boston, Mass. Opening meeting, New York, March 1915.

**NATIONAL INDEPENDENT TELEPHONE ASSOCIATION.** Secretary-treasurer, J. B. Earle, Waco, Tex.

**NEBRASKA SECTION, N. E. L. A. Secretary-treasurer, S. J. Bell, David City, Neb.**

**NEW ENGLAND ELECTRICAL CREDIT ASSOCIATION.** Secretary, Alton F. Tupper, 60 State St., Boston, Mass.

**NEW ENGLAND SECTION, ELECTRIC VEHICLE ASSOCIATION OF AMERICA.** Secretary, L. L. Edgar, 39 Boylston St., Boston, Mass.

**NEW ENGLAND STREET RAILWAY CLUB.** Secretary, H. A. Faulkner, 12 Pearl St., Boston, Mass. Meets last Thursday of each month.

**NEW ENGLAND SECTION, N. E. L. A. Secretary, Miss O. E. Bursiel, 149 Tremont St., Boston, Mass. Annual meeting, Narragansett Pier, R. I., Sept. 2-4.**

**NEW ORLEANS ELECTRICAL CONTRACTORS' ASSOCIATION.** Secretary, S. J. Stewart, 312 Carondelet St., New Orleans, La. Meetings, second and fourth Tuesday of each month.

**NEW YORK ELECTRIC RAILWAY ASSOCIATION.** Secretary, Charles C. Dietz, 239 W. 39th St., New York.

**NEW YORK ELECTRICAL CREDIT ASSOCIATION.** Affiliated with the National Electric Credit Association. Secretary, Franz Neilson, 80 Wall St., New York.

**NEW YORK ELECTRICAL SOCIETY.** Secretary, G. H. Guy, 33 West 39th St., New York.

**NORTHWEST SECTION, N. E. L. A. Secretary, N. W. Brockett, Pioneer Building, Seattle, Wash.**

**NORTHERN WHITE CEDAR ASSOCIATION.** Secretary, R. N. Boucher, 743 Lumber Exchange, Minneapolis, Minn.

**OHIO ELECTRIC LIGHT ASSOCIATION.** Secretary, D. L. Gaskill, Greenville, Ohio. Annual meeting, Cedar Point, Ohio, July 20-24.

**OHIO SOCIETY OF MECHANICAL, ELECTRICAL AND STEAM ENGINEERS.** Secretary, Prof. F. E. Sanborn, Ohio State University, Columbus, Ohio.

**OREGON ELECTRICAL CONTRACTORS' ASSOCIATION.** Secretary, F. C. Green, 291 East Morrison St., Portland, Ore.

**PENNSYLVANIA ELECTRIC ASSOCIATION (State Section N. E. L. A.).** Secretary-treasurer, S. C. Pohe, Bloomsburg, Pa. Annual meeting, Eagle's Mere, Pa., Sept. 8-11.

**RAILWAY SIGNAL ASSOCIATION.** Secretary-treasurer, E. Rosenberg, Times Building, Bethlehem, Pa.

**SOCIETY FOR ELECTRICAL DEVELOPMENT, INC.** General manager, J. M. Wakeman, 29 West 39th St., New York.

**SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION.** Secretary, Dean F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.

**SOUTHEASTERN SECTION, N. E. L. A. Secretary-treasurer, A. A. Wilbur, Columbus, Ga. Annual meeting, Isle of Palms, Charleston, S. C., Aug. 19-21, 1914.**

**SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION.** Secretary, H. S. Cooper, 405 Slaughter Building, Dallas, Tex.

**VERMONT ELECTRICAL ASSOCIATION.** Secretary-treasurer, A. B. Marsden, Manchester, Vt.

**WESTERN ASSOCIATION OF ELECTRICAL INSPECTORS.** Secretary, W. S. Boyd, 76 West Monroe St., Chicago, Ill.

**WESTERN SOCIETY OF ENGINEERS, ELECTRICAL SECTION.** Secretary, J. H. Warder, 1737 Monahan Block, Chicago.

**WISCONSIN ELECTRICAL ASSOCIATION.** Secretary, George Allison, 1410 First National Bank Bldg., Milwaukee, Wis.

## Weekly Record of Electrical Patents

### UNITED STATES PATENTS ISSUED JUNE 23, 1914.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York, N. Y.]

1,100,705. **ELECTRIC-CURRENT SHUNT.** W. L. Brooks, Schenectady, N. Y. App. filed Nov. 4, 1912. Has negligible inductance, intended for large current alternating-current circuits.

1,100,709. **ELECTRIC FURNACE.** J. W. Ewing, Lakewood, Ohio. App. filed Jan. 8, 1912. Material, such as granular carbon, moves at a uniform rate through the zone between the heating electrodes.

1,100,721. **SYSTEM OF SHIP PROPULSION.** W. E. Engh, Schenectady, N. Y. App. filed Nov. 23, 1909. Duplicate port and starboard power sets in the form of propeller-driving motors served from turbine-driven generators.

1,100,723. **POTENTIAL INDICATOR.** E. F. Gehrkins, Pittsfield, Mass. App. filed Apr. 8, 1912. For indicating voltage at some predetermined distant point on a transmission line.

1,100,731. **TROLLEY.** G. W. Hamilton,

Edgewood Park, Pa. App. filed June 28, 1911. For mine locomotives; adaptable to various elevations and lateral displacements.

1,100,736. **TRANSFORMER-TANK BREATHER.** A. Hundt, Pankow, Germany. App. filed Oct. 29, 1912. Humidity-removing means which acts only on the air passing from the exterior to the interior of the tank.

1,100,744. **TROLLEY-WIRE SPLICER.** W. H. Kempton, Mansfield, Ohio. App. filed Feb. 26, 1912. Has inclined bores for the ends of the trolley wire and clamping screws.

1,100,748. **SPEED REGULATOR.** H. A. Laycock, Schenectady, N. Y. App. filed July 11, 1913. For shunt-wound and compound-wound motors.

1,100,749. **MANUAL-CALL-DISTRIBUTING SYSTEM.** H. E. Lewis, Jr., Rochester, N. Y. App. filed Dec. 29, 1913. "Call operator" answers incoming calls and distributes the calls manually to idle operators.

1,100,767. **SIGNAL APPARATUS.** H. F. Newbury, New York, N. Y. App. filed Nov. 26, 1904. Special elevator signal system.

1,100,766. **CONTROL APPARATUS.** W. M. Scott, Radnor, Pa. App. filed Aug. 4, 1913. Motor-operated distant control.

1,100,789. **TIME-ELEMENT DEVICE.** J. G. Statter, Wilmslow, England. App. filed July 14, 1913. Slightly separated sucker elements with co-operating concave-convex conical surfaces.

1,100,792. **TROLLEY-WIRE HANGER.** N. W. Storer, Pittsburgh, Pa. App. filed Dec. 2, 1909. For catenary systems; embodies an interposed substantially elliptical strap spring.

1,100,795. **TYPEWRITING MACHINE.** C. H. Vogel, Vancouver, B. C., Canada. App. filed Aug. 22, 1910. Electromagnets complete the depression of the key initiated by the finger touch.

1,100,817. **SEMI-AUTOMATIC SIGNAL MECHANISM.** R. G. Balcan, Rochester, N. Y. App. filed Oct. 16, 1912. Dynamic indication electric interlocking.

1,100,832. **ELECTRIC FLAT-RATE CONTROLLER.** F. Kraemer, Chicago, Ill. App. filed March 14, 1907. For automatically breaking the supply circuit whenever



1,100,857. ELECTRICAL APPLIANCE; S. B. Van Rensselaer, Syracuse, N. Y., and M. Havens, Jr., Albany, N. Y., App. filed Feb. 21, 1907. Outlet socket for conduits.

1,100,859. LINE-WIRE FASTENER; T. A. Wiseman, Winchester, Mass., App. filed Sept. 13, 1912. For clamping telephone or telegraph wires to support insulator.

1,100,860. ELECTRIC INCANDESCENT SYSTEM; W. W. Wood, New York, N. Y., App. filed July 24, 1910. Ship's telephone.

1,100,883. WATTS-PER-CANDLE PHOTOMETER; H. E. Ivies, Mount Airy, Pa., App. filed March 10, 1913. For finding the voltage at which lamps will give their standard efficiency on watts-per-candle-power.

1,100,886. MEANS FOR INTERFERING THE VARIATIONS OF MAGNETIC FIELDS; F. G. Liljenroth, Minneapolis, Minn., App. filed Feb. 15, 1912. For effecting a more rapid variation of a magnetic field.

1,100,917. SIGN-FLASHING MECHANISM; W. S. Ryan, New York, N. Y., App. filed Oct. 28, 1912. Auxiliary circuit of the main rotating contact breaks the circuit with a snap action.

1,100,949. SWITCH; S. F. Briggs, Milwaukee, Wis., App. filed April 27, 1911. Auto "kick switch" with detents holding it in set position and capable of being pushed in to close a push-button circuit.

1,100,957. CIRCUIT-CLOSER; A. L. Davis, Clinton, S. C., App. filed Sept. 10, 1910. On railway track and operated by train to control traffic gates.

1,100,960. TROLLEY WHEEL; E. U. Down, Bowling Green, Ohio, App. filed Jan. 25, 1913. Special harp and brush construction.

1,100,964. MOTOR CONTROLLER; C. T. Evans, Milwaukee, Wis., App. filed Sept. 9, 1912. Compound starter for both starting and regulating.

1,100,972. ELECTRICAL FURNACE FOR THE REFINING OF COPPER AND OTHER ORES; W. H. Hamilton, New York, N. Y., App. filed Oct. 7, 1913. Plurality of shafts with electrical resistance heaters in their walls.

1,100,993. CONTACT FOR ELECTRIC FURNACES; F. T. Snyder, Oak Park, Ill., App. filed Oct. 28, 1912. Means for cooling the bottom contact or electrode.

1,100,994. DOOR FOR ELECTRIC FURNACES; F. T. Snyder, Oak Park, Ill., App. filed Oct. 28, 1912. Made to pull accurately the charging opening and reversible to keep the coolest side toward workman.

1,100,995. ELECTRIC FURNACE; F. T. Snyder, Oak Park, Ill., App. filed Oct. 28, 1912. Special roof arch or dome of brick construction.

1,100,997. APPARATUS FOR THE PRODUCTION OF OZONE; J. Steynis, New York, N. Y., App. filed Oct. 27, 1913. Dielectric tube and inner electrode both carried by the outer electrode.

1,101,014. FLAMING-ARC ATTACHMENT FOR INCLOSED-ARC LAMPS; H. G. Dyer, Colingswood, N. J., App. filed Jan. 17, 1913. For converting ordinary inclosed-arc lamps into flaming-arc.

1,101,016. ELECTRIC CAR HEATER; T. Farmer, Jr., New York, N. Y., App. filed July 6, 1913. Heater with means for communication with a continuous air duct.

1,101,018. SIGNALING CIRCUIT FOR TRAIN-DISPATCHING SYSTEMS; J. C. Field, Orange, N. J., App. filed March 30, 1911. Any way station on the line can signal any other way station without assistance of the sending or dispatching system.

1,101,027. TRANSFORMER; S. E. Johannsen, Pittsfield, Mass., App. filed Dec. 1, 1909. Straps or supports for laminations and serve for lifting the core and canopy from the casing.

1,101,033. DEVICE FOR CAPPING OFF GLASS CYLINDERS; C. T. Moore, Lancaster, Ohio, App. filed Sept. 29, 1913. Encircling heated wire with means for taking up the slack due to the expansion of the wire.

1,101,036. RAILWAY TRAFFIC-CONTROLLING APPARATUS; B. F. Oler, Elmhurst, N. Y., App. filed Nov. 26, 1912. Switch-throw-in and signaling mechanism.

1,101,039. RAILWAY TRAFFIC-CONTROLLING APPARATUS; G. R. Scattergood, Philadelphia, Pa., and H. A. Wallace, New York, N. Y., App. filed Dec. 14, 1912. Applied to cross-over having two switches.

1,101,040. RAILWAY TRAFFIC-CONTROLLING APPARATUS; G. R. Scattergood, Philadelphia, Pa., and H. A. Wallace, New York, N. Y., App. filed Dec. 14, 1912. Special indication apparatus.

1,101,050. MEANS FOR OPERATING LIQUID ELECTRIC CONTROLLERS AND STARTERS; R. F. Baerlocher, Brighton, England

App. filed Nov. 12, 1913. Time taken in starting and accelerating the motor is automatically limited independent of the speed of operating the starting lever.

1,101,064. ALPHABETIC CHARACTER DISTRIBUTING SIGNAL; G. Bell, Kensington, Eng., App. filed Oct. 17, 1908. Employing in a single-phase system a plurality of motor transformers and a supplementary transformer.

1,101,065. ELECTRICAL APPARATUS; T. A. C. Booth, New York, N. Y., App. filed Nov. 8, 1910. "Flash receptacle."

1,101,066. BURGLAR ALARM; G. A. Brewster, New York, N. Y., App. filed May 29, 1912. Can be temporarily attached to a door or window.

1,101,058. INSULATING SUPPORTING MEANS; F. E. Case, Schenectady, N. Y., App. filed April 9, 1914. For third-rail.

1,101,059. LAG PLATE; M. G. Chase, Cliftondale, Mass., App. filed April 18, 1912. For electric means; made of integral piece of sheet metal bent to form two hollow figures.

1,101,064. ELECTRIC SWITCH; J. F. Dana, Jackson, Mich., App. filed March 10, 1913. For action circuit; plurality of disks which must be set in predetermined relation.

1,101,067. ELECTRIC INTERLOCKING CIRCUITS; W. F. Follett, Orange, Conn., App. filed Jan. 19, 1909. Interlocking apparatus for switches.

1,101,068. RAILWAY TRAFFIC-CONTROLLING APPARATUS; W. F. Follett, New Haven, Conn., App. filed Jan. 3, 1911. Electric interlocking system.

1,101,069. ALTERNATING-CURRENT MOTOR; J. A. Fynn, St. Louis, Mo., App. filed July 10, 1913. Constant-speed alternating-current motor with phase compensation.

1,101,072. ELECTRIC HEATER; W. S. Hadaway, Jr., New York, N. Y., App. filed Aug. 16, 1911. Particularly for matrix driers.

1,101,078. DEVICE FOR GENERATING A STERILIZING GAS; R. A. Kiefer, Ramer, N. J., App. filed July 1, 1913. Liquid-containing vessel with submerged electrodes adapted for attachment to ordinary lamp socket.

1,101,095. ELECTROMAGNET; J. N. Reynolds, New York, N. Y., and H. D. Hill, Montclair, N. J., App. filed March 21, 1910. Armature construction for harmonic or reed bell used in telephone work.

1,101,120. RAILWAY SIGNALING APPARATUS; J. C. Coleman, New York, N. Y., App. filed May 25, 1909. Self-contained gas-generating apparatus for supplying gas to operate light semaphore signals.

1,101,127. ELECTRIC - CURRENT - CONTROL SAFETY DEVICE; L. T. Heald, New York, N. Y., App. filed March 1, 1911. Switches low-potential current onto line to set off signal and warn workmen on line that the high potential is about to be switched on.

1,101,133. SELECTIVE SIGNALING SYSTEM; J. L. Lyng, Yonkers, N. Y., App. filed Jan. 31, 1913. Signal of any party on the line may be operated instantaneously and selectively in response to operation of a calling key.

1,101,148. APPARATUS FOR THE PRODUCTION AND STRENGTHENING OF ELECTRICAL VIBRATIONS; J. Schiessler, Vienna, Austria-Hungary, App. filed Nov. 23, 1910. Luminescent arc is used for generation of electrical oscillations by means of a rotating magnet system.

1,101,175. AERIAL FOR WIRELESS TELEGRAPHY; E. Girardeau, Paris, France, App. filed Oct. 22, 1912. Conducting wires in two parts—an active part and a generally horizontal part.

1,101,197. MEANS FOR STARTING ALTERNATING-CURRENT MERCURY-VAPOR LAMPS; R. Kuch, Hradec, Germany, App. filed May 23, 1910. Has means preventing mercury forming a short-circuit between two anodes.

1,101,201. SELF-PROPELLED WHEEL; C. F. Linderoth, San Bernardino, Cal., App. filed April 18, 1913. Electric motor increased in and geared to hollow wheel.

1,101,210. TEMPORARY INSULATOR; C. W. Potter and A. F. Van Deine, Albuquerque, N. M., App. filed April 22, 1913. Insulating caps put over ends of service wires at the meter when the service is to be discontinued.

1,101,214. METHOD OF AND APPARATUS FOR OPERATING ELECTRIC MOTORS; W. Sieborm, Westfield, N. J., App. filed July 31, 1909. Mechanically coupled armatures; gradually reduces to substantial zero the field strength of the motor while maintaining a series connection between the armatures.

1,101,218. PRUSH-HOLDER; E. W. Stull, Milwaukee, Wis., App. filed June 7, 1909.

Spring and rocker construction to give constant tension at all times.

1,101,243. MECHANISM AND MEANS FOR HEATING WATER AND OTHER MEDIUMS OR FLUIDS; G. G. Bell, Kensington, Eng., App. filed Jan. 27, 1913. Water heated in strata, beginning at the top and working downward.

1,101,251. MERCURIO-ELECTRIC FIRE ALARM; L. Cavalier, West Maitland, New South Wales, Australia, App. filed March 8, 1912. Has a bent mercury tube with one end of the tube soldered to the other.

1,101,254. CIRCUIT - CONTROLLING APPARATUS; P. E. Collins, Boston, Mass., App. filed May 11, 1907. Electro-pneumatic timed sign flasher.

1,101,256. ELECTRICAL IGNITION APPARATUS; W. H. Cotton, Chicago, Ill., App. filed July 9, 1907. Spark plugs mounted in a valve pocket.

1,101,272. ELECTRIC SWITCH; P. E. Gilling, East Orange, N. J., App. filed Nov. 3, 1911. Detachable handle for the switch lever provided with a control linkage button.

1,101,278. APPARATUS FOR THE ELECTRICAL PURIFICATION OF WATER; H. B. Hartman, Philadelphia, Pa., App. filed Aug. 11, 1911. First subjects water to electrolytic action and thereafter separates out the precipitate.

1,101,289. ELECTRIC SOCKET AND CONNECTOR; G. C. Knauff, Chicago, Ill., App. filed Feb. 21, 1913. Bayonet slot-plus connection with wire sockets.

1,101,327. ATTACHMENT FOR OILERS; E. H. Philbrick, Rockland, Maine, App. filed April 19, 1913. Flash-light mounted upon handle of the oiler.

1,101,360. ELECTRODE TERMINAL FOR ELECTRIC HEATERS; J. T. Schuler, Pforzheim, Germany, App. filed Jan. 15, 1914. Expandable joint at the point where terminal member makes connection with the heater casing.

1,101,374. RAILWAY SIGNAL; H. S. Williams and L. G. Wilson, Columbia, S. C., App. filed Aug. 31, 1910. Operates upon destruction of any part of the track structure.

1,101,370. BRAKE; J. A. Williams, McColl, S. C., App. filed June 21, 1913. Electromagnetically operated band brake using current from lighting and ignition circuits on auto.

1,101,377. LAMP RECEPTACLE; R. Abbott, Bridgeport, Conn., App. filed Nov. 13, 1912. Outlet fixture with a chamber and terminals to receive Edison-type signal lamp with the lamp base parallel to the faceplate of the fixture.

1,101,384. ANTI-SPARKING DEVICE FOR DYNAMO-ELECTRIC MACHINES; L. R. Auvert and P. E. Ferland, Paris, France, App. filed July 25, 1913. Substitutes field of the rotary transformer with a metallic casing.

1,101,403. WARP STOP MOTION FOR LOOMS; T. A. B. Carver, Glasgow, Scotland, App. filed June 8, 1912. Knock-off mechanism and contacts held out of engagement with the adjacent dents by unbroken warp threads.

1,101,447. ELECTRIC METHOD OF WELDING; E. H. Jones, London, England, App. filed Feb. 26, 1914. Uses water-cooled welding roller for pressing together edges to be welded.

1,101,448. ELECTRIC WELDING APPARATUS; E. H. Jones, London, England, App. filed Feb. 27, 1914. Water-cooled welding roller to be used as a hand tool.

1,101,452. AUTOMATIC TICKET REGISTERING SYSTEM; A. Kiparski, St. Petersburg, Russia, App. filed April 9, 1912. Counts the number of tickets withdrawn from each ticket box.

1,101,453. APPARATUS FOR AUTOMATICALLY TOTALIZING TICKETS; A. Kiparski, St. Petersburg, Russia, App. filed April 9, 1912. Prevents further issuance of a ticket from a box until the preceding ticket has been registered.

1,101,491. SYSTEM FOR PRODUCING HIGH-FREQUENCY CURRENTS; E. Girardeau and J. Betheron, Paris, France, App. filed June 9, 1913. Has a continuous-current armature connected in series with the high-frequency discharge circuit.

1,101,494. AUTOMATIC SWITCH FOR FLASHERS AND FROM CHICAGO, Ill., App. filed May 10, 1913. Embodies a pair of magnets with a pair of associated switches and a pair of associated dash-pots.

1,101,495. FLAT-RATE CONTROLLER; F. Kraemer, Chicago, Ill., App. filed Jan. 14, 1909. For preventing unauthorized use of current.

1,101,503. APPARATUS FOR REMOVING SNOW AND ICE FROM RAILS; D. C. Joyce, Philadelphia, Pa., App. filed Nov. 10, 1910. Electrically heated shoe for melting the snow and ice, and means for taking up the resulting water from the rails.

# Electrical World

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**Politics in Chicago Board** Much comment has been aroused by the removal by Mayor Harrison of Chicago of Mr. George Weston as a member of the Board of Supervising Engineers, Chicago Traction, and the appointment to fill the vacancy of Prof. Edward W. Bemis, the well-known and able public utility expert. The reason announced by the Mayor for the removal of Mr. Weston is that he wants to have the city represented on the board by a member more aggressively active in guarding the city's interests. We think that it cannot be successfully maintained that the board has failed to do the work for which it was created by ordinances. The major part of the work allotted to the board was finished long ago. It consisted of supervision of the rehabilitation of the properties. With that great task out of the way, the subsequent duties of the board are less important. The real basis of the objection of the Mayor to Mr. Weston appears to be dissatisfaction because the board has not promoted his personal plan for subway construction. The complaint, then, is not that Mr. Weston was not aggressively active in guarding the city's interests, but that Mr. Weston was not aggressively active in guarding Mayor Harrison's interests. The complaint is not that the board did not comply with the provisions of the ordinances, but that it did not try in every way to carry out his individual ideas for subway development. The appointment of Professor Bemis will give the Mayor a voice in the affairs of the board, but it will not give that control of the board which the Mayor would like in order to make his ideas of subway development effective.

**Regulation of Utilities** The discussion on "State Regulation of Public Utilities" in the last number of the *Annals of the American Academy of Political and Social Science* deals with the subject more from the commission than from the company point of view. It reveals the ideas of authors who in the main present the efforts and arguments of the commissions, and it merits careful study. If it had included articles by the regulated in addition to those by the regulating, it would have given a better survey of regulative conditions as a whole. With so many authors and the wide latitude that it was necessary to give them in their treatment of the subject it is not strange that there is some duplication of fact and argument. There is not more, however, than would naturally be expected in such a compilation. The program of regulation has advanced so far that much of what

is written on this subject appears to cover first principles. It should be remembered, however, that what is elementary in the states where regulation is now an old story is exceedingly important in states where regulation is just getting well under way. One of the most interesting of the articles, by Mr. Eshleman, of California, is on the question of whether the commissions should have control of the issue of securities. Mr. Eshleman answers this in the affirmative. It would have helped in solving a problem which needs much light if the negative could have been presented by an equally prominent member of a commission who thinks that state control is unwise. No problem in regulation is more far-reaching. We cannot see how the state can control the issue of securities without at the same time assuming a moral if not a legal responsibility therefor. Desirable as this is for investors, the states should be fully aware of the obligations, if any, that they assume.

## **Bills and Friendship**

Officials of electric central stations are congratulated frequently on the fact that it is not necessary in the performance of their duties to have much direct contact with the public. Opportunities for contact with the public can be turned into either intangible assets or liabilities. The great obstacle is that the officials who would try to turn them into assets are not always at hand, and that the representatives who blunder into mistakes which make trouble for the company are likely to be in evidence. Because it is not easy to get men who can meet the public with unfailing courtesy and willingness to please, most officials are glad to have their organizations relieved of frequent direct contact with consumers. It is a satisfaction to these officials to know that as a rule the electrical central station has not much to do with its consumers after service is installed unless there is a question about the monthly bill for energy. Bills are commonly supposed to be a mere matter of form. There is some danger, however, that they may be accepted too readily as a matter of form, and that for that reason an opportunity to create satisfaction and prevent dissatisfaction may be overlooked. A consumer with a complaint about a bill is entitled to explanation and satisfaction. He is entitled to it as a matter of courtesy and business. One complaint by letter, telephone or call is enough. If that is not met properly by the company and a desire to straighten out a difficulty is not made plain to the consumer, the company's policy in this respect is bad policy and will make



trouble later. Though relieved of the necessity of constant direct relations with the public, from which electric railways suffer seriously, central stations cannot afford to lose any opportunities for cultivating public friendship.

### The Boston Edison Service Buildings

To many persons the generation and distribution of electricity constitute the alpha and omega of central-station practice, and the auxiliary activities of a modern progressive company of large size are frequently overlooked by those who have never been behind the scenes. Elsewhere in this issue we take pleasure in lifting the curtain from the new general service buildings of the Edison Electric Illuminating Company of Boston, which form the most complete plant ever established by an electric-service company for handling efficiently those features of its work involved in maintenance, stock-keeping, transportation, research, testing, and employees' welfare. Erected at a cost of over a million dollars, designed from basement to roof to meet the demands of the modern efficiency expert, and provided in every department with equipment selected and arranged by men of long experience in the internal administration of the company's affairs, with the able counsel of its engineering staff and valued assistance from without, the result is a revelation.

Space does not permit summarizing here the salient features of the installation otherwise than to point out that specialists in many branches of central-station work will find much to interest them in the descriptions of the various departments housed in the Massachusetts Avenue group, in the illustrations of equipment planned to reduce costs wherever such opportunity appeared, in the extended adoption of labor-saving appliances, protection of stock and machinery against fire, use of the motor drive, routing of supplies, garaging of motor vehicles, and in the provision made for employees' welfare in its broadest sense. Any one of the component buildings of the plant would furnish material for an article in itself and no apology is offered for the amount of space given to the subject, for it is the first time the central-station industry has seen anything so comprehensive planned and built from the ground up without the usual limitations of space and with efficiency as the sole criterion of expenditure. The non-specialist reader will be surprised at the amount of work which such a company is obliged to do outside the immediate fields of station operation and new-business getting, and the executive, we are confident, will see in the co-ordinated installation a striking example of modern scientific management.

For us to single out any one department for special mention seems almost invidious, but surely the perfection of detail evident in the laboratory building and in the equipment of the electric garage will call forth the admiration of the reader, as must also the welfare facilities and the shops of the meter and lamp divisions. Here has been created a great industrial plant and a center of employees' activities, business and

social, which will long be of service, and President Edgar and his associates in the Edison Electric Illuminating Company of Boston are to be congratulated upon the successful completion of what may truthfully be called a model for the larger central stations of the country.

### Interruptions on Transmission Circuits

A valuable outline of the conditions which affect the continuity of service on a high-voltage transmission line was given in a paper by Mr. P. Ackerman read before the Canadian Electrical Association. Nothing is more curious than the variation in continuity of service between one system and another under apparently similar conditions. The system of the Toronto Power Company seems to be a little unusual in the large number of troubles attributable to lightning, 80 to 90 per cent of the whole as reported by Mr. Ackerman. The territory covered by the system is certainly one in which thunderstorms are frequent, yet other systems having at least as great frequency of danger experience a smaller proportion of troubles due to this particular cause.

Lightning is an enemy of most unexpected directions of attack. Sometimes one of two lines apparently similar in all essential respects will be in continual trouble from lightning and the other reasonably free from it. No one has yet succeeded in determining why lightning strikes just where it does, although in a general way certain localities have acquired sinister reputations associated with apparent inducing qualities like the presence of high ridges over which the transmission line passes, or valleys which seem to be a favorite haunt of storms. At all events it is well understood that remedial measures can be applied even where conditions are very bad. Station apparatus can now be effectively safeguarded by the use of well-known types of lightning arresters, so that actual damage to apparatus is relatively rare. In many instances the line itself can be effectively protected by the usual arrangement of grounded guard wires, yet for some reason apparently inexplicable this precaution frequently fails of its purpose.

The sources of trouble to which Mr. Ackerman refers are chiefly those which do not involve the destruction of apparatus, but rather those which come from damage at the insulators either through puncture followed by an almost explosive rush of current or by "flashing over," with the subsequent arc which may destroy the insulators and burn off the line. On a modern steel-tower system one depends entirely on the insulators for security and when these fail the line is likely to be put out of service in the course of a very few seconds. On wooden-pole systems the lightning will frequently splinter more or less severely a succession of poles, jumping off perhaps at every insulator, yet without permanent damage sufficient to cripple the line. With steel poles and pins attention must be concentrated directly on the insulator itself. Mr. Ackerman's experi-

ence is very instructive in this matter. The insulators concerned are well-designed ones of porcelain, of the pin type. It is found that so far as interruption of service is concerned the danger of puncture is much greater than that of flashing over. A puncture is often followed instantaneously by a rush of current to the pin that not only completes the destruction of the insulator but burns off the line before the overload relays have a chance to act. The flash-over may also cause the wrecking of the insulator and the loss of the circuit. As, however, this result is less frequent than in the former case, Mr. Ackerman's attention was very largely directed to the proper testing of insulators against puncture. In Mr. Ackerman's opinion the puncture test voltage should be twice that required to produce a flash-over, and the latter, of course, should have ample leeway over any operating voltage likely to be found on the line.

Experimental investigation of the relation between puncture and flash-over voltage showed that it is easy to obtain by a suitable test puncture-resisting strength sufficient at least to insure the probability of a flash-over without puncture, and the next step was to investigate the remedial measures to prevent arcing in a flash-over powerful enough to injure the line.

Some interesting experiments were made with a modification of the horn device applied at the insulators to keep the flash-over from being localized. Better than this, however, proved to be an arc-extinguishing device installed at the station, consisting of an overload relay acting to cut across the line instantaneously through a high-tension fuse. This incipient short-circuit acts to draw away current from the damaged insulator, stopping the arc there and blowing the fuse so quickly that the effect on the line is only a momentary flicker on the voltage, after which service goes on as usual. This scheme is reported to work excellently for flash-overs, and Mr. Ackerman remarks that the first requisite for its success is an insulator that will not be punctured, especially—we may add—because this particular treatment is likely to start a minor surge which may impose unusual strains. Nevertheless, if so simple a scheme can check any considerable proportion of line interruptions it is worth a trial.

Mr. Ackerman notes one curious and interesting fact which ought to be investigated further regarding the weaknesses which become evident after the lapse of considerable time even in insulators which have withstood every reasonable test. Just why a porcelain insulator should occasionally give way after a year or two, in the absence of any unusual strain or mechanical injury, is not easy to understand. It is possible, of course, that there may be a certain amount of weathering at the surface, aided perhaps by slight electrolytic action at the supports, or the effect may even be a purely mechanical one due to a perpetual minute grinding by reason of the working of the conductors over their support. Whatever the cause, the effects are unpleasant, and it will be important to note whether they occur to the same extent in the case of

suspension insulators as with the ordinary pin type here considered.

### Electrification Problems

In a brief paper read before the Canadian Electrical Association Mr. J. A. Shaw entered a conservative plea for high-voltage direct-current traction. As in many similar discussions, the outcome hinges on the assumption made for the installation. In comparing single-phase and direct-current traction the author has proceeded on the assumption that in the former case energy for the system would be taken from the lines of some existing supply company and at a frequency which would compel the use of converting stations, the first cost and operative expense of which, together with the loss of efficiency entailed, would put them about on a parity with those necessary with the direct-current system. In some instances the assumption may be justified, but we are rather inclined to the opinion that with a really large electrification project it would be found desirable either to have absolute control of the transmission system or to secure energy by placing suitable generators at existing hydroelectric plants. The result of the author's hypothesis is, of course, to turn the scale toward direct current, in this case bringing to substantial equality in cost of energy and in cost of equipment the 2400-volt direct-current and the 11,000-volt single-phase system.

Perhaps the most uncertain point of all in the comparison, whether made as from Mr. Shaw's hypothesis or otherwise, is the matter of maintenance on the two types of locomotive. As regards the efficiency of the equipments, Mr. Shaw is probably right in judging that there is no material difference, but it is certainly not pertinent to quote the maintenance costs of the direct-current and alternating-current locomotives in use around New York as typical, since the so-called single-phase machines had to be equipped for working on both systems with a complete double set of collecting and control devices, and with the added difference that the alternating-current machines were deliberately made, for convenience, of a somewhat smaller output than the direct-current locomotives. When figures are obtainable from some of the large foreign alternating-current systems using heavy locomotives it will be possible to make a comparison on much more certain data. Considering the fact that the alternating-current system has been tentatively chosen for the Swiss railways, largely on the ground of operative superiority, it would seem only fair to assume that there is little to be feared in this particular matter. While following rationally from the data chosen and well worth careful reading by all engineers interested in the subject, Mr. Shaw's discussion of the whole matter does not seem to throw any new light on a situation which is certainly at present sufficiently befogged. The direct-current work now under way at 2400 volts will answer many questions as to the relative economy of the two rival methods of traction. Every friend of electrification will heartily wish success for the new undertaking.



# The News of the Week

## Activities and Events in the Electrical Field— Reports of Meetings—Commission Findings, Etc.

### Majority and Minority Reports on Public Ownership in District of Columbia

The committee on the District of Columbia of the House of Representatives has made a favorable report on the Crosser bill, which provides for public ownership of the electric railways in the District of Columbia. The minority members of the committee have obtained from Congress thirty days in which to submit a minority report. It is expected that this report will be presented about the end of July or the first part of August.

Mr. Theodore W. Noyes, editor-in-chief of the *Washington Star*, published in the issue of that paper for July 3 a long article against the Crosser bill. He declared that the District should approve the procedure of admonishing and threatening the public service corporations into more hearty co-operation with the Public Utilities Commission, but that the legislative advance of the bill should be abruptly halted at this point. He declared that public ownership under the Crosser bill is premature, unnecessary and unwise.

### Insurance for Employees in Pittsburgh

The Duquesne Light Company, of Pittsburgh, has taken out an insurance policy for all employees who have been in its service for one year or longer. The insurance was taken out with the Equitable Life Assurance Society under the group-plan arrangement. Employees who have been in the service for two years or more will be insured for an amount equal to one year's salary, payable in the event of death in twelve equal monthly payments to any beneficiary designated by the employee insured. Employees in the service one year and less than two years will be insured for an amount equal to one-half of one year's salary, payable similarly. No policy will be issued in excess of \$2,400. In the light company, railways company and other Pittsburgh properties controlled by the Philadelphia Company more than 14,000 persons have received insurance in this way.

### Iron and Steel Electrical Engineers

The following papers will be presented at the eighth annual convention of the Association of Iron and Steel Electrical Engineers, to be held at the Hotel Statler, Cleveland, Ohio, Sept. 14 to 19:

"Some Electrical Problems Practically Considered," by Mr. B. G. Lamme; "Statistical Data of Electrical Application in the Iron and Steel Industry," by Mr. R. Tschentscher; "Applications of Auxiliary Apparatus in Iron and Steel Mills," by Mr. Stewart C. Coey; "Load and Use Factors as Applied to Motor Installations," by Mr. H. M. Gassman; "A Synchronous Condenser Installation for Power-Factor Correction and Voltage Regulation," by Mr. W. O. Oschmann; "The Apprenticeship System as Applied to Steel Mills," by Mr. B. W. Gilson; "Cables and Accessories," by Mr. J. C. Bowman; "Underground Transmission in a Steel

Plant," by Mr. F. D. Egan; "Hot Metal Cranes for Steel Mill Service," by Mr. R. J. Mullally; "The Control of Induction Motors for Rolling-Mill Drive," by Messrs. Wilfred Sykes and G. E. Stoltz; "Magnetic Control Characteristics," by Mr. H. F. Stratton; "Alternating-Current and Direct-Current Magnetic Controllers for Auxiliary Motors," by Mr. W. O. Lum; "Switchboard and Switching for Steel Mills," by Mr. Saul Lavine; "Machine Tool Drives," by Mr. Charles Fair; "Condensers and Their Auxiliaries," by Mr. P. N. Ehrhart; "Silent Chain Power Transmission," by Mr. F. L. Morse; "Organized Safety," by Mr. L. R. Palmer; "High Candle-Power Incandescent Lamps for Steel Mill Illumination," by Messrs. G. H. Stickney and A. B. O'Day; "Transformer Construction for Steel Mills," by Mr. G. A. Waters; "Watt-Hour and Ampere-Hour Meters and Their Application in Steel Mills," by Mr. R. C. Lanphier; "The Flaming-Arc Lamp in the Iron and Steel Industry," by Mr. Allen T. Baldwin. Mr. W. T. Snyder, McKeesport, Pa., is secretary of the association.

### Electric Power Club Approves Single Rating

At the recent meeting of the Electric Power Club at Hot Springs, Va., attended by representatives of most of the manufacturers of electrical machinery in this country, both large and small, Mr. Charles Robbins, East Pittsburgh, Pa., read a paper on the subject of single rating of electric motors. All special-application motors used for crane, elevator, machine-tool and railway work are now so rated, but the bulk of general-purpose motors are still sold with a time-overload rating in addition to the nominal rating, and it was recognized that any immediate change in practice would cause considerable confusion in the trade. The members of the Electric Power Club unanimously adopted a resolution expressing entire concurrence in the principle of single rating and instructing the different committees to work constructively toward the single-rating method in all standardization work. The club's committee will co-operate with those of the A. I. E. E.

Prof. F. B. Crocker, Ampere, N. J., president of the club, also presented a paper defining the proper limits of standardization work. The club officially adopted 550 volts as a standard pressure for direct-current motors, in addition to 115 volts and 230 volts. For direct-current generators 600 volts was accepted as standard, in addition to 125 volts and 250 volts. For alternators the standards adopted were 240 volts, 480 volts, 600 volts and 2400 volts.

### Utah Company and Government Land

Judge Marshall of the United States District Court at Salt Lake City, Utah, has rendered a decision against the Utah Light & Railway Company in a suit brought against it by the government. The company was enjoined from occupying government land with portions of its hydroelectric power works, pipe line, diverting dam and power house in Big Cottonwood Canyon.

### Westinghouse Strike Situation

The Westinghouse Electric & Manufacturing Company and other companies in the East Pittsburgh district which have been affected by the strike have advertised in large cities of the country for men to take the vacant places in the plants.

Mr. E. M. Herr, president of the Westinghouse Electric & Manufacturing Company, when in New York on July 7, said that the situation looked more favorable than at any other time since the men went out. He said that men were returning to work each day and that several hundred returned on July 6.

### Condition of Water-Power Legislation

It is understood in Washington that several more White House conferences may be necessary before the executive and legislative branches succeed in untangling what they call the difficult situation relating to proposed legislation concerning water-powers in navigable streams and on public lands.

Advocates of such legislation at this session of Congress who do not approve of specific plans offered in the bills now before the House, or who approve of one bill and not another, are hoping to find that the difficulties will make it impossible to pass any legislation at this session, and tactics connected with delay have been brought into play. In view, however, of the active interest of President Wilson, the Secretary of War and the Secretary of the Interior in the subject, and the announced intention of administrative leaders to force legislation at this session of Congress, there is little doubt that an agreement on the proposed legislation will be reached and that it will probably be one supported personally by President Wilson.

There is a rumor in Washington of a disagreement on the subject of water-power legislation between the Secretary of War and the Secretary of the Interior. The possibility of such a disagreement lies in the fact that if both bills now before Congress are passed the Interior Department will lose to the War Department a certain amount of authority.

The Adamson bill for developing navigation and the water-power resources of navigable streams was to have come up before the House on July 2. It did not come up, thus halting the Ferris public domain dam bill, which was to have followed it in the House. Instead, it was announced that it would be necessary to have further conferences at the White House concerning both measures. These conferences are continuing, and the subject is taken up constantly at Cabinet meetings.

Secretary Garrison and Secretary Lane originally agreed upon six proposed amendments to the two bills and submitted them to the House leaders. They proved unsatisfactory to the House leaders, who are now dividing themselves into "conservatives" and "radicals." The Ferris bill, reported by the committee on public lands, was prepared under Secretary Lane's direction and represents the ideas of the "conservationists." The Adamson bill, reported by the committee on interstate commerce, was the result of hearings at which many water-power authorities were heard. The War Department is behind the Adamson measure.

If the Adamson bill passes, it will take authority away from the Forestry Service and the Interior Department and give it to the War Department. It will give to the power companies the future increase of values resulting from growth in population and industry. The Adamson bill does not limit or control capitalization of power companies.

In the House a determined fight is being organized against the Adamson bill. Representative Murdock has announced that he intends to lead such an opposition, assisted by Representatives Henry T. Rainey, Martin D. Foster and Graham.

A number of amendments to the Adamson bill have been framed, ready for presentation as soon as it comes up. On the other hand, water-power authorities who believe the bill is what it should be are flooding Congress with telegrams advocating its passage, and the statement is made in Washington that these telegrams are doing the bill more harm than good inasmuch as many of them are identical in language and seem to show a common source of inspiration.

### Revision of Patent Laws

The House of Representatives on July 6 passed two measures dealing with patent affairs. One is an act to amend the Revised Statutes so that it shall no longer be necessary to have patent applications attested by two witnesses, and the other is an act providing that the Commissioner of Patents of the United States shall exchange with the Dominion of Canada Patent Office copies of patents now in the United States Patent Office and hereafter issued.

During the debate and passage of the acts the curious fact was developed that the principal reason why the House committee on patents recommended in its report the adoption of the resolution providing for the exchange with Canada was that such an exchange system would result in there being filed in Canada copies of United States patents away from danger of fire in the present Patent Office in Washington.

The report brought out the fact that the danger of destruction of the Patent Office by fire in Washington is imminent. The copies of patents already printed and on hand in Washington are stated to have cost the government about \$50,000. Representative Mann caused the Democratic majority in the House some discomfort by bringing out the fact that the government is giving away \$50,000 worth of property rather than build a new Patent Office in Washington that would be fire-proof.

It was developed that the system of exchange with Canada was in effect ten or twelve years ago, but was discontinued. Representative Oldfield called attention to the fact that there is already in existence an exchange system of patents with other countries which aids the research work of the Patent Office.

### Vacuum Cleaners Used to Dust Pullman Cars

Four motor-driven vacuum cleaners, and the electric-service outlets from which to operate them, have been installed at Memphis, Tenn., by the Pullman company for cleaning cars delivered to that terminal. Mr. W. H. Bucher, local manager of the Pullman company, announces that tests are being made on the new equipment which if satisfactory will lead to the adoption of vacuum cleaning at all terminal stations. The railroad yards at Louisville are also being wired for vacuum-cleaner service.

Each cleaner is operated by a 1-hp direct-connected motor. By using one of these devices two negroes can clean a car in two hours, thus making it possible to renovate thirty cars a day with the equipment installed. The cleaners are first used as blowers for removing the dust and dirt from the ceilings of the cars. Then the air current is reversed, and the seats and carpets are cleaned by the vacuum principle.



## Results of First Five-Year Period of Commonwealth Edison Employees' Savings Fund

On July 1, 1914, the first five-year period of the Employees' Savings Fund of the Commonwealth Edison Company of Chicago came to an end. The results of this unique undertaking have been very profitable to the employees who subscribed to the fund, and they all seem pleased. The company benefits by this feeling of satisfaction and also by adding materially to its number of small stockholders.

The plan was that an employee might deposit either 3 per cent or 5 per cent of his monthly wages with the treasurer of the fund, as in a savings bank, receiving interest at the rate of 6 per cent compounded semi-annually, provided he kept his money in for five years. The employee received a pass-book in which his deposits were entered. Membership in the fund was in no wise compulsory, every employee receiving his full salary monthly and voluntarily tendering the percentage which he elected to deposit in the fund. In almost all cases this was 5 per cent. It was provided that at the end of the five-year period the depositor might receive his money back with the 6 per cent compound interest in cash, or, if he preferred, might receive stock in the company at par (from a fund of treasury stock set aside for the purpose), so far as the total of his deposits and interest would buy even hundred-dollar shares of the company's stock. It is of interest to see how the plan has worked out in actual practice.

### An Example of the Plan of Operation

For illustration, the case may be taken of a man earning \$60 a month who deposited \$3 a month for the five-year period, or \$180 in all, it being remarked that if the man's salary was changed during the period he was allowed to deposit 5 per cent of the new salary. In closing out the account as of July 1, 1914, it was found that such a man's deposits, with interest compounded according to the rules, amounted to \$209.82. For this he was entitled to two full shares of the Commonwealth Edison Company stock at par, the balance of \$9.82 being deposited to the subscriber's new account in a new five-year savings fund known as Series B. It may be remarked that the company's stock is now paying 8 per cent.

In addition to this \$209.82, however, the committee sent a check for \$44.06 as the subscriber's pro rata share of the profit made in handling the fund during the period covered by the Series A fund. This profit was made from the fact that the dividend rate was raised twice during the five-year period; also from the fact that a 10 per cent stock dividend was issued, while other stock was issued at par. In all of these profits the stock held by the committee for the benefit of the Employees' Savings Fund participated. Thus the entire cash receipts of the man who deposited \$180 were \$253.88. However, the two shares of Commonwealth stock are actually worth at the present (July 1) market value \$270—they could be taken by the owner and sold for that—so that the entire return on the final investment of \$180 was \$323.88. This shows a profit of \$143.88, or \$28.78 for each of the five years, which is an annual profit of 31 per cent on the average investment of \$90.

### Conditions of Eligibility for Savings Fund

To be eligible for the savings fund the employees of the company must have been in the service of the organization for one year or more. On May 1, 1914, there were 3132 eligibles in the company. Of these 2051 were members of the Employees' Savings Fund. Up to July 1, 1914, the amount actually paid into the fund by depositors amounted (with interest) to about \$325,000.

On the date mentioned 314 accounts came to maturity, and this means that about 275 new stockholders were added to the company's list, the others being already stockholders.

As other accounts mature (as they will from day to day) under the Series A arrangement, other new stockholders will be added, until a total of about 2000 new stockholders will have been added through the means of this fund. The Series A fund will terminate on July 1, 1919, and the Series B fund will terminate on the same date.

### Plan of the New Series B Fund

The arrangement for the new Series B fund, just begun, are somewhat different from those for the original Series A fund. The investment price of the company's stock for the Series B five-year period is fixed at \$120 per share instead of the par value fixed in the Series A arrangement. However, this is still fifteen points below the present market value. It is provided that if during the five-year period the subscriber is placed under the service-annuity rules of the company his subscription in the savings fund shall cease and he may withdraw his deposits, together with 6 per cent compound interest. The rate of interest in the Series B fund, as in Series A, is 6 per cent compounded semi-annually. In the Series B fund the subscription periods of all subscribers terminate at the same time—that is, on July 1, 1919—unless sooner terminated according to the carefully drawn rules and regulations of the fund.

The committee in charge of the Employees' Savings Fund consists of Messrs. Samuel Insull, Henry A. Blair, Benjamin Carpenter, Louis A. Ferguson, J. H. Goehst, W. L. Abbott and P. Junkersfeld. Mr. Insull is chairman of the committee and Mr. William A. Fox, vice-president of the Commonwealth Edison Company, is in charge of finances, securities and claims, is treasurer of the Employees' Savings Fund. Mr. John F. Gilchrist is secretary of the committee and Mr. John H. Gulick is auditor.

### Slow Progress of Trust Legislation

With at times but fifteen or twenty Senators present the bill reported by Senator Newlands' committee providing for the proposed federal trade commission has continued under debate during the past week. It is said in the Senate that the much-discussed fifth section of the bill, which provides that "unfair competition" shall be unlawful and leaves to the commission the determination of what is "unfair competition," is to remain in the bill. The language of the section may be changed in some respects, but the principle, it is stated, is to remain in the measure. This information is the result of a canvass of the Senate interstate commerce committee, which reported the bill.

At the time the bill was reported there was but one Democrat on the committee who voted against this section. He has since changed his mind and has decided to support the section, and it is announced that a number of Republican senators also will support this section, including Senator Cummins.

It is expected that the language of the section will be changed to make it clear that the courts are to have the final decision in all matters which the proposed commission considers involve "unfair competition."

Speaking on this section of the bill, Senator Borah who is leading the debate against the whole bill in the Senate, declared that the Sherman law compels competition, while the fifth section of the proposed law will make some forms of competition illegal. He declares that the ultimate result of the proposed law will be to

provide a buffer against the enforcement of the Sherman law.

Senator Newlands, who is leading the fight for the bill, replied to Senator Borah, as follows:

"It seems to me that it would be folly for us to attempt to define each practice so as to cover the field, because we have the testimony of experts in business that unfair competition is so multifarious that if we condemn twenty practices to-day twenty more will be invented to-morrow. So we must have some general rule."

Senator Newlands, while admitting that combinations had got rid of much "brutal competition," declared that they had accomplished this end by creating monopoly.

"We wish to get rid of it, not by creating a monopoly, but by establishing a fair competition that is in good accord with the moral law," said Senator Newlands.

The Senate is having great difficulty in maintaining a quorum to debate the bill. A number of Senators have gone to Europe, and others are at their homes in the different states. During the week the charge was made on the floor of the Senate that the attempt to pass legislation of such great importance with so few members of the Senate in Washington to discuss it and work upon framing it constitutes "a public scandal."

The Democratic Senate caucus has met and passed a resolution that Congress shall stay in Washington at this session until the anti-trust legislation included in the so-called administration program has been passed. This is binding upon the Democrats, who are in the majority.

### Big Meadows Dam in Service

Following the completion of the new hydraulic-fill dam at Big Meadows, Cal., the site was visited recently by a party of Great Western Power Company officials, including Messrs. Mortimer Fleishhacker, president; Guy C. Earl, vice-president; E. W. Beardsley, superintendent, and J. M. Howard, chief engineer. Mr. Fleishhacker reported that the reservoir now covers an area of about 30 sq. miles, being 10 miles long and about 8

miles in width at the widest point. The party traversed the lake in a tug, and it was noted that in the tributary watershed only a small portion of the snow had melted, although the 250,000 acre-ft. of water in the lake was collected in May and an overflow of several thousand second-feet has continued since. Mr. Fleishhacker said he had no doubt that there would be an ample water supply for the ultimate storage capacity which the company plans to provide by adding 15 ft. to the height of the dam and thereby flooding an additional 12 sq. miles. The spillway in the dam is made large enough to pass 50,000 second-ft., or five times the amount of the maximum flood on record. Within a distance of 12 miles below the reservoir there is a total drop in the stream bed of over 2000 ft.

### Electric Illumination Supplants Pyrotechnic Displays on New York's Fourth

Extensive and elaborate electrical illumination of parks and public buildings was employed in New York on July 4 as a "safe and sane" substitute for dangerous forms of patriotic expression. More than 26,000 red, white and blue incandescent lamps having an aggregate rating of over 1,000,000 cp were used for decorative purposes on Manhattan Island alone. These included a number of very large high-efficiency nitrogen-filled lamps. The famous old City Hall, as shown by the accompanying illustration, was one of the buildings to be elaborately decorated. Cornices, balconies and water tables were illuminated so as to present dazzling bands of light, and strings of incandescent lamps were employed to outline the tower and dome.

Numerous other public buildings and monuments were similarly lighted, while parks devoted to public speaking, moving pictures, exhibitions of folk dancing and other entertainments were decorated with festoons of colored lamps. The lamps, wiring and energy for the illumination of the municipal buildings were furnished gratis by the New York Edison Company.



NEW YORK CITY HALL IN FOURTH OF JULY ATTIRE



### Curtis Steam Turbine Development

Much interesting information concerning the evolution of the steam turbine was given in an opinion filed in connection with a suit concerning United States patents Nos. 566,969 and 595,435, issued on Sept. 2, 1896, and Dec. 14, 1897, to Mr. Charles G. Curtis. The opinion was rendered by Circuit Judge J. Buffington on an appeal from the District Court of the United States for the Eastern District of Pennsylvania in a suit brought by the International Curtis Marine Turbine Company and the Curtis Marine Turbine Company of the United States against the William Cramp & Sons Ship & Engine Building Company.

It seems that the pioneer work in the development of commercial turbines was carried on along two radically different lines. In 1884 the Hon. C. A. Parsons took out British patent No. 6735 covering the practical application of the reaction principle as applied to steam turbines. In its essential aspects to-day the Parsons turbine closely follows the ideas of its inventor. In 1889 De Laval filed application for a patent on a turbine of the impulse type.

Parsons and De Laval were successful in overcoming the objection common to both types, that is, the inherently high rotative speed of the machines compared with the speed of the electric generators or other apparatus they were to drive. Parsons succeeded in reducing the speed to practical limits by using a very large number of reaction blades, expanding the steam by small steps through each. De Laval on the other hand, using a single wheel, developed his flexible shaft which permitted the wheel to run at very high speed, and then perfected a reduction gear to transmit the power at lower speed to the driven apparatus.

It was in 1896 that Mr. C. G. Curtis secured patent

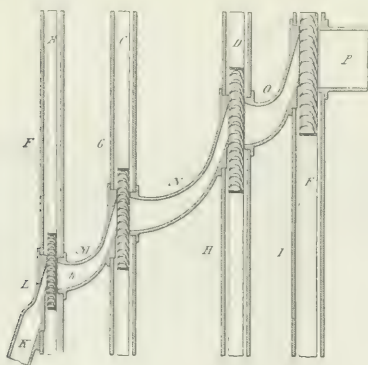


FIG. 1—TURBINE STAGING

No. 566,969, covering a turbine of characteristics different from those of either of his predecessors. His original ideas are well expressed in the testimony recently submitted in the patent suit referred to above. The point at issue in this litigation was whether or not the original Curtis patent covered impulse turbines using more than one stage, with one or more rotating rows of buckets per stage. In testifying in this case Mr. Curtis said:

"After giving the subject a great deal of thought, it seemed to me that it would be possible to devise a machine which could be run at a much lower speed of revolution than any turbine of which I was aware, that would have an even higher efficiency, sufficiently high to enable it to take the place of the steam engine in

large units. At the same time the machine could be made very rugged and mechanically simple, and the necessity for small blade or bucket clearances eliminated. I remember being very much struck with the fact that no machine having these characteristics had yet been produced, although a great amount of thought and experiment seemed to have been devoted to the subject."

The object which Curtis had in mind was the production of a highly efficient machine of comparatively low speed. His original patent shows that this was to be accomplished in one of two ways, or a combination of both. The patent reads:

"The method by which the turbine of my present invention operates consists in converting the pressure

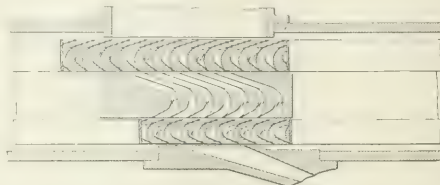


FIG. 2—VELOCITY COMPOUNDING

of the fluid into *vis viva* by stages and utilizing the *vis viva* developed at each stage by passing the fluid through rotating vanes, the speed of revolution of which is adapted to abstract substantially all or a large portion of the velocity. . . . The movable elements of the apparatus in which the *vis viva* developed at each stage is utilized may consist of single sets of rotating vanes, or of two or more such sets with intermediate stationary vanes or passages, or of two or more sets of rotating vanes, connected to different shafts."

As shown in Fig. 1, which forms part of the original patent, each stage was to consist of a single row of rotating buckets connected to the following stage by a suitable nozzle or nozzles. The idea of velocity compounding—that is, using the velocity acquired in one set of nozzles in more than one rotating row of buckets in the same stage—is also shown in Fig. 2, taken from the patent specifications.

The Court of Appeals in its decision in the patent suit referred to states:

"This brings us to the question, Was Curtis' disclosure of this pressure-staging an impulse turbine alone, or the combining of such pressure staging with velocity compounding, inventive? After a patient and thorough study of this record, we are satisfied it was. When Curtis started the work which eventuated in this patent the steam-turbine problem was involved in complexity and uncertainty. The pioneer work of Parsons and De Laval was based on machines wholly unlike in basis principle of operation, and this dissimilarity rather tended to confuse and mislead those who sought improvement in lines common to both."

The court finally concludes: "The plaintiffs are entitled to a decree sustaining patent No. 566,969, so far as indicated in the foregoing opinion."

With this court decision sustaining the original patent, it is possible to define briefly the Curtis turbine of patent No. 566,969 as covering a steam turbine of the impulse type, employing two or more pressure stages, each pressure stage containing one or more rows of revolving buckets.

As actually constructed for commercial work, the first Curtis turbines built had several velocity stages for each pressure stage. This was due to the necessity for slow speed, both to permit a generator design not

too far beyond previous practice and to allow the wheel and bucket stresses to come well within the known limitations of the materials available at that time. Thus the first three 5000-kw turbines installed by the Chicago Edison Company (now the Commonwealth Edison Company) were built with two stages, each stage containing four rows of revolving buckets. Later developments, together with improvements in wheel and bucket construction, showed that greater economy could be obtained with more pressure stages and fewer velocity stages. The fourth 5000-kw machine installed in Chicago had five stages, each containing two rows of revolving buckets. Still later development indicated that some of the stages could be profitably constructed with but a single row of buckets, as set forth in Curtis' early patent. The present practice in building large Curtis turbines is to employ not more than two rows in any stage, and under certain conditions governed by size, speed, etc., a large number of stages contain a single row of rotating buckets.

Several of the more recent large installations have machines of this latter construction. Notable among these is the installation recently completed at Hauto, Pa., by the Lehigh Navigation Electric Company and described in the *Electrical World* of May 9, 1914. The generating equipment consists of three 12,500-kw Curtis turbines built by the General Electric Company. In these machines the first stage consists of two rows of buckets, while the following stages each contain a single row. The efficiency obtained by this arrangement is such that these three units and a number of similar machines both larger and smaller have proved to be the most economical turbines so far installed in this country.

### Progress of Department of Machinery, Panama-Pacific International Exposition

Since the recent return of Lieut. George W. Danforth, chief of the department of machinery of the Panama-Pacific International Exposition, from an extended tour of the Eastern States, the department has been actively engaged upon the allotment of space in the completed Palace of Machinery. As there were far too many applicants, each asking for a large amount of space, to be accommodated in the area of the building—369,600 sq. ft.—it became necessary to consider carefully each application so that all amounts of space might be appreciably reduced. The task is now, how-

ever, practically completed and the final allotments are being made.

The exhibits will comprise what it is said will be the finest collection of electrical and machinery exhibits ever assembled under one roof, and the exhibitors are co-operating with the Department of Machinery in associating their exhibits with others so as to permit of complete operation and demonstration of the working of the various machines and electrical exhibits.

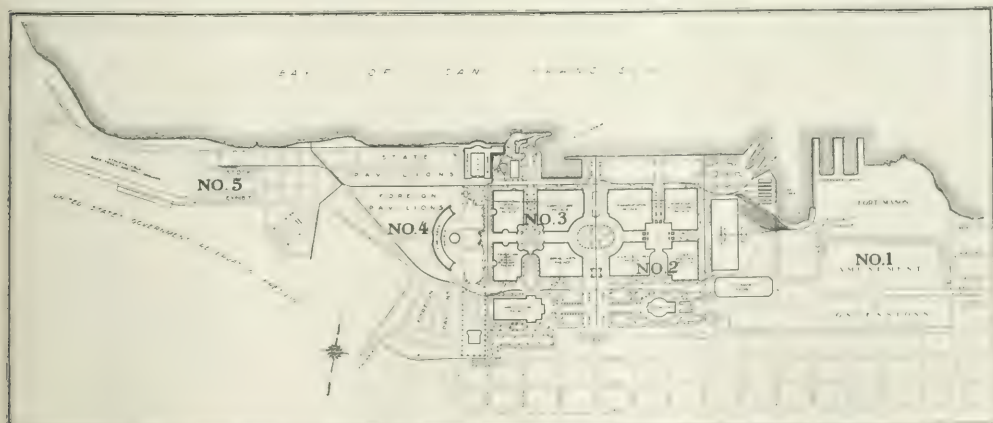
On April 1 preliminary work was started on the installation of the first exhibit, a 500-hp marine Diesel engine, by the Busch-Sulzer Brothers Diesel Engine Company, and the first pile for the foundation was driven with appropriate ceremonies on May 27 by Capt. Asher Carter Baker, director of the division of exhibits. The installation will cost \$70,000.

The entrances to the Palace of Machinery will be handsomely decorated with palms and shrubs which will afford a pleasing surprise to those who may expect to find only a display of machinery. To attract the non-technical visitor many spectacular exhibits have been arranged, and it is believed that the "Palace" may be made the most popular of all the exhibit buildings. Several of the exhibitors have arranged, through the operation of pumps, etc., beautiful and artistic effects, such as waterfalls and illuminated fountains.

The latest and most modern approved methods of illumination will be used in connection with the exhibits in the Palace of Machinery and will be of interest to the layman as well as to the student and those vitally interested in such affairs. One phase will be especially interesting—the isolated electric-house-lighting systems for farm use compared with the most complicated systems in use for city lighting.

The testing of high-potential insulators and transformers will be made possible by the arrangements which have been made with a large manufacturer of high-voltage testing apparatus, and many spectacular effects have been prepared by the use of such instruments.

A feature of the Palace of Machinery will be the methods employed for the convenience of the visitors. A number of plans are now being tested to insure to engineers and students the opportunity to make a careful examination of each exhibit in privacy and comfort. Reception spaces will be provided in connection with each exhibit and equipped with suitable fixtures which will enable technical visitors to prepare notes on the various features.



PLAN OF PANAMA-PACIFIC INTERNATIONAL EXPOSITION GROUNDS



All of the working exhibits—and it is now certain that a large percentage will be in actual operation—will be equipped with the latest "safety-first" devices, and these guards will form one of the most interesting exhibits to the engineer and manufacturer.

The Department of Machinery of the Exposition will soon take formal possession of the offices which have been built inside the building on a mezzanine floor and will remain there until the close of the Exposition. The gates of the Exposition will open on Feb. 20, 1915, and will close on Dec. 4, 1915. Nine of the eleven principal exhibit buildings are now completed, and the others will be finished shortly.

### Mutual Liability Insurance Company in New York

Electrical and gas companies in New York State have organized a mutual-liability insurance company under the compulsory workmen's compensation law which went into effect on July 1. The company has been named the Utilities Mutual Insurance Company, and it began business on July 1 with sixty-nine policies written, covering about 3000 employees.

The organization of the company was made possible largely by the past work of the Empire State Gas & Electric Association, which has maintained friendly relations between the various companies and has promoted unity of action and co-operative effort.

The New York law requires insurance of employees against injuries and provides four ways in which this may be obtained. For the State fund the rates of insurance have been set at a little over 8 per cent below the rates which may be charged by stock or mutual companies. There are also the stock companies and the mutual companies. The minimum rates which may be charged by stock and mutual companies are fixed by the State. There is self-insurance under certain restrictions prescribed by the State.

Each of the four methods was discussed fully before it was decided that as matters stood in New York State, at least, the plan of a mutual company held out the prospects of greatest benefits.

The by-laws of the company provide for at least thirteen directors, eleven of whom must be policy-holders. Each policy-holder is a member of the company and has one vote with one additional vote for every 500 employees, but in no case can a member have more than twenty votes.

In addition to fixing the minimum rates which may be charged for each class of risk the State determines the maximum percentage of premiums which may be devoted to operating and administrative expenses. As an added precaution the directors have fixed the rates at 10 per cent higher than the minimum set by the State.

The State department has ruled that operating and administrative expenses of mutual companies shall not exceed 23 1/3 per cent of the premiums. A "catastrophe surplus" must be set aside at the rate of 10 per cent of the premiums until it shall amount to \$100,000, and thereafter at the rate of 5 per cent until it shall in amount comply with the provisions of the law.

Profits accumulated after paying all losses and expenses and setting aside the necessary reserves are to be returned to the members in the form of dividends. It is also provided that, as a still further measure of safety, a "certificate holders' surplus fund" shall be set up. The object is to provide a secondary defense against any catastrophe, thereby strengthening the policies. At the end of each year a certificate will be given to each member setting forth his interest in the

fund. While the fund belongs to the holders of the certificates, the company reserves the right to draw upon it under certain extraordinary circumstances which are stated in the by-laws.

The company will promulgate and may modify from time to time standards for construction and for methods of operation, with a view to reduction in the number of accidents. It will circulate information among its members in regard to accidents, so that measures may be taken to prevent repetition. It will employ inspectors to visit the plants of all members or applicants for membership. The merit rating system will be employed, which will give added incentive to the members to bring their plants and systems up to standard and to maintain a high state of efficiency in their accident prevention work.

Of the sixty-nine members on July 1 forty-five are electric companies, seven artificial gas companies, ten gas and electric companies, and seven natural gas companies. The officers are: President, Mr. J. T. Hutchings, general manager Rochester Railway & Light Company; vice-president, Mr. J. C. DeLong, president Syracuse Lighting Company; secretary and treasurer, Mr. C. H. B. Chapin, secretary Empire State Gas & Electric Association. The general agents are Parsons & Company, and the company's headquarters are at 51 Wall Street, New York City.

## PUBLIC SERVICE COMMISSION NEWS

### Ohio Commission

The Union Gas & Electric Company, of Cincinnati, has appealed to the Ohio Public Utilities Commission for relief from an ordinance recently passed by the Cincinnati City Council requiring the company to furnish electric light service to several suburbs. The company complains that the ordinance is unreasonable in that it would require costly extensions which the amount of business available in the suburbs would not justify.

### Maryland Commission

Mr. Philip D. Laird, chairman of the Maryland Public Service Commission, has sent his resignation to Governor Goldsborough, effective on Aug. 1. In resigning Mr. Laird is carrying out a determination made about a year ago. The hard work, which is constantly increasing, is making inroads on his health.

The Maryland Public Service Commission has rejected the petition of the residents of Roslyn asking that the Consolidated Gas, Electric Light & Power Company be required to extend its lines to that point. The petition was based upon an agreement with the Patapsco Electric Company, which was absorbed by the consolidated company. Under this agreement it was said that the electric-lighting service was to be extended to Roslyn and the petitioners asked that the contract be observed by the commission and the Consolidated company.

### Idaho Commission

The State Supreme Court has handed down a decision upholding the constitutionality of the public utilities law and the legality of the acts of the commission. The cases involved were those in which the commission issued orders refusing to issue certificates of convenience and necessity for the Idaho Power & Light Company to enter Twin Falls and the Beaver River company to enter Pocatello. The Great Shoshone & Twin Falls Water Power Company was already rendering service in Twin Falls, and the Southern Idaho Water Power Company in Pocatello.

#### Wisconsin Commission

The commission has given its approval to the purchase of the Dodgeville Electric Light & Power Company by the Mineral Point Public Service Company. The price determined upon is \$15,700. The Oakfield Light & Power Company has been authorized to issue \$10,000 of 6 per cent bonds for the purpose of paying outstanding indebtedness and furnishing funds for the construction of a transmission line from the company's distribution system to the terminus of the lines of the Eastern Wisconsin Railway, Light & Power Company at Fond du Lac, with the necessary substation equipment. The Oakfield company plans to purchase its power from the Eastern Wisconsin Railway, Light & Power Company.

#### Indiana Commission

Present interest centering in the Public Service Commission of Indiana turns entirely on the developments in the cases relative to the Indianapolis lighting situation. Following the filing of petitions for revision of rates the commission's valuations have been finished.

Much controversy between the city administration and the lighting companies has resulted from the recent contract for city lighting for the next ten years at rates approximately one-half of those formerly paid to the Indianapolis Light & Heat Company. The Merchants' Heat & Light Company was the successful bidder for the new contract. Meanwhile a test suit is pending to determine whether the Board of Public Works has power to conclude such a contract or whether the rate-making provisions are entirely in the hands of the commission. In argument in court Corporation Counsel W. A. Pickens admitted that the commission has authority as to rate-making contracts between cities and public service corporations. The commission members say that they will serve notice on the local companies of the completion of the valuations at once and that the hearings on the cases will begin in Indianapolis, probably before Aug. 1.

Attorney-General Thomas M. Honan has given an opinion to the Public Service Commission, interpreting the public service statute on several points.

#### New York Commissions

In preparation for the proposed appraisal of property of the New York Telephone Company, a preliminary survey of the property has been sent to the New York Public Service Commission, Second District, by the committee appointed by the company, of which Mr. F. B. H. Paine is chairman. The company believes that it is necessary to make a valuation of the entire property of the company within New York State, in order to determine the value of the property within New York City.

The commission thinks that an appraisal of the entire property in the State is unnecessary. Its special counsel, Mr. D. B. Murphy and Mr. William McClellan, who was appointed recently confidential engineer for this work, are now studying the preliminary survey sent to the commission by the committee acting for the company. Mr. Paine and Mr. Swayze, general counsel of the company, say that it is not possible to separate the use to which the New York City property is put for toll and local exchange service, so as to give a basis for making local rates in New York City which will stand in court.

The committee will go ahead with the work of valuation. It is believed that little, if any, more time will be required to make a valuation of the property within the entire State than to value the city property alone. Much the largest part of the time will be required for the property in the city of New York, so that the work in other districts will not have any effect on the prosecution of that in New York City. It is proposed to divide

the State into six divisions. A large amount of time will be required for study of the accounts.

#### New Hampshire Commission

The commission has issued an order containing rules prescribing standards for electric service and providing for the testing of meters and otherwise regulating the service of electric utilities. The order applies to each public utility engaged in the generation, transmission or sale of electric-energy ultimately sold to the public which in any one year shall have generated, transmitted or sold more than 25,000 kw-hr. or shall have had more than twenty-five consumers. The order took effect on July 1, 1914. Ninety days is fixed as a reasonable time within which the companies shall comply with the rules relating to meter-testing equipment and voltage survey.

#### New Jersey Commission

The order of the Board of Public Utility Commissioners of New Jersey in the matter of the complaint of Max Taub against the Public Service Electric Company is based on the previous decisions of the board in regard to the grounding of secondaries. The position of the board upon the questions involved was stated in a report made on May 17, 1912. However, complaints have been filed repeatedly since then. Owing to the misunderstanding of the position of the board, which seems to persist, it was considered advisable that the entire situation be reviewed and the conclusions of the board restated, so that there may be no reasonable ground hereafter for filing like complaints. The complaint on which the decision was based is one of a series made from time to time by residents of Hoboken, who employed Mr. Joseph McBride, an electrical contractor, to wire their premises, and who had been refused service because of the unqualified refusal of the contractor to provide for the grounding of secondaries of transformers inside the premises of the complainants, as required by the rule of the company.

The decision quotes from a report on the alternating-current distributing system in Hoboken made by Prof. Albert F. Ganz, of the Stevens Institute of Technology, on Dec. 2, 1912, to the Board of Water Commissioners of Hoboken. It also quotes from a report made to the New Jersey commission on March 30, 1912, by Prof. Malcolm MacLaren, of the school of electrical engineering of Princeton University. Extracts from the reports of both Professor Ganz and Professor MacLaren are given. Both point out that until comparatively recently expert opinion upon this matter has been divided. Each, however, asserts that the weight of expert opinion, both here and abroad, now strongly favors the grounding of secondaries of transformers. Both accord in the opinion that it is better to connect the ground wire to the service pipe inside of a building than to make the connection to the underground pipes in the street. The rules contained in the 1913 edition of the National Electrical Code regarding the grounding of secondaries were adopted by the board as of Jan. 1, 1914, for all new connections. The rule of the Public Service Electric Company is in accord with those rules. In the judgment of the board, it is not necessary that the consent of the municipality be obtained to make a connection.

The board finds nothing in the record to change the general rule regarding this matter put into effect by its order, which became effective on Jan. 1, 1914. Because the rule of the company is in accord with the rule established by the board, and because of the considerations set forth in the decision, the board finds the rule to be reasonable and orders the complaint dismissed.



## Current News Notes

**ELYSIAN DELIGHTS TO BE AUGMENTED.**—The village of Elysian, about 18 miles west of Faribault, Minn., has granted an electrical franchise to the Consumers' Power Company of St. Paul. As soon as water-pumping and city lighting contracts have been secured the company will begin the construction of the distribution lines within the village.

\* \* \*

**LONG SERVICE EMPLOYEES DISTINGUISHED WITH BADGES.**—The Commonwealth Edison Company, which has for some years furnished its employees with badges indicating the length of their service, reports that there are now 180 men who have been with the company five years or longer. Of these 121 have served five years, thirty-nine ten years, twelve fifteen years, ten twenty years, and seven twenty-five years.

**ELECTRICAL SHOW FOR LANSING, MICH.**—An electrical show is planned for Lansing, Mich., Aug. 17 to 20, under the auspices of the Michigan Power Company. A two-story brick building containing 8000 sq. ft. of floor space will house the exhibits. Manufacturers of electrical devices who desire to display their products are asked to address Mr. D. R. Thomas, general manager of the Michigan Power Company.

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**ELECTRO-MEDICAL EXHIBIT.**—During July the New York Edison Company is displaying an extensive exhibit of electro-therapeutic apparatus and devices at its new showrooms, Irving Place and Fifteenth Street, New York City. Physicians, surgeons and dentists have been invited to inspect the display of Roentgen-ray apparatus, compressed-air outfits, bath cabinets, electric-lighted instruments, anæsthetizing machines, etc.

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**PANAMA'S 600-FT. RADIO STATION NEARING COMPLETION.**—The three 600-ft. steel towers for the government wireless-telegraph station on the Isthmus of Panama are now nearing completion, and it is hoped to have messages exchanged shortly between the Canal Zone and the Arlington station, near Washington, D. C. Another similar station is being erected at Tutuila, Samoan Islands, and others will be provided at San Francisco, Honolulu and Manila.

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**FOR A NATIONAL "ELECTRIC VEHICLE DAY."**—Mr. Robert Montgomery, manager of the commercial department of the Louisville (Ky.) Gas & Electric Company, has proposed that a certain day be set aside throughout the country as "Electric Vehicle Day." On such a day, preferably a holiday, Mr. Montgomery suggests that an electric-vehicle parade be held to demonstrate the extent to which electricity is used for driving passenger and commercial cars. Prizes might also be awarded by local concerns for the most attractively decorated truck or pleasure car.

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**TURBINES, TARIFF AND SALT SEA AIR.**—It is of interest to note that the English-built 25,000-kw Parsons turbo-alternator set, installation of which has just been completed by the Commonwealth Edison Company, Chicago, was received in this country late last summer shortly before the new tariff law went into effect. To gain the saving in customs duties possible under the new tariff the turbine was therefore held in bond for about a month until the date when the act went into force. Upon unpacking the set at the end of this period

it was found, however, that the insulation of the machine had absorbed considerable salt moisture during its sea voyage across the Atlantic, so that the armature end-turns had to be reinsulated before the turbo-generator could be made ready for use.

\* \* \*

**THE ELECTRIC-LIGHTING SALESMAN IN FICTION.**—A combination illuminating engineer and electric-service contract agent is the hero of Richard Washburn Child's story, "The Game of Light," in *Everybody's Magazine* for July. Allowing for the rather-to-be-expected short-story exaggeration, the yarn is an interesting one. And it is worthy of commendation for the correct use of electrical terms. The principal character is a lighting enthusiast. To the lovely daughter of the president of the company, and of course the heroine, he says this: "You don't realize how much light affects life, do you? It's marvelous! Houses lighted the wrong way hurt the souls of people who live in 'em. I'll bet I have put installations in people's private dining-rooms and parlors that have prevented divorces. Correct lighting will make parents bring up children the right way!"

\* \* \*

### SOCIETY MEETINGS

**THE ENGINEER IN PUBLIC SERVICE.**—At the annual meeting of the American Society of Mechanical Engineers, to be held in New York from Dec. 1 to 4, one entire session, that of Dec. 3, will be devoted to a discussion of the general subject of the engineer in public service. Problems in municipal engineering of interest to the mechanical engineer will also be considered.

\* \* \*

**ARKANSAS ELECTRIC CLUB'S OUTING.**—The Hot Springs (Ark.) Electric Service Club on June 27 entertained the Little Rock (Ark.) Electric Club with a chicken dinner and outing at Riverview Park, Hot Springs. Felicitous addresses were made by both hosts and guests, including Messrs. S. E. Dillon, C. J. Griffith, Arthur Smith, W. J. Sharp, T. E. Bragg, George Peebles and others.

\* \* \*

**KENTUCKY CONTRACTORS' ASSOCIATION.**—Kentucky members of the National Electrical Contractors' Association recently organized a state branch at Louisville, electing Mr. Gus Albrecht, Louisville, president, and Mr. S. D. Dalby, Paducah, vice-president. Mr. F. E. Good, of the F. A. Clegg Company, Louisville, was named to represent the state section at the Detroit convention of the national association.

\* \* \*

**CO-OPERATION IN TECHNICAL ADVERTISING.**—"How the Publisher and the Advertising Manager of the Manufacturer Can Co-operate to the Best Advantage," was the title of a paper presented at the trade and technical-publication session of the recent Toronto convention of the Associated Advertising Clubs by Mr. A. N. Fox, advertising manager of the Benjamin Electric Manufacturing Company, Chicago, Ill.

\* \* \*

**AMERICAN PEAT SOCIETY.**—The eighth annual meeting of the American Peat Society will be held at the Commercial Club, Duluth, Minn., Aug. 20, 21 and 22. Among the papers to be read is one on "Developments of the Peat Gas Producer," by Mr. F. B. Haanel, of the Department of Mines, Ottawa, Canada, and one on "The Conversion of Peat Into Fuel," by Prof. C. A. Davis, of the United States Bureau of Mines, Washington, D. C. The secretary of the society is Mr. Julius Bordollo, Kingsbridge, New York City.

# Boston Edison General-Service Buildings—I



BY H. S. KNOWLTON

THE Edison Electric Illuminating Company of Boston, Mass., has lately opened for business a general service plant which represents the most comprehensive solution thus far achieved in the central-station industry of the important problem of handling efficiently those features of its work directly associated with installation, maintenance, transportation, testing and employees' welfare. The initial arrangement of buildings and equipment, the provision for future expansion, the internal departmental scheme of operation, and the perfection of detail found in every part of the property, express the most advanced ideas in scientific management and illustrate at every turn the advantages of designing such an establishment *de novo* instead of attempting to meet the auxiliary service requirements of a rapidly developing system by existing and outgrown accommodations. Upon a tract of land previously unoccupied by company plant there has been created a great industrial establishment, unique in scope, which represents an investment of about a million dollars, and which sets a new standard of service in the industry of electrical energy supply.

The rapid growth of the company during the last ten years, and particularly the expansion of its business in suburban districts, rendered the service facilities of a few years ago wholly inadequate to meet the present conditions and made necessary the construction of the new plant. The company was originally organized to

supply electrical energy in the city of Boston, but practically ever since the beginning its business has been expanding into territory outside the metropolitan center, resulting in the acquisition of many outside electric generating plants and the centralization of their services until the company is now one of the largest on the continent.

Seven hundred square miles of city and suburban territory are now served by the system, the lines of which extend from Boston as a center to the Rhode Island state line on the southwest and to the Chelmsford-Carlisle line on the northwest, the maximum distance of transmission from the principal generating station in South Boston being about 40 miles. Boston and its suburbs are radial in plan, and the company's territory is divided into seven districts for administrative purposes. In these districts the company serves about forty municipalities, with a combined population of 1,500,000.

The territory above mentioned contains company property valued at over \$30,000,000, in office buildings, generating stations and substations, storehouses, pole yards, shops, wire, cable and supplies, besides distribution equipment. The taking over of many small suburban plants, with equipment of varying value, has further complicated the problem of handling supplies efficiently, but from the first the property has been developed upon a consistent basis. The new service plant is therefore designed to fit the needs of the ter-

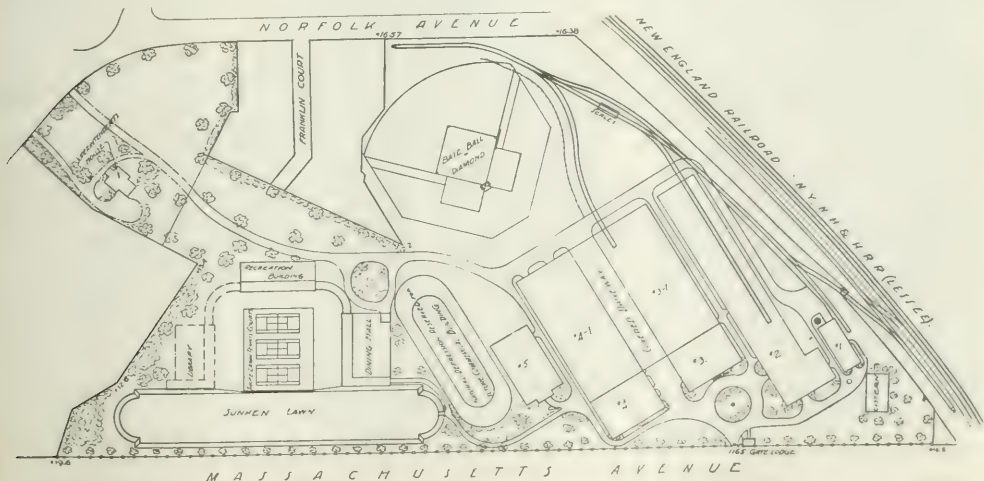


FIG. 1—PLAN OF EDISON SERVICE BUILDINGS, BOSTON





FIG. 2—GENERAL VIEW IN HEAVY-STOCK ROOM

ritory as a whole, to supplement the facilities offered by local districts and, in a word, to dominate the general service activities of the entire company from a central point of administration and departure. The site selected was the most convenient which could be found in proximity to the heart of Boston, the plant being situated on Massachusetts Avenue, at the east of the Midland division of the New York, New Haven & Hartford Railroad. Its distance from the downtown district is about two miles. A private side track enters the property from the railroad.

#### General Features of the Group

Eight buildings have been erected, and close attention has been given to their architectural appearance as well as to their practical use. They are principally of reinforced-concrete construction, with offices finished in mission style. The group consists of a combined substation and heating plant, quarters for linemen and supplies, the administration offices and stockrooms, a

garage, repair shops, the laboratory and the welfare buildings. About 12 acres are at present utilized, and ample provision is being made for social and athletic activities among employees. The latter include a baseball diamond, tennis courts and a green for clock golf.

The plant is most advantageously situated with respect to load centers, bases of supplies and territorial layout. Much of the work formerly done in separated buildings is now concentrated at Massachusetts Avenue, and valuable space in the downtown district has been released for other uses by the transfer of the laboratory, meter shop and other department activities to the service plant. Stockroom consolidation, improved fire protection, directly connected motor drives, modern industrial lighting equipment, economical routing of material, unit storeroom apparatus and many other features resulting from long and thorough study of the company's general service are embodied in the installation.

The industrial engineering problem at the service buildings was solved with the co-operation of Mr. Frederick A. Waldron, consulting engineer, New York City, who also drew the plans for the industrial buildings; the consulting architects were Bigelow & Wadsworth, Boston, and the construction work was done by the Stone & Webster Engineering Corporation, Boston, with the exception of the welfare buildings, which were handled by separate contract. General oversight of the entire development was given by the construction bureau of the Edison company.

Referring to the general plan of the property, Building No. 1 is the heating plant and substation (measuring 37 ft. by 96 ft. and one story in height); Building No. 2 (75 ft. by 448 ft., one story) is utilized in the storage and handling of heavy stock; Building No. 3 (80 ft. by 110 ft., three stories and basement) contains the administrative offices of the plant and various

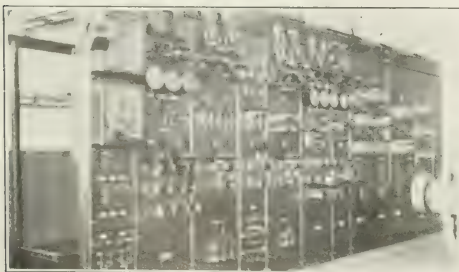


FIG. 3—LOW-TENSION SWITCHBOARD IN GROUP SUBSTATION

bureaus; Building No. 3-1 (110 ft. by 256 ft., at present one story with basement) is utilized for the storage of light stock by the meter, arc-lamp and incandescent lamp divisions of the installation department, in lamp and light line-material storage; Building No. 4, similar to Building No. 3, but with no basement, is the gasoline-car garage, three stories, with maintenance shop and quarters for chauffeurs; Building No. 4-1, one story, similar to No. 3-1, is the electric garage, and Building 5 is the laboratory, 75 ft. by 112 ft., two stories high at the front and one at the rear.

The welfare buildings, now rapidly approaching completion, consist of a dining hall, library and recreation building bordering an attractive court. The various structures are well connected by driveways and spur tracks are carried into the room for heavy stock, the room for light stock and the heating plant. Cars are shifted to and from the railroad main line by a 25-ton Westinghouse-Baldwin electric locomotive owned by the company and equipped with forty-eight cells of "Exide" battery.

The buildings are laid out with uniform bay spacing of 16 ft. between centers, slab and girder construction being used throughout except at elevator and stair wells. As the site is filled-in ground, piling was required throughout the property. The fire protection includes a complete system of automatic sprinklers, hydrants, extinguishers, fire pails and alarm boxes. Water for the underground piping of the property is supplied from the Boston high-pressure system through two 4-in. connections and from the city low-pressure system through a 4-in. connection to a cistern and fire pump.

The high-pressure line carries between 80 lb. and 90 lb. pressure, and the low-pressure line about 45 lb. The cistern has a capacity of 150,000 gal. and is of reinforced-concrete construction, being situated underground near the pump, which is a two-stage centrifugal Underwriters' outfit with a capacity of 1000 gal. per minute at 100 lb. pressure. It is operated by a 100-hp induction motor having duplicate sources of energy supply.

Except for a covered driveway 60 ft. wide between



FIG. 5—MOTOR-GENERATOR SET IN SUBSTATION

the electric garage and the room for light stock, the plant is equipped throughout with the wet-pipe system of sprinklers, the dry-pipe system being used in the driveway. The hydrants are of the three-way type, and ample hose facilities are provided. Special mention should be made of the gasoline storage facilities. Two qualities of gasoline are used—a 76-deg. grade for torches and a 61.5-deg. grade for automobiles. The latter is stored in two 500-gal. tanks placed underground and 10 ft. away from Building No. 4. These tanks are equipped with the usual filling, measuring and vent pipes, and have a suction pipe leading to a measuring and recording pump on the first floor of the garage, the suction pipe having valves placed so that either tank may be cut off. The tank for the highest gasoline is also placed underground, the suction pipe leading to a pump just outside an oil room on the first floor of Building No. 3-1.

#### Heating and Lighting for the Buildings

The service buildings are heated by steam from a battery of four 103-hp Babcock & Wilcox boilers in the local steam plant. To provide hot water for service purposes, a Green fuel economizer was placed in the smoke flue and inserted in the hot-water circulating system. Water is supplied from the city mains to a Kenny rotary pump discharging through a National



FIG. 4—DRIVEWAY ADJOINING STOCKROOM, SHOWING METHOD OF LOADING LAMP AND SUPPLY TRUCKS





FIG. 6—ELECTRIC LOCOMOTIVE OF BOSTON EDISON COMPANY

feed-water heater to the economizer. The feed-water heater is connected in the return pipe of the heating system and serves as a cooling coil.

When the boilers are shut down during the summer the service water is warmed by three Simplex electrically heated boilers of 20-kw rating and 300 gal. capacity each, a boiler of 500 gal. capacity and 25-kw rating being installed for the garage service. Each of these boilers is supported horizontally and is equipped with three heating units, two of which are at the bottom of the boiler and one at the top. The units at the bottom are employed for steady service, the top unit being placed in circuit in case of a sudden demand for hot water. By a system of valves these boilers are cut out of service when the steam plant is in operation.

As the plant is in the company's alternating-current service district, the general lighting is accomplished by alternating current, but direct current is available for the laboratory, the meter and arc-lamp repair shops, the garage and the locomotive battery-charging panels. About 2 watts per sq. ft. of floor area was allowed in determining the number of outlets required for the lighting system, assuming the use of four 16-cp lamps per outlet. The 16-ft. bay spacing made an outlet spacing of 8 ft. the natural selection. No local switching was considered at the time the work was laid out, the decision being to let this requirement await development and to employ pendent switches as occasion dictated. Panelboards and distribution boxes were made as large as practicable in order to reduce to the minimum the total number required. Conduit was used throughout, being embedded in the floor slabs.

In general, mains are brought into basements and carried to the upper floors through the panel boxes and conduit. Specially designed deep outlet boxes were used to permit laying the conduit above the steel reinforcement and to enter the boxes without bending. This arrangement made it possible to cut and make up most of the runs of conduit on the ground, thereby reducing the time the concrete gangs were kept off the work. Outlet boxes were held in position by a false fixture stud which extended through the form and was secured below by a nut and washer. This was found to be the most satisfactory and economical of all the devices tried.

#### Stock-Handling Methods

Throughout the service plant special pains have been taken to arrange the various divisions to permit of the minimum handling of material. The principal stockrooms are near the railroad tracks, reducing the

amount of trackage required in spotting cars; platform scales are installed in the principal spur track leading into the property so that the smallest amount of shifting is necessary in checking up weights, and the room for heavy stock is provided with two electric cranes of 5 tons and 3 tons lifting capacity, equipped with operators' platforms and covering the entire storage area. Hand trucks are liberally provided for all interior service, and all swinging doors between important aisles and department sections are designed to withstand the shock of pushing such trucks at full speed against the door, so that no time is lost in passing through. Short hauls into and out of the property are also a feature of the company's trucking service, the main entrance being close to the stockrooms.

An important feature is the location of the room for light stock with numerous doors bordering a shipping platform running along the covered driveway between the garage and Building No. 3-1. The platform is 10 ft. wide and 256 ft. in length, and it contains lockers in which are placed packages and materials taken from the stockroom as orders are received during the day, so that a considerable portion of the outgoing loads is practically made up during the absence of the vehicles, greatly reducing the loading time of drivers and delivery wagons or trucks. Excellent elevator facilities are installed in the administration building and the garage building.

Further particulars of the methods of handling stock will be given later, but in passing it is worth noting that these are planned so carefully that a carload of fiber conduit, for example, can be unloaded and placed at an expense of about \$4 compared with an outlay of \$25 under former conditions. The amount of stock necessary to be carried for a given volume of business is also greatly decreased; transportation costs are cut down, and the time from the receipt of an order from a customer until the shipment of his material has been reduced from five days to one. As a result of the scientific study made of the arrangement and equipment of the buildings, the working area required was reduced to 226,000 sq. ft., or 186,000 sq. ft. less than originally contemplated. Not the least important feature is the concentration of the office staff in well lighted and ventilated buildings.

#### Substation Equipment

The group substation supplies a varied service, the range of electrical requirements being of particular in-

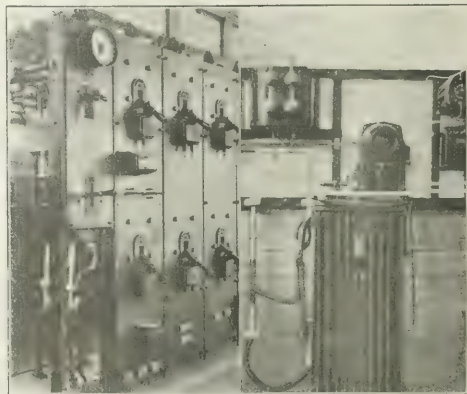


FIG. 7—PANELS OF HIGH-TENSION SWITCHBOARD

FIG. 8—REGULATOR FOR LABORATORY CIRCUIT

terest. The garage has a capacity of 110 machines, and the economical supply of energy for battery charging presented a considerable problem. The boiler room is designed to accommodate two more units of the present size and contains a set of Howe scales weighing up to 3800 lb., hand firing being employed. A 350-ton concrete coal bunker adjoins the boiler room, coal being delivered by gravity from cars on the local siding. Draft is provided by a Custodis radial-brick stack 125 ft. high and 5 ft. 2 in. in diameter at the top, and the furnaces are equipped with Reagan grates. An 8-in. by 6-in. Blake air compressor, chain-driven by a 7.5-hp, 220-volt induction motor, is provided in the boiler room, the air being used in the meter and arc-lamp shops, in the motor-generator room of the substation and for blowing out tubes. An independent air supply is provided for the garage tire-pumping service. There are two Kenny vacuum pumps, each driven by a 7.5-hp, 220-volt induction motor, in the basement, besides a 2-hp feed pump and a 5-hp economizer circulating-water pump of the same make.

Two three-phase Y-connected 4000-volt lines are brought into the substation through underground conduit from the company's Zeigler Street substation, one line being provided with a neutral wire. Each line is carried to an independent set of buses at the rear of a high-tension switchboard in the substation operating room, the usual disconnecting switches being mounted between asbestos wood barriers 7 in. apart on the wall at the rear of the board. Potential transformer taps are taken off at the rear, and current transformers are placed on the wall side of the incoming leads. One set of buses gives 2300 volts between the neutral wire and each phase wire, corresponding to the company's standard practice in distribution, which permits independent phase regulation and enables transformers with 2300-volt primaries to be used in the lighting service. The other set gives 4000 volts between each pair of busbars.

The high-tension switchboard is 16 ft. long and contains nine panels furnished mainly with Westinghouse apparatus. Three panels are provided for synchronous motors; one panel is for bus junctions, one panel enables either line to be cut off its appropriate bus by an oil switch; one panel controls the supply of energy from the three-phase, four-wire line to the local lighting transformers; one panel enables the fire-pump motor to be operated on either bus; one panel controls the energy supply to the local power transformers, and one controls the supply of energy to a special transformer



FIG. 11—MOTOR-DRIVEN PUMPS INSTALLED IN SUBSTATION BASEMENT

supplying the laboratory building with power through an induction regulator.

All the direct current required on the grounds is derived from three synchronous motor-generator sets in the operating room. These machines are of General Electric make, two being equipped with 300-hp, 4000-volt, revolving field motors, each driving two directly connected 100-kw two-wire direct-current interpole generators. The third set consists of a 50-kw two-wire generator directly driven by a 4000-volt, 75-hp motor. All three motors are started through compensator switches on the motor panel, the compensators being mounted at the rear of the switchboard and against the wall. The oil circuit-breakers for the synchronous motor service are arranged with overload relays mounted on the motor-control panels and the board is liberally equipped with testing and instrument calibration contacts. All oil circuit-breakers controlling lines to transformer primaries are numbered to correspond with the transformer numbers and the numbers of the transformer secondary leads running to the low-tension board.

Transformers are housed in a 12.5-ft. by 5.3-ft. fire-proof room near the high-tension switchboard. Two 100-kw, three-phase units are provided for the fire-pump service, which is 230 volts, three-phase; a 20-kw transformer provides a special 220-volt, three-phase service for the laboratory; a 100-kw, three-phase transformer takes care of the general 230-volt, three-phase power service around the property; two 100-kw units supply three-wire, 115-230-volt, single-phase lighting service, and a 100-kw transformer is installed for the 115-230-volt regulated power special laboratory service mentioned above. The floor of the transformer room drains out of doors and the doorsill is  $1\frac{1}{2}$  in. high to prevent oil overflow. A 10-kw transformer is also installed for the supply of 220-volt, three-phase service to the laboratory.

The low-tension service is controlled from a switchboard in the operating room. This board is 21.5 ft. long and is equipped with eleven panels. The direct-current arrangements consist of a two-wire bus for garage service, a combination high and low bus set with one positive bar and two negative bars for garage use, and a three-wire bus which can be split into two sections to enable energy to be supplied at two different pressures for testing or other work. The generators of either or both large units may be thrown upon either section of the split bus; either may be run



FIG. 9—METER RACK IN STOCKROOM      FIG. 10—MAGNETITE ARC LAMP STORAGE RACK





FIG. 12—TYPICAL VIEW, OFFICE OF DEPARTMENT OF MAINTENANCE OF LINES

upon the high or low combination garage buses, and by a tie switch placed on the machine panel the two-wire bus feeding the garage may be thrown upon one section of the split bus.

The 50-kw generator may, if necessary, supply the two-wire bus, caring for daytime battery charging. At night the larger generators are operated on the charging load. The field rheostats of the latter are magnetically operated, their control switches being mounted on the machine panels, while the rheostats are carried on angle-irons above and behind the board. The range of pressure available on these various buses extends from about 70 volts to 300 volts. The alternating-current section of the board contains the usual knife switches governing the various three-wire, single-phase and three-phase motor and lighting circuits, oil circuit-breakers being used on all transformer secondary leads carried to the board. A circuit breaker is installed for each direct-current generator and for each garage feeder; an alternating-current ammeter is provided in each synchronous-motor circuit, and direct-current ammeters are connected in circuit with each generator.

#### Maintenance Facilities

Building No. 2, utilized as a storehouse for heavy material, is occupied by the street engineering department, street maintenance department and supply department. It has a concrete floor and steel-truss roof and contains ample storage facilities for transformers, cable, reels, underground and overhead material and tools, tubing and spare machinery for company serv-

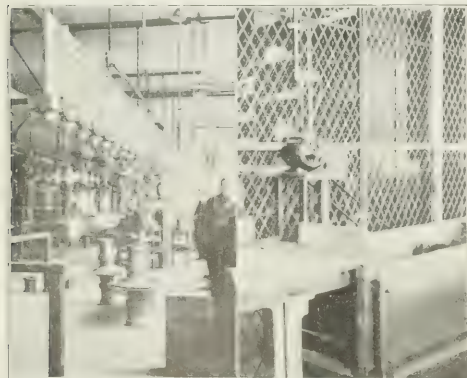


FIG. 13—ARC-LAMP TEST FRAME, ARC-LAMP SHOP

FIG. 14—MOTOR-DRIVEN BRUSH FOR GLOBES

ice in substations and elsewhere. In general, this building is the headquarters of the construction and maintenance forces occupied in line work and contains excellent lavatories with unit wash-basins for employees' use, quarters for transformer repairs and testing, and a section utilized by the station engineering force in the storage of tools and supplies.

The transformer-testing facilities are used mainly on apparatus returned from service, and the maintenance work done here consists chiefly of oil removal, fitting of new cases, repairs to terminal blocks and bushings, and the provision of new leads and ground tests. The usual test is 2300 volts between the secondary winding and the core and 6900 volts between primary and core. A special switchboard panel is installed to facilitate transformer testing, giving by 2300-volt steps pressures from 2300 volts to 13,800 volts by the use of plugs and flexible cables connected with the secondary windings of seven small transformers installed behind the board. The transformer primaries are connected in parallel to a 230-volt, three-

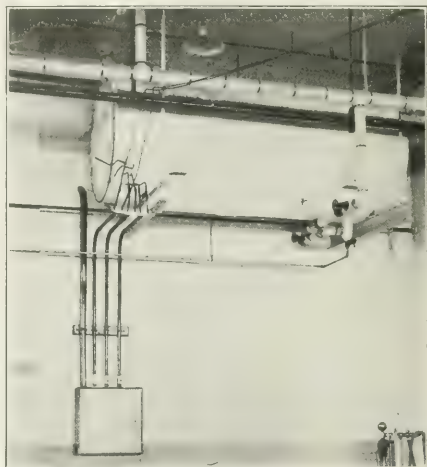


FIG. 15—ELECTRICALLY HEATED HOT-WATER TANK

phase service. A 7-ft. horizontal screen above the panel protects its contacts and circuit-breakers against the chain falls of the traveling cranes which serve the room.

Tests of linemen's rubber gloves are also made at this point, seamless gloves being tested at 10,000 volts and lined gloves at 6500 volts by partly immersing the glove in salt water, the interior of the glove being filled with shot, so that the potential test is between shot and water.

The building is well provided with doorways for truck service in addition to the spur track and cranes previously mentioned. An interesting detail in the storage facilities is a transformer hanger rack placed against the wall. This rack, measuring 96 ft. long and 7 ft. high, is built of 3-in. by 4-in. timbers and holds about 600 hangers. The rack is constructed in 16-ft. sections, with an intermediate horizontal bar 5 ft. above the floor to care for the longer hanger members. The general lighting is by 250-watt lamps, two being used for truss.

#### "Welfare Buildings"

The "welfare buildings," as now completed, provide a general meeting place for employees, of whom about 1900 are now on the payroll. There are three

structures in the group and all border an attractive court with broad, connected piazzas. Nothing like these structures has previously been built on a comprehensive scale in the central-station industry. The group consists of a library, a recreation building and a combined auditorium and dining hall. The recreation building is central, the dining hall being on the western side of the court facing the present laboratory. The distance across the open court between the piazzas of the library and dining hall is 225 ft., and in this space three tennis courts will be provided. All the piazzas are covered and brick-paved, being 16 ft. wide and having a total length of 683 ft.

The buildings are all of fireproof construction, with concrete foundations, walls of terra-cotta blocks, and slate roofs. Their equipment provides practically every convenience common to the best clubs. There is a first-class restaurant operated by the company and open twenty-four hours a day every day in the year; private dining rooms are provided for the ladies, and spacious accommodations are offered for entertainments, dances, etc. The building contains four bowling alleys, three pool tables, a billiard table, a number of private lockers and shower baths, large lounging rooms with open fireplaces, a well-appointed library, writing room, committee, card and checker rooms, thirteen sleeping rooms, coat rooms and toilets.

The dining hall will seat 400 people when arranged as a café and 600 when used as an auditorium. A commodious stage and a small gallery for extra seating and moving-picture machines are notable features.

The kitchen, 88 ft. by 17 ft., occupies the entire rear of the building and will be equipped with every feasible and necessary device for electric cooking. Included in this apparatus are a 9-ft. by 3-ft. Simplex flat-topped electric range, three three-heat baking ovens, five hot-food cabinets, one large electric serving table with an electrically heated dish closet, three 5-gal. coffee urns, electrically heated cup warmers, frying kettles, roll warmer, bread raiser, bake ovens of smaller sizes, etc. Outlets are also provided in the dining hall for electric cooking at the tables, and a varied assortment of electric waffle irons, toasters, griddles, egg boilers, etc., is a feature of the establishment.

#### Yard Lighting

The illumination of the yard and roadways at the service plant is cared for by an initial installation of about twenty 6.6-amp, 350-watt tungsten lamps in ground glass, acorn-shaped globes mounted about 20 ft.

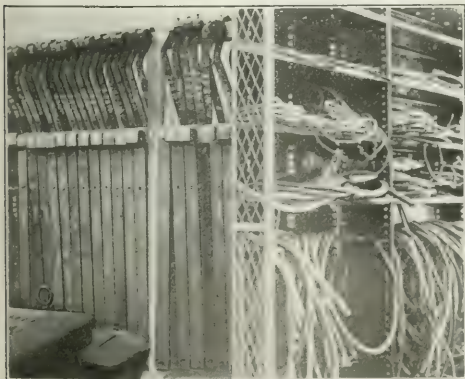


FIG. 16 — TRANSFORMER HANGER IRONS IN RACK      FIG. 17—LOOSE WIRE AND CABLE STORAGE SHELVES

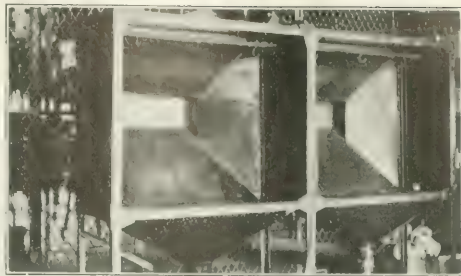


FIG. 18 —ARC-LAMP CLEANSING CHAMBERS, ARC-LAMP SHOP

above the road surface. Several 400-watt multiple lamps housed in similar globes are mounted on the fronts and sides of the buildings and supplied with energy from the house circuits. The yard lamps are carried by iron goosenecks coated with aluminum paint and mounted on combination wooden and iron poles 19.5 ft. high. The lower sections of these poles are of fluted iron to a height of 3 ft. 6 in. above the ground, with the usual short-circuiting switch in the base. All post lamps are fed by underground conduit. The wooden sections of the poles are 9 in. in diameter at the junction point with the iron bases, and not a trace of a wire can be seen in the entire yard lighting. Constant current for this service is derived from a tub transformer in the operating room of the service buildings substation.

Succeeding sections of this article will describe the arc-lamp shop, methods of testing meters, provisions for handling incandescent lamps, the photometer equipment, and the facilities of the transportation department.

#### Cost of Electric Hoisting

At the Penn and Republic Iron Mines in Michigan ore is being hoisted in electrically operated cages at 600 ft. per minute with an average energy consumption of about 0.00146 kw-hr. per live-ton-foot. By "live-ton-foot" is meant the weight of the useful material hoisted multiplied by the number of feet of vertical lift. Balanced Curry hoists are employed and the average load per trip is 12,000 lb. As hoisting at these mines is intermittent, the motors are operated on signals only. About twenty seconds is required to bring the hoisting rate up to the normal rope speed of 600 ft. per minute.

#### Electric Welding While You Wait

A workman in a railway shop approached his foreman not long ago with a request for a new machinist's hammer, showing his former tool split into longitudinal halves as the result of a heavy blow. Being busy, the foreman in a half-joking manner said, "Take it to the electric welder; we're out of hammers." Without question the workman obeyed. Later the foreman noticed the man lustily chipping a nut and asked him where he got the new hammer. The inquiry elicited the fact that the two pieces of the broken hammer, small and irregular as they were, had been welded electrically with neatness almost defying detection. Whether this was an economical process has yet to be determined, but as evidence of the electric welder's general usefulness the incident is worth chronicling.



## Model for Alternating-Current Quantities

A kinematical model for displaying the instantaneous relations between the pressure, current, power and energy in an alternating-current circuit. By A. E. Kennelly and H. G. Crane

THE model here described is intended to be operated by rolling it slowly over the edge of a table, so as to be able to observe, from moment to moment, the projections of three revolving vectors upon four graduated scales. Three of these scales, representing respectively volts, amperes and watts, are vertical and are attached to the moving model. The fourth, representing joules, is horizontal and is fastened to the edge of the table.

The model consists of a pair of wooden disks 25 cm in diameter and 1.9 cm thick, mounted rotatively in a brass frame or carriage, which carries a handle at the back. The left-hand disk, which may be called the *L* disk, takes cognizance of the power and energy relations and rolls counterclockwise on the edge of the

marked from 0 at the center of the disk to +20 above and to -20 below that level. Each unit of the scale represents either 10 volts or 10 amp, so that this *R* scale reads directly in dekalvolts or dekamperes.

Disk *L* carries a single brass pointer or power vector *P*, friction-tight on its shaft, so as to be adjustable in phase. An arrow-head, friction-tight on the pointer, allows the vector power to be set at different vector lengths. A thin brass strip hangs vertically from the arrow-head so as to mark the projection of the latter on the horizontal scale of joules fastened to the table edge. The fixed vertical scale, carried in front of the *L* disk, is graduated from 0 at the table level to +15 kw above and -5 kw below.

When the model is allowed to roll toward the left

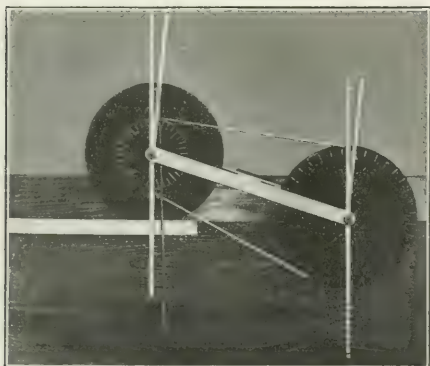


FIG. 1—NON-INDUCTIVE CASE

$E = 100 \angle 0^\circ$  volts     $P = 10 \angle 0^\circ$  kw  
 $I = 100 \angle 0^\circ$  amp     $W = 0$  kj

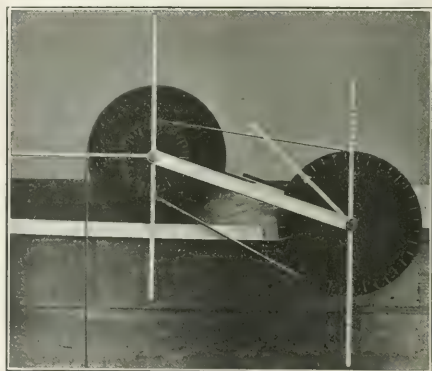


FIG. 2—NON-INDUCTIVE CASE

$E = 100 \angle 45^\circ$      $W = 1.0$  kj  
 $I = 100 \angle 45^\circ$      $e = 70.7$  volts  
 $P = 5.0$  kw     $i = 70.7$  amp

table. The right-hand disk, which may be called the *R* disk, takes cognizance of the pressure and current relations. The *R* disk is driven counterclockwise by the *L* disk, at half angular speed, by a small belt, so that *R* makes one complete revolution for two revolutions of *L*. Since the model rests upon disk *L*, and a small roller at the back of *R*, disk *R* has no resistance to overcome save the friction of its sleeve on the bearing-pin of the carriage; so there is very little tendency for the driving belt to slip.

Disk *R* carries one fixed vector painted in white, the full radius of the disk (12.5 cm), and also one adjustable movable vector, carried friction-tight on the shaft of the disk. The fixed or  $E_m$  vector represents an impressed emf of 100 volts, while the adjustable brass vector is the current or  $I_m$ -vector, the phase of which is adjustable within 60 deg. ahead or astern of  $E_m$ . The magnitude of this current may be adjusted by sliding a friction-tight arrow-head along the brass *I* pointer between the limits of 100 amp and 200 amp. The fixed vertical scale on the carriage in front of the *R* disk is

along the table edge, starting from a point when the *E* vector painted on the *R* disk is vertical and upward, while the *I* vector on the *R* disk has its proper phase with respect to the latter, and the *P* vector stands parallel to *I*, the vectors continue to rotate in such a manner that their projections on the proper scales mark the instantaneous values of *E*, *I*, *P* and *W* in dekalvolts, dekamperes, kilowatts and kilojoules respectively.

Figs. 1 to 5 inclusive show five successive stages in a cycle of cophase *E* and *I*, with power-factor 1. Figs. 6 to 11 inclusive show six successive stages in a half-cycle, with *I* lagging 60 deg. behind *E* and with power-factor 0.5.

Considering the non-inductive case of Figs. 1 to 5, we have a maximum cyclic emf of  $100 \angle 0^\circ$  volts, supplying a maximum cyclic current of  $100 \angle 0^\circ$  amp through a resistance of 1 ohm. In Fig. 1 the *E* and *I* vectors are shown at 10, just behind the vertical position of standard phase, while *P* is shown at 10 in the same phase. The vertical index from *P* is over the zero of the energy scale.

In Fig. 2 the  $E$  and  $I$  vectors have advanced through 45 deg., while the  $P$  vector has advanced through 90 deg. The instantaneous projection of  $E$  is 7.07 deka-volts, of  $I$  7.07 dekamperes, of  $P$  5.0 kw. It is assumed that the emf makes 1 cycle per second, so that there will be 5 kilojoules of energy delivered to the circuit per second. In the first eighth of a second, as represented in Fig. 2, the average energy would be 0.625

At this instant the energy liberated in the circuit is momentarily stationary. That is to say, there is a momentary stoppage in the energy flow.

In Fig. 4, one-half second from the start,  $E$  and  $I$  have completed a half-cycle, while  $P$  has completed a cycle or one revolution of the  $L$  disk. The instantaneous emf and current are each at — 100, and  $P$  is at 10. The instantaneous energy is at 2.5 kilojoules.

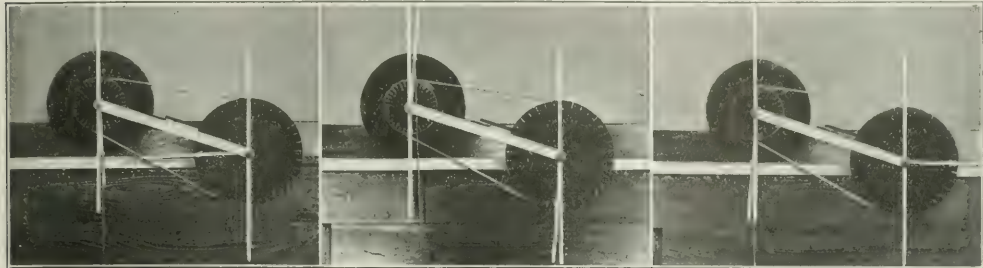


FIG. 3—NON-INDUCTIVE CASE

$E = 100 \mid 90^\circ$        $W = 1.25 \text{ kj}$   
 $I = 100 \mid 90^\circ$        $e = 0 \text{ volts}$   
 $P = 0 \text{ kw}$            $i = 0 \text{ amp}$

FIG. 4—NON-INDUCTIVE CASE

$E = 100 \mid 180^\circ$        $W = 2.5 \text{ kj}$   
 $I = 100 \mid 180^\circ$        $e = 100 \text{ volts}$   
 $P = 10.0 \text{ kw}$          $i = 100 \text{ amp}$

FIG. 5—NON-INDUCTIVE CASE

$E = 100 \mid 270^\circ$        $W = 3.75 \text{ kj}$   
 $I = 100 \mid 270^\circ$        $e = 0 \text{ volts}$   
 $P = 0 \text{ kw}$            $i = 0 \text{ amp}$

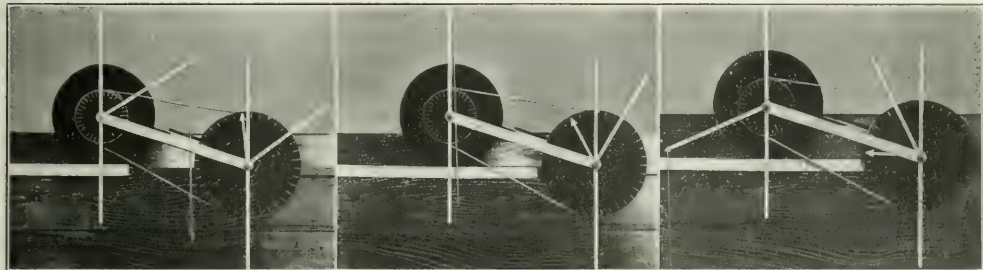


FIG. 6—INDUCTIVE CASE

$E = 100 \mid 0^\circ$        $W = 0.69 \text{ kj}$   
 $I = 200 \mid 60^\circ$        $e = 100 \text{ volts}$   
 $P = 10.0 \text{ kw}$          $i = 100 \text{ amp}$

FIG. 7—INDUCTIVE CASE

$E = 100 \mid 30^\circ$        $W = 0.42 \text{ kj}$   
 $I = 200 \mid 30^\circ$        $e = 86.6 \text{ volts}$   
 $P = 15.0 \text{ kw}$          $i = 173.2 \text{ amp}$

FIG. 8—INDUCTIVE CASE

$E = 100 \mid 90^\circ$        $W = 1.94 \text{ kj}$   
 $I = 200 \mid 30^\circ$        $e = 0 \text{ volts}$   
 $P = 0 \text{ kw}$            $i = 173.2 \text{ amp}$

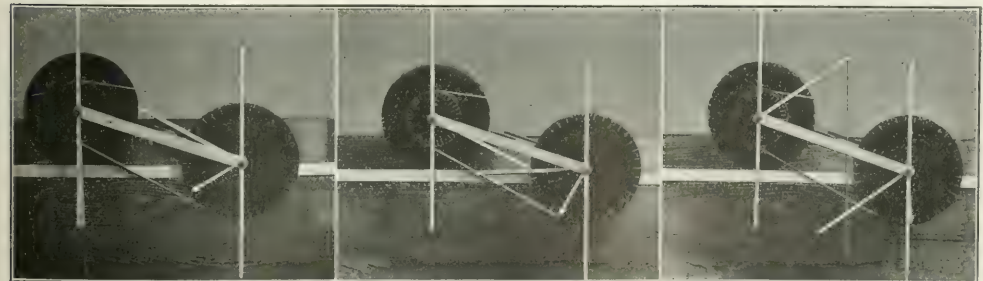


FIG. 9—INDUCTIVE CASE

$E = 100 \mid 120^\circ$        $W = 1.67 \text{ kj}$   
 $I = 200 \mid 60^\circ$        $e = 50 \text{ volts}$   
 $P = 5.0 \text{ kw}$          $i = 100 \text{ amp}$

FIG. 10—INDUCTIVE CASE

$E = 100 \mid 150^\circ$        $W = 1.39 \text{ kj}$   
 $I = 200 \mid 90^\circ$        $e = 86.6 \text{ volts}$   
 $P = 0 \text{ kw}$            $i = 0 \text{ amp}$

FIG. 11—INDUCTIVE CASE

$E = 100 \mid 180^\circ$        $W = 1.81 \text{ kj}$   
 $I = 200 \mid 120^\circ$        $e = -100 \text{ volts}$   
 $P = 10 \text{ kw}$          $i = -100 \text{ amp}$

kilojoule, but the actual energy expended is 1 kilojoule.

In Fig. 3, one-quarter of a second from the start,  $E$  and  $I$  have advanced a quarter cycle, or 90 deg. Their instantaneous projections are zero.  $P$  has advanced through one-half of its cycle, or 180 deg.; its projection has vanished.  $W$  has advanced to 1.25 kilojoules.

Finally, in Fig. 5, three-quarters of a second from the start,  $E$  and  $I$  have their projections at zero, and  $P$  is also at zero with a total energy output at 3.75 kilojoules, with another momentary energy pause.

The three vectors  $E$ ,  $I$  and  $P$  thus rotate together, except that  $P$  has double frequency. The energy pro-



jection is that of a point on the tread of a rolling disk, and is thus the projection of a cycloidally moving point.

Turning now to the inductive case, Fig. 6 represents a maximum cyclic impressed emf of 100 volts acting on a maximum cyclic current of 200 amp retarded 60 deg. in phase. At the moment presented the emf is at standard phase, or full maximum, corresponding to  $t = 0$  in the equation  $e = 100 \cos(\omega t)$  volts, it being understood that the frequency is to be one cycle per second, and therefore the angular velocity  $\omega$  of the vector is 6.28 radians per second. The emf in Fig. 6 has in fact passed its maximum a few degrees, and sufficiently far to reveal the painted arrow clear of the vertical scale on the  $R$  disk. The  $I$  pointer with its arrow-head at the extreme end follows  $E$  60 deg. in the rear. The active component of this current is  $200 \cos 60 \text{ deg.} = 100$  maximum amp, or the same as in the non-inductive case, but the reactive component is  $200 \sin 60 \text{ deg.} = 173.2$  maximum amp. On the  $L$  disk the power vector starts at 10 kw amplitude, parallel to  $I$ ; that is, 60 deg. behind the maximum projection. At the instant represented the power is just 10 kw and the vertical projection from the  $P$  arrow-head would intersect the horizontal white energy scale at  $-0.69$ , the axis of  $P$  being over the zero of this scale.

In Fig. 7, after the lapse of one-twelfth second,  $E$  has advanced 30 deg.,  $I$  being 30 deg. behind its maximum.  $P$  has reached its maximum development at 15 kw, and  $W$  has reached 0.42 kilojoule, or 1.11 kilojoules beyond its starting point.

Fig. 8 shows the state of affairs after the lapse of a quarter emf cycle. The projection of the  $E$  vector is now zero, and that of  $I$  is 173.2 amp. The projection of the  $P$  vector is zero, and on the  $W$  scale 1.94 kilojoules. This energy projection, instead of advancing, now commences to retreat, representing a floodtide of energy from the circuit back to the source during this portion of the cycle.

In Fig. 9, after one-third of an emf cycle, the  $E$  vector has advanced through 120 deg., and its projected value is  $-50$  volts. The  $I$  vector has its projection at  $+100$  amp. The power-vector is at  $-5$  kw, and the energy has receded to 1.67 kilojoules.

In Fig. 10, five-twelfths of an emf cycle from the start, the  $E$  vector, having advanced through 150 deg., has a projected value of  $-86.6$  volts, while the projected value of the current is zero. The projected value of the  $P$  vector on the vertical power scale is 0 kw, and on the horizontal energy scale is 1.39 kilojoules. From this moment the floodtide of energy stops and the ebb-tide commences, at first slowly, and then at maximum rate when the power is a maximum.

Finally, in Fig. 11, after a lapse of one-half emf cycle, the emf has just passed its full negative value, while the current is  $-100$  amp. The exact epoch designated would leave the  $E$  pointer concealed. The projection of the  $P$  pointer on the vertical scale of disk  $L$  is 10 kw, and that on the horizontal scale 1.81 (1.84 actually indicated owing to the necessary displacement for revealing  $E$ ). The actual energy delivery in the emf half cycle has therefore amounted to 2.50 kilojoules. It is evident that the conditions in the next emf half cycle will be the same as in that just considered, except that the signs of  $E$  and  $I$  are both opposite to what they were.

The paths of the  $E$ ,  $I$  and  $P$  vectors with relation to their traveling vertical scales are simple circles. The path of the  $P$  vector with respect to the fixed horizontal scale of energy is an oblate trochoid.

We have hitherto assumed that the emf phase was the phase of reference for  $E$  and  $I$  vectors, so that the current was taken as lagging with respect thereto. We may, however, take the current phase as the phase of

reference, and the emf leading with respect thereto. This means starting the model with  $I$  vertical, and  $P$  at the same moment parallel to the leader  $E$ .

We have also assumed that the circuit represented by the model was inductive, or that the current lagged behind the pressure. But in order to represent a condensative circuit, with the same power-factor, to pressure standard phase, it is only necessary to start with  $E$  vertical,  $I$  advanced 60 deg., and  $P$  at the same moment parallel to  $I$ .

The model described is constructed for an active power of 5 kw, as it would be indicated on an ordinary wattmeter in the circuit. That is, with  $E_m$  at 100 volts, the inphase or active component of  $I_m$  must be 100 amp. The actual maximum cyclic current may vary between 100 amp and 200 amp, with a corresponding phase difference from 0 deg. to  $\pm 60$  deg. It would readily be possible to make the model capable of representing lesser active powers and power-factors by changing the size of the rolling disk  $L$ . For zero power-factor the rolling disk diameter should be zero, so that the disks should then rotate without perceptible advance. Since, however, the purpose of the model is to reveal to the eye the essential relations between the  $E$ ,  $I$ ,  $P$  and  $W$  cyclic variations in a simple alternating-current circuit, it is not necessary to indicate more than a few illustrative cases.

In the operation of the model,  $E$ ,  $I$  and  $P$  advance with time counterclockwise, or according to convention, and their instantaneous projections on their appropriate vertical scales travel up and down in the conventionally correct  $+$  and  $-$  directions, except as regards the direction of advance over the energy scale, which is from right to left, or negative. This error in direction may, however, be conceived to be eliminated by making the model roll vertically upward on the edge of a door. The advance over the  $W$  scale would then be positive upward, and the  $E$ ,  $I$ ,  $P$  scales would become horizontal scales, retaining their proper conventions.

The theory of the action of the model was discussed, without reference to a working model, in a paper\* presented by one of the authors of this article before the annual convention of the American Institute of Electrical Engineers held in 1910.

## Mercury-Vapor Light for Inspecting Translucent Products

Cube sugar and ivory piano keys are inspected under artificial illumination produced by mercury-vapor lamps with greater speed and accuracy than can be attained in ordinary daylight. Raw sugar is a brown substance, while the refined product is pure white, its whiteness being due to the same cause as the whiteness of snow, since both are made up of small transparent crystals. Any impurity in sugar manifests itself by changing the white to a shade of yellow. To detect impurities, plates of the crystallized sugar 1 in. thick are examined by a man looking through them toward a mercury-vapor lamp. When thus viewed the yellow impurities stand out clearly in the bluish-green light. The color of ivory varies from the outside to the center of the tusk to such an extent that manufacturers sort the pieces into sixteen different shades. Formerly this sorting could be done only in bright daylight, but with the light of the mercury-vapor lamp grading can be done without limitation at any hour out of the entire twenty-four.

\*"Vector Power in Alternating-Current Circuits," by A. E. Kennelly, *Trans. Am. Inst. Elec. Engrs.*, June, 1910, Vol. XXIX, Part II, pp. 1233-1267.

# Canadian Electrical Association Convention at Montreal

Abstracts of papers and discussions presented at the twenty-fourth annual meeting of electrical utility operators of the Dominion, June 24, 25 and 26

**A** SUMMARY of the news features of the Montreal convention of the Canadian Electrical Association, June 24, 25 and 26, was given in these columns last week. Herewith we present abstracts of papers and discussions withheld for lack of space in that issue. In addition to the formal papers here noted, addresses were also delivered by Mr. L. B. Chubbuck, Hamilton, Ont., on "Modern Switching Equipment"; Mr. J. F. H. Wyse, Toronto, Ont., on "Safety First," and Mr. H. J. Madgwick, Cleveland, Ohio, on "High-Efficiency Incandescent Lamps."

## Legal Aspects of Electrical Interference

"The Legal Aspect of Interference Between Systems of Electrical Companies" was the subject of a paper by Mr. G. H. Montgomery, K. C., Montreal, read at the session of Wednesday afternoon. Mr. Montgomery reviewed in a general way the tenor of the judgments handed down in the United States in such cases, bringing out the general point that priority usually indicates superior rights, although this suffers exception due to franchise rights. Street railways enjoy dominant rights within city limits but are considered a burden on country roads. Priority usually holds in cases of interference in overhead lines, but disturbance in telephone and telegraph lines cannot be claimed if the companies are not equipped with modern appliances for correcting this trouble. In the Canadian decisions cited it was pointed out that travel is the dominant purpose of the streets; that telephones and telegraph lines can be placed on the sides but must not interfere with each other or with the power lines, and that priority usually holds within reasonable rights. In closing, Mr. Montgomery suggested further investigation of the topics of decisions relating to electrolysis and accident cases.

## Discussion

Mr. D. H. McDougall, of Toronto, cited the verdict recently handed down in favor of the Toronto Electric Light Company in a case where the city contended that all of the poles of the company were used to light the streets and therefore should be removed in accordance with a clause in the street-lighting agreement by which all poles should be removed on the expiration of the agreement.

Mr. A. A. Dion cited a case in Ottawa where, taking advantage of a clause in the franchise which allowed the municipality to attach wires to the company's poles (fire alarms being the intention of the clause), the municipality insisted that this meant any wires and that it could transfer this right to another company which had started up in competition. Arbitration upheld the municipality on this point and the city later bought out the competing company and now has the use of the company's poles. The arbitration made this a mutual privilege accompanied by a nominal yearly rental fee.

## Grounding of Distribution Circuits

The undesirability of operating grounded distribution systems unless the ground connections have very low

resistance was brought out in Mr. S. Bingham Hood's paper on "Grounding of Distribution Circuits." Attention was called to the fact that driven grounds vary in resistance from about 5 ohms to 180 ohms, depending on the soil and contact therewith. In the earth around

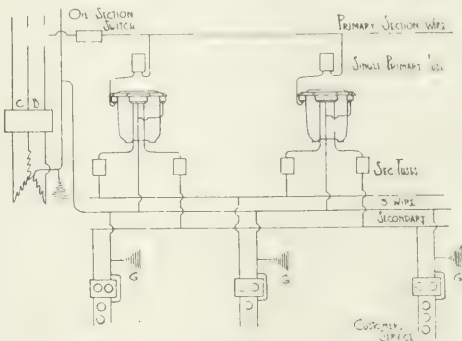


FIG. 1—PRIMARY AND SECONDARY SYSTEM HAVING COMMON GROUND NEUTRAL

such ground connections the potential gradient may be considerable, and a person walking in the vicinity may receive a noticeable or even fatal shock due to the potential difference between the places where his feet touch. The danger of having uninsulated ground wires on poles was also pointed out when they are in such positions that linemen may come in contact with them while working on ungrounded conductors. The method illustrated here was suggested for grounding house-service systems and is less expensive than that prescribed by the code. Where possible it was advised to connect ground conductors to water pipes at the point where they leave

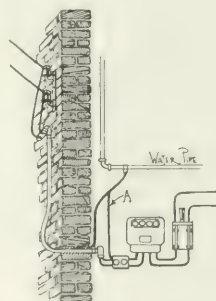


FIG. 2—ECONOMICAL METHOD OF GROUNDING HOUSE CIRCUITS

the building. When lines enter a house through the upper walls it is sometimes practicable to attach the ground wire to bathroom fixtures or vent pipes, or to overflow pipes on expansion tanks when hot-water heating equipment is employed. By thoroughly ground-



ing the neutral conductor of an interconnected three-wire distribution system every 300 ft. or 400 ft. it was declared that accidents and instrument trouble from accidental grounds have been considerably decreased. A three-phase primary and a three-wire secondary system were described having a common neutral conductor which makes it possible to eliminate ground wires on poles and employ one conductor in the single-phase primary sections, thereby reducing the installation investment. The connections used in this system are shown in an accompanying diagram.

#### Discussion

Mr. V. B. Coleman, of Port Hope, said that his city has no extensive water-works system, and while one part of the town is underlaid by rock very close to the surface, the other portion is built on a deep layer of porous sand.

Mr. Wills MacLachlan, Toronto, said that in towns built on sand he had found "coke" grounds to be the most satisfactory, although they have to be inspected from time to time. He took issue with Mr. Hood on the point of removing ground wires from transformer poles and insisted that to insure grounding of the system transformers ground wires should be run down transformer poles and insulated if necessary to protect the linemen.

After further discussion by Messrs. Dion, Mudge and Gould, a resolution was passed that a committee on grounding be appointed with Mr. S. B. Hood as chairman. It was suggested that the committee (1) obtain a complete record of present rules and regulations on grounding, (2) obtain full information from member companies as to their experience in different localities, (3) secure information from the N. E. L. A. and from European societies on the question of grounding, (4) draft recommendations for standard practice of grounding, (5) carry on a campaign of standardization of grounding among member companies, and (6) assist in demonstrating to municipalities that grounding to water systems is not injurious.

#### Value of Electric-Heating Load to Central Stations

Electric heating devices, operating data thereon and the revenue produced by such loads were discussed in Mr. Harold S. Brown's paper on "The Value of Electrical Heating Devices to the Central Station." Electric flatirons were referred to as being the most exten-

sive revenue producers of all heating devices. The average monthly income from them comes to about 70 cents each, and since about 250,000 irons were sold in 1910, the estimated revenue therefrom (\$2,000,000) about equaled the value of the apparatus sold. Investigations conducted in 1911 at Scranton, Pa., showed that the flatiron load is very desirable, for on the days when most used the load comes on at 7 a. m. and disappears about 5 p. m. Data were presented on the cost of operating electric ranges in preparing meals for average and large-sized families, for hotels and clubs, etc. For a family of four or five people meals were prepared for a total monthly cost of \$3 at an energy rate of 3 cents per kw-hr. The maximum demand during the six successive days' tests was 2.85 kw, and the average energy consumption was 3.28 kw-hr. By employing six ranges and preparing all of the meals at once (a theoretical case) the maximum demand would have been only 9.6 kw instead of 17.1 kw, thus showing a diversity factor of 56 per cent. The costs of cooking similar foods by gas and electricity were also compared with electricity at 3 cents per kw-hr. and gas at \$1 per 1000 cu. ft. In some cases the costs were about the same, in others the gas or electricity showed advantages. When meals were prepared by electricity the average energy consumption was 0.219 kw-hr. per person for average meals and 0.369 kw-hr. for heavy meals. With energy at 3 cents per kw-hr. the cost of preparing a meal for five persons varied from \$0.007 to \$0.019 per person. The revenue derived from electric cooking is as high as fifteen times that derived from lighting in some localities. A club employing an electric range and bake-oven with steam-heated stock kettles reported that electricity at 3 cents per kw-hr. will compete with coal at \$7.50 per ton or gas at \$1 per 1000 cu. ft.

#### Discussion

Mr. Brown's paper was preceded by a moving-picture film depicting the advantages of electrical appliances in the home.

During the discussion of the paper Mr. Leacock, of Toronto, and Mr. Moore, of Belleville, brought out the point that the shrinkage in roasts cooked by electrical heat is only 8 per cent as compared with 20 per cent by gas or coal.

Mr. D. H. McDougall, of Toronto, and Mr. A. A. Dion, of Ottawa, warned that the universal use of electric ranges and appliances might bring about a "heating peak" higher than the normal lighting peak, and this by means of business obtained on a supposedly "off-peak" rate!

Mr. W. L. Bird, of Fort William; Mr. J. C. Wills, of Belleville, and Mr. Wills MacLachlan, of Toronto, showed that electric ranges would be used more in summer than in winter and that residential business is of value to a central station not only from the purely financial standpoint but also by reason of the political aid obtainable from satisfied householders.

Mr. G. Radcliffe-Hulme, representing the British Electric Traction Systems, advised the proper installation of all electric appliance outlets and wiring.

#### Co-operation in Appliance Sales

"Co-operation in the Selling of Heating and Cooking Devices from the Standpoint of the Central-Station Companies" was the topic of a paper by Mr. W. B. Johnson, Montreal, in which the author declared that the selling of electrical appliances by central stations has no defense from a commercial standpoint but simply antagonizes the contractors and dealers. Prices should be maintained at which the dealer can make his fair profit, and this should be from 20 per cent to 30 per cent above cost. Sales of appliances should not, however, be left entirely to dealers, as such sales are always boosted by the central station carrying them. Cutting of prices by dealers is the only justification for reducing the standard price on the part of the cen-

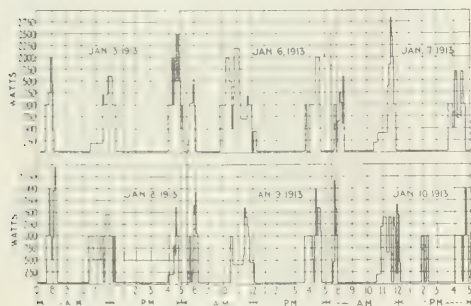


FIG. 3—POWER DEMANDS FOR PREPARING MEALS FOR FIVE PERSONS

sive revenue producers of all heating devices. The average monthly income from them comes to about 70 cents each, and since about 250,000 irons were sold in 1910, the estimated revenue therefrom (\$2,000,000) about equaled the value of the apparatus sold. Invest-

tral station. Appliances at cost or reduced prices will sell quickly but are also discarded quickly.

### Discussion

A lively discussion followed the reading of the paper. Mr. V. B. Coleman, of Port Hope, and Mr. R. J. Smith, of Belleville, both declared that the dealers in small towns have no special interest in appliances, do not inform themselves on the question and, if they were to push the sales, they would be likely to encourage inefficient apparatus.

Mr. Oswald H. Scott, of Belleville, on the other hand, felt that the public would soon find who supplied the most efficient appliances and that the dealers alone should handle them.

Messrs. MacLachlan and Dion in speaking of the sale of lamps felt that 25-watt and 40-watt lamps should be sold at the same price but that the 60-watt size is rather too large for residence use and therefore should be rated at a different figure. Mr. Dion in particular stated that the equal pricing of 25-watt and 40-watt lamps had resulted in a greater energy consumption than would have obtained if the prices had been higher on the 40-watt unit.

Mr. Carr, of Toronto, asked why central stations do not give away electric irons if the revenue therefrom is 70 cents per month. Mr. Johnson replied that 70 cents per month is too much to be expected from an iron and that the policy of giving away any appliance is not a sound one.

### Maximum Demand

Mr. P. T. Davies, of the Montreal Light, Heat & Power Company, presented a paper on "Maximum Demand Determination and Its Relation to the Cost of Supply of Electrical Energy." The author showed that the most important item in the cost of supplying energy is that of fixed charges. For a steam plant with a high load-factor the fixed charges may average 78.5 per cent of the total charges, while for a hydroelectric development they may amount to 86 per cent. The amount of the fixed charges borne by the customer depends on his demand. This may be determined on the basis of instantaneous peak, of lowest point of usage during a stated interval, or of average load during a known interval. The first two were shown to be unsatisfactory. Taking the third method, the author discussed the length of demand period, the number of demands to be taken, and whether a demand once established shall remain the billing basis for the remainder of the contract, unless exceeded.

### Discussion

Mr. McDougall, in view of the investment required for supplying service, advocated a progressive demand, that is, that the demand once established should obtain throughout a year rather than fluctuate each month.

Another point of view was offered by Mr. G. Radcliffe-Hulme. His opinion, based on eighteen years of central-station experience in England, was that the maximum-demand basis of billing is not the most satisfactory method. In the event that a demand basis were to be used he advised against taking any standard duration of peak but suggested measuring the overlapping of the motor and lighting peaks as a method of arriving at the demand for billing purposes.

### Steam Railway Electrification

Mr. J. A. Shaw, of the Canadian Pacific Railway Company, presented some notes on steam-railway electrification. Of the three systems—three-phase, single-phase and 2400-volt direct current—only the last two, he declared, are shown to be suitable for general work. The author compared the general arrangement of the two

systems and their cost of installation and operation. Where energy is obtained from a three-phase distribution, the single-phase and direct-current costs are substantially the same. The single-phase current has an objectionable effect on telegraph and telephone wires, while with direct current there is the objectionable feature of electrolysis. The 2400-volt direct-current system presents a few difficulties, but these will be remedied by experience. The author then made a final comparison of the two systems. With direct current a large portion of the installation cost is in feeder copper and conversion apparatus, and less in locomotives. Most of the operation costs are in substation attendance and maintenance, instead of in locomotive maintenance as in a single-phase system. The regulation of speed on the single-phase system is in many ways preferable to that on the direct-current system. It has been estimated that on a 440-mile division electric operation offers a saving of 25 per cent over steam.

### Interruptions on Long-Distance Transmission Lines

In his paper, "Interruptions on Long-Distance Transmission Lines; Their Origin and Means of Prevention," Mr. P. Ackerman pointed out that from 80 per cent to 90 per cent of transmission-line interruptions are caused by lightning puncturing insulators or causing flash-overs. By designing insulators so that surges with steep wave-fronts will flash over rather than puncture the insulators, one of the principal causes of breakdown can be eliminated. When an insulator is punctured the energy discharged is usually concentrated in such a small space that it will sometimes burst the disks and even unseat or burn off the conductors. It is therefore advisable to support the conductor away from the insulator if possible. As a flash-over serves as a sort of safety valve to insulators, it is advisable to make the ratio of puncture voltage to flash-over voltage about 1.5:1, or, better, 2:1. When requiring tests on insulators to insure electrostatically even and sound material it should be specified that a flash-over test of several minutes' duration be conducted with the short-circuit current of the testing transformer choked down as much as possible. Attention was called to some flash-over tests which showed that insulators built with sections similar to suspension-insulator disks are damaged less by flash-overs than are insulators having drooping petticoats with deep air pockets. Discharge horns were recommended to protect insulators from the brunt of flash-overs, but Nicholson arc extinguishers were suggested as a better preventive of insulator trouble. Interruptions caused by sleet or wind short-circuiting conductors can be prevented most effectively by selective relays. Selective straight-overload protection employing definite-time relays was recommended for localizing interruptions in distribution or feeders. It was suggested that the selective action of reverse-energy relays can be improved where conditions permit operation of two lines with the high-tension side sectionalized, thus affording a path for a short-circuit current from one line into the other through the transformers and low-tension bus. This arrangement will have a tendency to maintain some voltage on the low-tension bus and thereby insure operation of the reverse-energy relays. Selective protection of three or more parallel lines can be obtained by taking advantage of the fact that a short-circuit in one line unbalances conditions in the respective phases of the other lines.

Messrs. MacLachlan and Hood, of Toronto, brought up the question of "fatigue of insulators," and the author of the paper expressed as his personal opinion that this fatigue is a molecular phenomenon similar to that of a steel spring under vibration.



# Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods and Current Practice Among Successful Utilities

## Cost of Handling an Electric-Light Bill in Chicago

The average cost to the Commonwealth Edison Company, Chicago, for handling a customer's bill is said to be 12 cents. In this figure are included cost of material and labor required to complete the operation of rendering the bill. Collections are made in the regular way, and it is interesting to note that 72 per cent of the customers' bills are paid by mail and through the various cashiers' offices, 23 per cent are received through collectors, while the remaining 5 per cent reach the company through the medium of an express company, the customer paying a small fee for the convenience of paying in his own neighborhood. The scheme now in force of carrying lamp-renewal accounts in connection with the customers' bills is said to facilitate collections for lamp renewals and to save considerable money which would otherwise be expended in extra stamps for mailing lamp-renewal bills.

## Electric Vehicle in Outdoor Vacuum-Cleaner Demonstration

By employing an electric vehicle in a new business campaign conducted recently by the United Electric Light & Power Company, New York, it was possible to

quire electricity for its operation. Energy from the vehicle storage battery was utilized in operating the cleaner and in illuminating signs advertising the electric-service company and the special price of the appliance displayed.

To provide for the street demonstration, a 1-ton truck which had been in service for several years was stripped of its body and a carpeted platform fastened to the chassis in its place. Wooden uprights connected by a railing and braced by two-by-fours were then erected on the platform to support a 24-in. transparent border sign. The framework, while preventing the demonstrator within from accidentally stepping off the platform, permitted a clear view of the operation of the vacuum cleaner. The lettering on the border sign was brought out emphatically by illumination from 90-volt lamps equipped with Frink reflectors concealed within the box-shaped sign. Long horizontal panels below the border sign were equipped with Argus lamp-letters spelling out the name of the electric-service company.

The demonstration on the vehicle was supplemented by the circulation of pamphlets advertising the reduced price at which the cleaner was offered for sale. During the campaign, which covered May and June, forty-dollar vacuum cleaners were sold at \$27.50. Return postal cards attached to the circulars, when signed by a prospective customer, instructed the company to send a demonstrator to the inquirer's home. The text on the folders called attention to the construction of the cleaner and also to the low cost of operation—1 cent per hour.

Impressed by an increase in sales of over fifteen cleaners per week (due to the display), the company has decided to utilize this effective publicity method still further in a flatiron campaign.



OUTDOOR DEMONSTRATION OF VACUUM CLEANER ON ELECTRIC VEHICLE

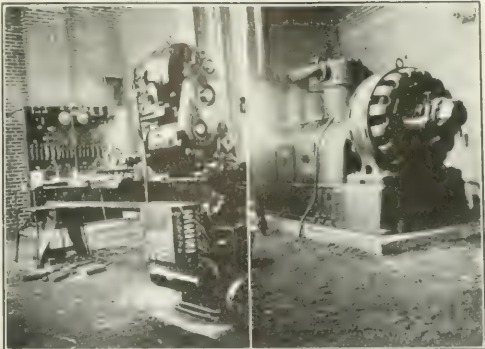
demonstrate the operation of an electric vacuum cleaner on the street, thereby attracting considerably more attention than could have been obtained by an office-window demonstration. The campaign not only advertised the particular electric appliance being introduced but suggested to others how an electric vehicle can be utilized in demonstrating apparatus which re-

## Reserves for Depreciation

Mr. H. A. Fee outlined in a paper before the Michigan Electric Association the necessity for making proper reserves for depreciation. Too often companies view with satisfaction a growing surplus, although such surplus would be much less had depreciation been taken into account. Rates have been reduced where earnings were high, although this would not have happened under a proper system of accounting. Ordinary maintenance takes into account only partial renewal. Cumulative depreciation, on the other hand, considers wear or decay, inadequacy, obsolescence, disaster, and loss of franchise. In arriving at the proper percentage care must be taken to treat each plant separately. The author stated that the simplest method of creating the reserve is to combine the straight-line method with the sinking-fund method, so that the straight-line funds in accumulating may yield the greatest possible earnings. The creation and maintenance of a reserve fund should always precede the payment of dividends. At the end of his paper the author appended a form of cash and journal account and a ledger account for handling depreciation.

Seven Barrels of Self-Heated Irons

Mr. C. E. Michel, manager of the appliance department of the Union Electric Light & Power Company, St. Louis, Mo., recently announced that the company would allow its customers \$1 on the purchase price of any electric iron if they brought with them any type of old self-heated iron when they called to make their electrical purchases. As the result of this offer and the ensuing campaign, seven barrels of old irons now stand in the cellar of the St. Louis company's electric store. Eighty per cent of the lot are gas-heated irons and the remainder are charcoal and gasoline irons. Mr. Michel says that these old relics will soon be dumped from the Eads Bridge into the Mississippi River.



FIGS. 2 AND 3 -ALTERNATING-CURRENT MOTOR APPLICATIONS

When Mr. C. F. McGregory, who is in charge of the shop, had the purchase of this machinery under advisement considerable doubt was expressed as to the MOTOR APPLICATIONS IN MACHINE AND CARPENTER SHOPS

Application of Twenty-Five-Cycle Motors to Machine-Tool Drive

The bringing of Keokuk hydroelectric energy into a manufacturing center such as St. Louis has created some interesting problems for the engineer. The Manufacturers' Railway Company, as its name implies, handles freight for manufacturers in the southern part of the city. For repairing its steam locomotives



FIG. 1—INTERIOR OF PRIVATE SUBSTATION

a new shop has been erected along the company's right-of-way which at this point parallels the Mississippi River. Repair work on steam engines of construction companies and other interests not having repair shops of their own is also taken to keep the shop working at high efficiency.

Energy from the mains of the Union Electric Light & Power Company is delivered to a brick substation outside the shop where the potential is reduced from 13,200 volts to 230 volts. In addition to the three 350-kw transformers, the substation contains the usual oil-switching, metering, lightning-arrester and choke-coil equipment. Energy for the entire shop is metered on the watt-hour meter shown on the panel in the substation (Fig. 1). An average of the meter readings made since the shop has been in operation shows that the monthly energy consumption for all motors and lighting is approximately 12,000 kw-hr.

Separate circuits in the shop are controlled from the two-panel distribution board shown in Fig. 2. Here also is shown one of the variable-speed lathes driven by an individual motor mounted above the headstock.

Number of Motors	Aggregate Hp.	Application
Machine shop:		
3	24	79-in. driving-wheel lathe
1	5	5-ft. radial drill.
1	1	22-in. drill press.
1	5	12.5-in. double-head bolt cutter.
1	5	24-in. shaper.
1	10	24-in. engine lathe.
1	3	14-in. steel lathe.
1	15	42-in. boring mill.
1	3	Double-wheel emery grinder.
1	15	36-in. by 36-in. by 14-in. planer.
1	1	50-ton forcing press.
2	70	Transfer table for locomotives
1	60	Three-cylinder air compressor.
1	5	Metal saw
1	2	Drill grinder.
1	27	Locomotive jacks
3	25	10-ton Pawling & Harnesheger crane
1	25	10-ft. fan.
1	20	Centrifugal pump.
1	0.5	Metal-saw grinder.
Carpenter shop:		
1	5	Variety saw.
1	5	Carpenter's planer and jointer
1	5	Band saw.
1	3	Pattern-maker's lathe.
20	480.5	

feasibility of alternating-current motors for the work. However, with the speed changes obtainable from the motor itself, used in conjunction with the lathe back

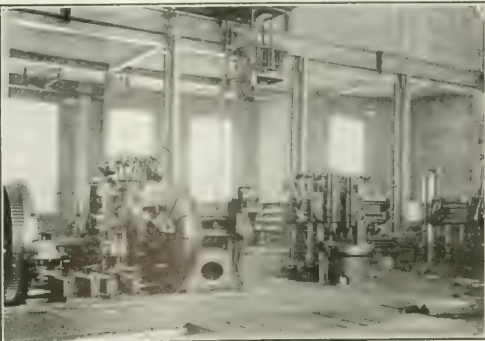


FIG. 4—GENERAL VIEW OF SHOP



gears, it is possible to secure eight speeds. These are of such wide range that any piece of work ordinarily accomplished by the lathe equipped with a direct-current variable-speed motor may be turned out with equal ease and accuracy with this equipment.

Another interesting motor-driven machine is the automatic air compressor shown in Fig. 3, which supplies air for drills and hammers in the shop. This three-cylinder machine, driven by a 60-hp motor, delivers 300 cu. ft. of air a minute to the supply tank and its operation is controlled by a pressure valve manipulating the control apparatus whenever the pressure in the tank falls below a predetermined limit.

A general view of the shop, including the Niles-Bement 79-in. driving-wheel lathe, is given in Fig. 4. Driven by three motors aggregating 24 hp and provided with a double-quartering attachment, this machine has proved to be efficient for finishing large pieces presenting themselves to the shop force.

The accompanying table gives a complete list of the motor applications. All machines are of the alternating-current, three-phase, twenty-five-cycle type and were furnished by the General Electric Company, the Westinghouse Electric & Manufacturing Company and the Wagner Electric Manufacturing Company. A portion of the shop is in operation throughout the entire day furnishing a twenty-four-hour load for the electric-service company.

### House-Wiring Results from Plan of Prize Awards

By giving each month prizes of an amount less than the salary of one salesman working on the house-wiring campaign of the Louisville Gas & Electric Company, Mr. Robert Montgomery, manager of the commercial department of the company, has been able to get better results with five salesmen than were previously obtained when eight were working. These solicitors are restricted to making contracts for the wiring of old houses and are keeping up the average well, having signed up forty-nine contracts in a recent week.

The principal prize awarded is \$10 in cash for what is termed "efficiency." The number of calls made by the salesman do not figure in this, the winner being determined by the amount of business he gets, computed in terms of kilowatt-hours, the amount of overtime he puts in, the neatness of his reports, his promptness in reporting and the absence of mistakes in his contracts. Record is kept on a blackboard in plain view of all the employees in the office so that each man is able to determine each day just where he stands with respect to the other solicitors. In addition \$10 is given in weekly prizes. Only the volume of business turned in during the week by the men is figured in the award of these weekly prizes. The man who gets the most business receives the six-dollar prize and the man next to him gets \$4. Mr. Montgomery has found that this method of stimulating his salesmen has done more to increase their efficiency and to get returns for the company than any plan previously tried. The salesmen are kept keyed up all the time and accomplish large results.

### Forewarning the Prospective Customer

In many instances a prospective user of electric service waits until "the last minute" before giving his order to the central-station company to have connection made. When such a belated order finally does arrive it is usually without previous notice, the customer is invariably in a great hurry, the company is required to attempt a rushed and overtime job, and even then the

efforts sometimes ends in disappointment for the customer owing to the absence of lines, connections, certificates of inspection, etc., necessary to complete the installation by nightfall.

To minimize this trouble the Southwestern Gas & Electric Company, Shreveport, La., makes use of warning tags which its meter readers, construction men, etc., are instructed to affix in prominent positions in each new dwelling or business structure they note along their routes. These tags read: "Please notify us when service is wanted and if possible ahead of time. Do not wait until the last minute. This is very important for new houses, as the connections may not be in and the city inspectors must issue certificates before service can be given. If you intend to move, arrange with our office in advance for the date."

### Central-Station Company Gives Away 500-Watt Fixtures

Since the first of the year the United Electric Light & Power Company, of New York, has been offering 500-watt tungsten fixtures to its consumers without charge, provided they install the necessary wiring for the lamps. Up to the middle of June 1300 of these fixtures had been thus installed and the lighting load increased accordingly. During the campaign illustrated circulars with return postal cards attached were sent to the company's customers calling their attention to the advertising value of well-illuminated stores and requesting them to allow a central-station representative to call and install one of the units. Accompanying the text were several halftone reproductions of business houses where these tungsten fixtures are used for interior and exterior illumination. The units offered were very attractive, consisting of milk-glass bowls and fixtures suspended from either chains or outriggers, depending on whether exterior or interior illumination was desired.

### Growth of Central-Station Business in Detroit

Compared with last year, the output of the Edison Illuminating Company and the Peninsular Electric Company, of Detroit, exhibits a healthy but not remarkable increase. The number of customers added to the system of these companies (which are operated together by one organization, being controlled by the Detroit Edison Company) during the month of April, 1914, was 1770. In May the number of new customers secured was 1701, while in June the estimated addition was between 1650 and 1700.

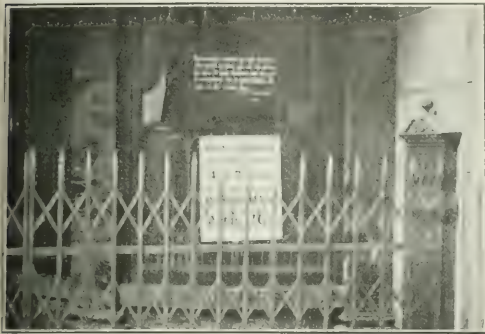
Detroit is pre-eminently a city of homes. The electric-service companies have about 85,000 customers, and of these perhaps 70,000 are residence customers. Statistics show that 39.1 per cent of the residences in Detroit are occupied by their owners. It is doubtful whether any large city in the country can show a larger percentage of householders owning their own homes. This fact is reflected in central-station business.

Miss Sarah M. Sheridan is the sales manager of both the Edison and the Peninsular company. The sales department of this system in Detroit has wide scope, having charge of all public dealings. It might be called the public relations department. All complaints come to it, and it oversees the meter and construction departments in so far as the duties of these departments relate to customers' installations. Not only does the sales department keep in close touch with every industrial prospect in Detroit but it also makes a point of keeping on friendly terms with existing customers.

## Illumination and Wiring

### Electrical Transparency in Massachusetts Savings Bank

The Home Savings Bank, of Boston, Mass., is a consistent user of electricity in advertising its service, and in harmony with the historic local "atmosphere" in which it transacts business quotations from Ben-



AN ELECTRICALLY LIGHTED LESSON OF THRIFT

jamin Franklin and other advocates of thrift are often displayed by electrical transparencies hung in the windows after the closing hour. The accompanying photograph illustrates a quotation from a modern writer on business, set up in transparency form, the display being about 24 in. long by 12 in. high and lighted by two 40-watt tungsten lamps mounted behind the lettering. The transparency can be read with ease at a distance of 15 ft., and it receives a good deal of attention from persons walking down town in the evening hours.

### Tower Lighting of a Railroad Yard with Quartz-Tube Lamps

Under the supervision of Mr. D. P. Morrison, chief electrician of the Pittsburgh & Lake Erie Railroad, that company is now trying out a new system of freight-yard lighting. The experiment is being conducted in the McKee's Rocks classification yard near Pittsburgh, Pa.

Ordinarily poles supporting electric lamps in railroad



FIG. 2—THE M'KEE'S ROCKS YARDS AT NIGHT

yards are from 25 ft. to 30 ft. high and the light from the lamps in the midst of a crowded yard is practically lost. With this new system, however, eight steel towers, 100 ft. high and 12 ft. square at the base, have been erected at approximately 500-ft. intervals along the boundaries of the tracks. At the tops of these towers Cooper Hewitt quartz-tube lamps, operating on a 220-volt direct-current circuit, supply the illumination. Each of these lamps requires about 726 watts and the specific energy consumption is said to be about 0.33 watt per candle.



FIG. 1—QUARTZ-TUBE LAMPS ON STEEL TOWERS IN PITTSBURGH RAILROAD YARD





matic constant-current transformers and regulators, together with the necessary switching apparatus and instruments. In all there are sixteen constant-current transformers, each capable of supplying energy for fifty-series lamps. The number of lamps on any one circuit varies from twenty-two to fifty-three.

Standing on an octagonal base, the slender cast-iron posts present a graceful and attractive appearance. The post proper is about 12 ft. in height and the surmounting globe measures 1.5 ft. in diameter. By proper arrangement of the socket within the globe the center of the lamp filament occupies approximately the center of the globe, giving an even and almost-perfect diffusion of the light. The series tungsten lamps used in the globes are rated at 7.5 amp, 250 watts, and the illumination provided makes the South Side boulevards as brightly lighted as any in the city. Spaced on approximately 75-ft. centers and installed opposite each other on both sides of the street, 960 of these lighting units were required to carry out the lighting scheme as shown in Fig. 1.

As a feature of the installation attention should be called to the special combination pot-head and receptacle used in the top of each post. As is shown in the cross-sectional drawing (Fig. 4), No. 6 insulated copper leads enter from the underground fiber conduit through the hollow post and pass through holes in a porcelain bushing. A heavy layer of tape wrapped about the lead sheath retains the cable in position.

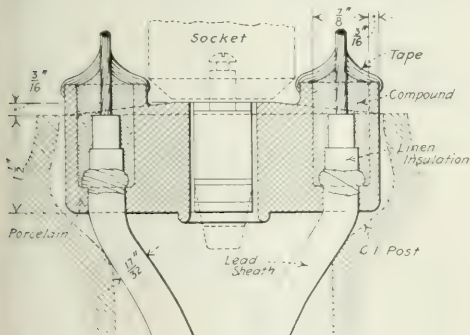


FIG. 4—CROSS-SECTION OF POT-HEAD AND RECEPTACLE

When the ends of the cable have been properly skinned pot-head compound poured into the porcelain receptacles seals the joint. The bare ends of the wire which protrude are then connected to the socket terminals by means of set screws.

The engineers for the South Park Commissioners are Messrs. W. I. Bell and F. Brueggeman.

### Inexpensive Lighting for a Modest Summer Garden

By erecting lighting posts along two sides of his summer garden a thrifty Italian who supplies refreshments to park visitors and baseball fans in the western part of St. Louis has given his establishment a bright and cleanly appearance generally lacking in such places. That the installation is inexpensive is evident from the illustration, for the bodies of the posts are made up of 4-in. by 4-in. pine timbers painted green. Surmounting each post an ordinary porcelain socket carries a 25-watt tungsten lamp. Around the top of each socket a brass fixture has been clamped so that it supports an inverted globe of the type commonly used with smaller sizes of inverted gas mantles. This globe not only acts



ELECTRIC LIGHTING IN A MODEST SUMMER GARDEN

as a diffuser for the rays of the 25-watt lamps, but also helps to protect the socket from the weather.

By carrying the multiple-circuit wiring along the top of the posts from lamp to lamp, the cost was held down to the minimum. The circuit is controlled from inside the corrugated-iron building which houses the electric meter and the Italian's stock of goods.

### A Printer's Illuminated Proof Table

For aligning the margins of proofs of book pages which are to be printed on both sides of the sheet, a Philadelphia printing house now saves much time by the use of a novel glass-topped proof table, beneath which are mounted several tungsten lamps. When the proof sheet, printed on both sides, is laid on this illuminated table the transmitted light shows at a glance where the page forms fail to register, and the time required to align proofs is eight minutes instead of twenty.

### Military Drill by Artificial Light

Troop B of the Missouri National Guard stationed at St. Louis, Mo., in command of Capt. A. C. Orrick, has been drilling in the open at night on a parade ground illuminated by tungsten lamps. The entire lighted inclosure measures about 530 ft. by 486 ft., part of this space being taken up by the barracks and stables. In front of the stables six 30-ft. poles have been erected in two rows, 150 ft. apart. The poles are spaced at 80-ft. intervals. In the three 150-ft. spans strings of five 250-watt tungsten lamps have been installed. These units not only illuminate the 150-ft. by 160-ft. space directly beneath them, but also shed enough light on the surrounding parade ground to allow the maneuvers to be executed on any part of the open area.



PARADE-GROUND LIGHTING



### Recent Telephone Patents

To obviate the necessity of holding a receiver to the ear, Mr. H. W. France, London, England, has designed and patented a sound trumpet which can be attached to the front of a receiver.

Mr. T. L. Savin, Pine Bluff, Ark., is the patentee of a device for referring a calling party to another telephone number when the original call is unanswered. The ringing of the bell at the unanswered telephone station causes a motor to lift the hook switch and strike signals near the transmitter indicating where the called party can be reached by telephone.

### Telephone Conductor

In designing a submarine cable Mr. I. Kitsee, Philadelphia, Pa., has made use of the principle that two insulated conductors in close physical relation will, through their mutual capacity, serve as a telephone conductor. The conductors in the cable patented by him are arranged in pairs, wrapped with braid and incased in a shell made of fine metallic strands. This shell, which is grounded, protects the conductors within from any eternal inductive disturbances. The entire cable is incased in an impervious metallic sheath, surrounded by an armor of insulated wire. Interstices are left in the latter to permit contact of the water with the sheath.

### Telephone Circuit

Another patent granted to the same inventor describes a loop telephone circuit in which the stations are located at intervals, with the batteries connected at diametrically opposite sides of the circuit. At each station is a single-stroke bell, connected in series with the line, but shunted by a condenser. A telegraph key is similarly connected at each station, so that signals may be transmitted to all bells simultaneously. Each telephone-transmitter circuit, including the primary of the induction coil, is bridged across its respective bell coil but is open when the hook is down. Each receiver circuit, which includes the secondary winding of the induction coil and a condenser, is connected across the line when the switch hook is raised. When conversation is being carried on, the talking current traverses the receiver circuits of all listening stations. The current is prevented from passing through the batteries, however, by placing retardation coils in series with them. The patent has been assigned to the Western Electric Company.

## Letter to the Editors

### Electric Lamp Development

To the Editors of the *Electrical World*:

SIRS:—In the *Electrical World* of March 7, 1914, Mr. E. R. Knowles writes concerning the nitrogen "vacuum" lamps manufactured by Sawyer and Man in 1880. It is true that Mr. Sawyer produced lamps of this type at about the date noted and also that others were working with nitrogen and other gases in lamp bulbs during this period, but work had been done much earlier along the same line.

One of the first investigators, if not the first, to produce what may properly be termed an incandescent lamp was W. R. Grove, the inventor of the "Grove" cell. It is noteworthy that Faraday, previous to this time, had proposed "inclosing wire in a tube for the purpose of being able to ignite a longer portion of it." In 1840 and 1841 Grove was using for lighting his laboratory an incandescent lamp which embodied some of the principles of our latest lamps. He used a metallic filament.

Not knowing how to reduce tungsten powder to a wire, he used platinum as the best metal available for a filament, and arranged the wire in the form of a helix, the spirals of which were brought as close together as possible, "as each aids by its heat that of its neighbor, or rather diminishes the cooling effect of the gaseous atmosphere. The wire should not be too fine, as it would not then become fully ignited. The helix form offers the advantages that, the cooling effect being lessened, a much longer wire can be ignited by the same battery. By this increased length of wire, the battery fuel is economized, while a greater light is afforded. By the increased heat, the resistance is still further increased and the consumption still further diminished." Here we see not only the metallic helix, but also the beginning of an attempt for a high-resistance lamp later worked on by Edison.

Grove's lamp was made by inverting over water a beaker within which the filament was placed, the insulated leading-in wires dipping under the edge of the beaker. Grove realized, however, that the result could be accomplished better by placing the wire in a glass globe into which the conducting wires were sealed.

The form of the latest nitrogen-filled tungsten lamp was even more closely approximated than this, for, realizing the effect of different gases on radiant heat, Grove tried filling his lamp at approximately atmospheric pressure with a number of different gases, hydrogen, carbon dioxide, oxygen and nitrogen. As nearly as he could observe the candle-power was the same in oxygen, nitrogen and air, using in each case the same battery, which consisted of two or three pairs of Grove cells. He measured roughly the power consumed and discovered that with nitrogen and air less power was used than with the other gases; hydrogen and carbon dioxide, besides taking considerably more electrical power, gave very much lower candle-powers.

We see then that more than seventy years ago very many of the ideas contained in the latest lamp development had been tried and noted. Very soon after this Starr patented his carbon-filament vacuum lamp. The work on incandescent lamps since that time has been largely a repetition of the earlier attempts, alternating between metallic and carbon filaments and between vacua and nitrogen atmospheres.

Another type of lamp which has come into use comparatively recently, the mercury-vapor lamp, was employed as early as 1861, when signals were flashed from Fort Washington to the White House using the light-house lantern with the mercury-vapor lamp as a source of light. And in 1862 Geissler tubes (vacuum-tube lighting) were proposed for mine illumination.

It might be interesting to note here that another one of the recent developments—indirect lighting—was also utilized in the early days of electric light. Perhaps the first commercial interior lighting system was that installed in one of the Paris railway stations, in 1877. In this installation use was made of the old Reynier "semi-incandescent" lamp with a large carbon block at the bottom, throwing a large percentage of the light of the lamp upward. This plan may well be considered a defect in this lamp, but advantage was soon taken of the natural light distribution. Reflectors were placed beneath the lamp, and the entire illumination of the station was obtained by the light reflected from the ceiling.

These earliest lamps were put aside and practically forgotten for a generation. Then about 1870 a new generation came in, and with the development of the dynamo the commercial use of the electric lamp became assured.

Urbana, Ill.

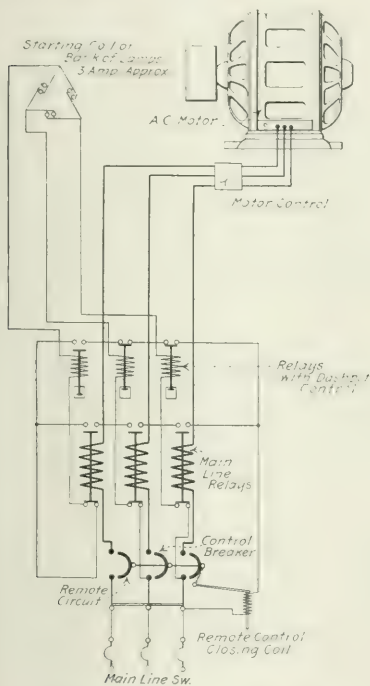
E. H. WALDO.

# Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects Questions and Answers

## Automatic Control for Alternating-Current Motor

Situated in isolated positions as they generally are, automatically controlled motors need to be protected by apparatus which will remove them from the line if trouble occurs on any one phase, and to make the automatic service of true value the same control apparatus must replace the motor in operation when the circuit



AUTOMATIC MOTOR-CONTROL CIRCUIT

has been restored. Such a control circuit, together with apparatus for stopping and starting an alternating-current motor, has recently been designed by Mr. Nels Joleen, of the Commonwealth Edison Company, Chicago.

Tracing the connections on the sketch herewith, the main three-phase circuit is conducted to the motor through fuses, a remotely controlled circuit-breaker and main-line relays. With the motor at rest the main-line relays retain the position shown in the illustration, and the application of energy to the motor service line lights the lamps, which act as a temporary auxiliary load. Electricity flowing in the lamp circuit energizes the three smaller relays, bringing their armatures to the "up" position to close the three sets of series contacts which are arranged in the same circuit with the remotely controlled closing coil of the main-line circuit-

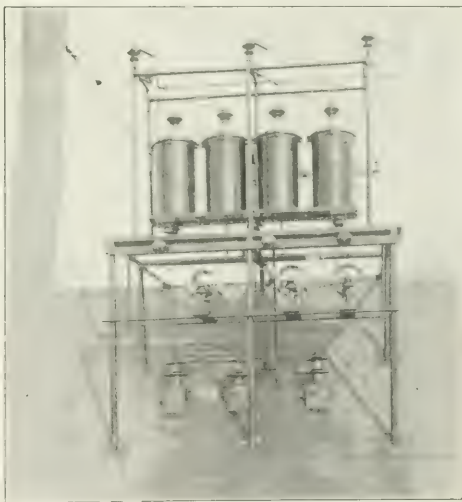
breaker. With the closure of this breaker energy flows to the motor, lifts the armatures of the main-line relays and shunts the auxiliary starting apparatus and temporary load out of the circuit.

The failure of the energy supply in any phase interrupts the operation of all three phases and shuts down the motor. As will be seen, the application of the circuit of this type eliminates the necessity of stringing any but the three-phase motor-service circuit between the source of the energy supply and the remotely controlled motor.

## Mounting Lightning-Arrester Equipment on Roof of Substation

Since the consolidation of the Evansville Gas & Electric Light Company, the Evansville Public Service Company and the Evansville & Southern Indiana Traction Company, many improvements have been made in the service rendered the public by the interurban and traction line as well as by the central-station company itself.

In addition to installing new feeders on practically all of the city traction lines and extending its trackage



LIGHTNING ARRESTERS INSTALLED ON ROOF OF SUBSTATION

system the new organization operating these utilities, known under the name of the Public Utilities Company and the Evansville Public Service Company, has converted the transmission line feeding the interurban substation from a 11,000-volt line to a 22,000-volt line. In so doing it has remodeled the substations at Bauer and at Princeton, Ind., and has installed the lightning



arrester equipment on the roof as shown in the accompanying illustration. This arrangement has avoided building an elevated platform or extending the substation to receive it.

The installation which is shown in the illustration printed on the preceding page is the one in use on the substation roof at Princeton, Ind.

### Reducing Bills for Compressor Service

Starting a large air compressor under load not only imposes undue strains upon the compressor and motor but also establishes an exceedingly high reading on the customer's maximum-demand indicator. Where a com-

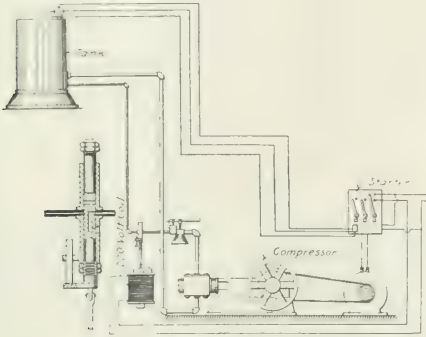


FIG. 1—AUTOMATIC INTAKE-CLOSING DEVICE

pressor is automatically operated, as is the one in the accompanying diagram, a momentary interruption in the energy supply establishes such an overload condition, and the result is that customers complain of high bills created by high maximum demands.

To obviate this difficulty, Mr. Nels Joleen, Commonwealth Edison Company, Chicago, has invented the scheme shown in the sketch herewith. When the motor-service circuit is interrupted the operation of the starter contactor interrupts an auxiliary 220-volt circuit to a small coil shown at the left-hand side of the illustration. This coil, becoming de-energized, opens the valve in a small pipe line, admitting air into the cylinder shown in detail in Fig. 2. The pressure of the air on the piston in the cylinder acts through the lever to close the compressor intake. Once this intake is closed, the load on the air compressor is reduced, and it

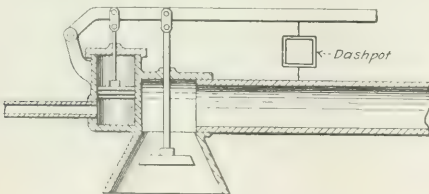
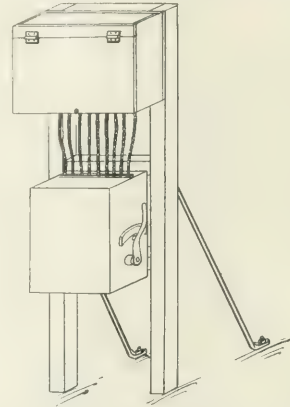


FIG. 2—DETAIL OF INTAKE

may be started again without trouble. However, as soon as the controller has reached the full running position the last contactor closes the 220-volt circuit to the coil and releases the pressure from the small piston. With this operation completed the air intake automatically opens, this operation being retarded only by a small dash-pot.

### Support for Compensator Case

A wooden frame adaptable for supporting all sizes of compensators and fuse cabinets is shown herewith. It consists of two vertical two-by-fours fastened at the middle and top by crosspieces of the same stock. The



FRAME TO SUPPORT COMPENSATOR

frame may be painted a dark color and braced as shown. This method of support has been used extensively in large railway shops. With a compensator supported in this manner it is advisable to ground the casing to prevent accidents.

### Regulation and Motor Speed

A 200-volt shunt-wound motor is connected in a 250-volt direct-current system. The load on the generator pulls the voltage down, especially so if the steam happens to go down. Is there any way to regulate the voltage? Will an alternating-current motor run with a steady speed regardless of the line drop?

D. J. C.

When the load on a plain, shunt-wound generator increases, the voltage at its terminals falls off, although the generator may continue to run at constant speed. The drop in voltage is attributable to the loss in the resistance of the machine. This voltage drop, in turn, decreases the excitation, which then further decreases the terminal voltage. Therefore means must be employed to increase the excitation sufficiently to overcome both of the above effects. This falling-off in pressure is in practice counteracted by means of a field winding in series with the armature of the generator. If the direct-current motor referred to in the first part of the query is so designed that it can be operated with its field core at low magnetic density, its speed will be only slightly affected by voltage variations. Coming to the last question, there are two kinds of alternating-current motors to be considered, the synchronous motor and the induction motor. The synchronous motor will run at a constant speed provided the frequency is constant. The induction motor, however, will not run at constant speed when the voltage varies. The induction motor runs at a speed less than synchronous by an amount proportional to the percentage of loss in the secondary. On a lower voltage the losses will be increased slightly, and the loss percentage at a greater rate. Thus the motor will drop somewhat in speed. The decrease in speed, however, is only slight. The percentage drop in speed might be in the neighborhood of 10 per cent of the percentage of voltage drop.

# Digest of Current Electrical Literature

## Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

### Generators, Motors and Transformers

#### *Polyphase Series Motors with Double Sets of Brushes.*

—J. JONAS.—The author describes a method of regulating the speed of polyphase series motors with a double set of brushes by means of displacement of the brushes. In this method, by displacing only one set of the brushes the motor is brought from the range of good phase compensation into the range of stable conditions at low speeds. It is necessary that the currents of the two sets of brushes be different. The set of brushes which carries the greater current must be stationary and the number of rotor ampere-turns produced by the current of the stationary set of brushes must be smaller than the number of stator ampere-turns. In the case of motors designed for higher voltages it is advantageous to use series transformers with the primaries connected in series and the secondaries in opposition for the current supply of the rotor. Motors of this kind are suitable for speed regulation when the speed has to vary according to several periodic laws. Instead of depending on an oscillating motion of the one set of brushes a revolving motion may be employed, and this will simplify considerably the design of the controller.—*Elek. Zeit.*, June 18, 1914.

*Rectifier.*—H. GREINACHER.—A description of an aluminum rectifier for rectifying alternating current into continuous (not undulating) direct current, for use with very small currents for ionization experiments.—*Elek. u. Masch.* (Vienna), June 7, 1914.

*Transformer Oil.*—W. BRAUEN.—An abstract in English of the author's recent German paper on the properties and suitability of different oils for use in transformers.—*London Electrician*, June 19, 1914.

### Lamps and Lighting

*Ductile Tungsten.*—A note on a recent British patent (No. 8956, 1913) of A. Just. In this process a small percentage of another metal, such as vanadium, molybdenum, chromium or tantalum, is added to previously prepared pure tungsten and the mixture is gradually heated up to about 2000 deg. C. according to the ordinary sintering process, or else the mixture is melted at a temperature of 3000 deg. C. In both methods the maximum temperature must be maintained for some time to allow the tungsten to dissolve the added metal. The mixture is then suddenly cooled so that a crystalline solid solution of one of the above metals in tungsten is obtained. This product is then tempered in an electric furnace in a stream of pure hydrogen or nitrogen, and is then found to be well suited for wire-drawing.—*London Elec. Eng'ing*, June 18, 1914.

*Arc-Lamp Carbons.*—A note on a recent British patent (No. 22,319, 1913) of H. Ayrton. The negative electrode consists of a tubular rod of carbon coated on the outside with a thin metallic film, preferably of copper. The object of this film is to regulate the rate of burning of the negative carbon. By having the film of suitable thickness, the negative carbon can be made to burn away at the same rate as the positive electrode. It is found that increasing the thickness of the film

makes the carbon burn more slowly.—*London Elec. Eng'ing*, June 18, 1914.

### Generation, Transmission and Distribution

*Disconnection of Lines.*—W. PETERSON.—An illustrated article on the transient phenomena which occur when a slightly loaded or an unloaded line is disconnected. After a phase has been disconnected there occurs during the first half cycle a reconnection of the phase, together with rises of voltage which may become dangerous either to the machines and transformers or to the disconnected line. The author calculates to what amount these voltages can rise.—*Elek. Zeit.*, June 18, 1914.

*Dangerous Voltage Rises on Transmission Lines.*—M. OUBOUKHOFF.—An article illustrated by diagrams on the protection of lines and machines against dangerous rises of voltage and also on a new protective device called the resonance voltage-limiting device.—*La Lumière Elec.*, May 16, 1914.

*Boiler-House Plant.*—S. E. FEDDEN.—A paper read before the (British) Municipal Electrical Association on the design and operation of a modern boiler-house plant. The author first considers the design of a modern boiler-house plant with special reference to the Neepsden station of the Sheffield Corporation, attention afterward being paid, in a more general way, to the questions of ash handling, coal measuring, boiler selection and rating, mechanical stoking and boiler-house organization.—*London Electrician*, June 19, 1914.

### Traction

*Starting Resistances for Traction Motors.*—H. PARODL.—The author shows how by means of a set of curves once plotted it is possible to determine exactly by a graphical method the values of the successive starting resistances for a direct-current series-motor for electric locomotives.—*La Lumière Elec.*, May 23, 1914.

*Storage-Battery Traction.*—M. BUTTNER.—An English translation of his recent German paper on the development of storage-battery traction on German railways.—Translated in abstract from *Elek. Kraftbet. u. Bahnen* in *London Electrician*, June 5, 1914.

### Installations, Systems and Appliances

*Rates for Electrical Energy.*—ROBERT ARBEITER.—A paper read before the Vienna Electrical Society in which the author discusses critically the following three different rate schedules: first, the meter rate on the basis of the kilowatt-hours consumed; second, the flat rate on the basis of the kilowatt maximum demand, and, third, rates which take both the kilowatt-hours consumed and the maximum demand into consideration.—*Elek. u. Masch.* (Vienna), June 7, 1914.

*Standardization of Rates.*—J. HORACE BOWDEN.—A long paper read before the (British) Municipal Electrical Association. The author discusses, in great detail, a proposed rate system which could be employed in any community and so help toward standardization of rates. If this system were adopted, two fetishes of the electrical industry—viz., "diversity factor" and "load factor"—would go out of existence.—*London Electrician*, June 19, 1914.



**Electric Heating and Cooking.**—F. BRENDL.—An illustrated description of modern designs of electric cooking utensils and water-heating apparatus, with automatic disconnection during hours of peak load on the central station.—*Elek. Zeit.*, June 11, 1914.

#### Electrophysics and Magnetism

**Surface Leakage Over Insulator.**—HARVEY L. CURTIS.—An abstract of a paper presented before the American Physical Society. The resistance between two conductors insulated by a solid dielectric usually depends very largely on the surface condition of the dielectric. If the insulator is in a humid atmosphere, condensation of moisture is known to take place on the surface, and this increases the surface leakage. In the present paper an attempt is made to find a connection between the moisture condensed and the surface leakage. The surface resistivity is defined as the resistance between two opposite edges of a surface film which is 1 cm square. The surface conductivity is the reciprocal of this. The surface resistance of most insulators varies greatly with the humidity of the surrounding air. In one case (hard rubber which had been exposed to the sunlight) the surface resistivity in very dry air was nearly one trillion ( $10^{12}$ ) times as large as in very humid air. With waxy materials such as paraffin, ozokerite and beeswax, there is very little change with the humidity but all other insulators show marked changes. A factor of  $10^5$  or  $10^6$  between high and low humidities is not uncommon. It is to be expected that this change in surface resistivity is due to condensed moisture. The thickness of the surface film of water upon quartz and glass has been determined by weighing. Knowing this thickness and the surface resistivity, the conductivity of the surface is readily computed. In the case of waxy materials water does not spread over the surface, but collects in drops. Hence one would not expect any change of surface resistivity with humidity.—*Phys. Review*, June, 1914.

#### Electrochemistry and Batteries

**Instrument for the Control of Storage Batteries.**—R. RANKIN.—Batteries suffer greatly from any over-discharge, and this is especially serious with the batteries of electric automobiles. The author describes an instrument which prevents such damage. The operation of this instrument depends on the fact that for every value of battery current there is a definite final value for the voltage of each cell, below which it is unsafe to go. The arrangement of the working parts of the instrument is such that when the final value of the voltage is approached, corresponding to the current at any moment of working, this fact is indicated at the switchboard, and if the voltage is actually reached an alarm may be given, or a record made, or both. The instrument shows the total battery voltage, actual voltage per cell, permissible final voltage per cell, and actual value of current. There are two movements in the instrument, one that of a coil, the displacement of which from its zero position varies with the value of the battery current, the other that of a second coil, the displacement of which varies with the voltage of the whole or part of the battery. The former, or current coil, moves an arm in such a way that the movement of the arm is proportional, not to the value of the current, but to the value of the permissible final potential difference corresponding to that current, whatever the current may be. This arm may, therefore, be made to move over a scale of voltages which may be calibrated in terms of volts per cell, and over which a pointer may move which is actuated by the second or voltage coil previously referred to. This latter pointer will—on discharge, of course—always point to a higher

voltage than the current-coil arm, which may be termed the limit indicator, until the limiting value of the voltage is reached on discharge, when the two will coincide, and it is the approach of the voltage pointer to the limit indicator which warns the attendant to be careful and the final coincidence which operates the alarm or makes the record. The principle of opera-

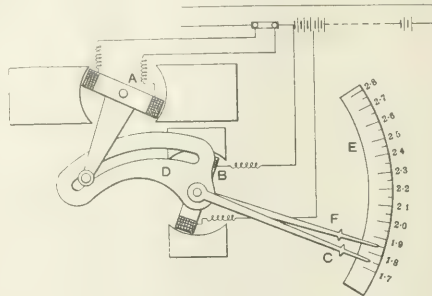


FIG. 1.—MECHANISM OF OVERLOAD DETECTOR

tion of the instrument is shown diagrammatically in Fig. 1. A is the movement responsive to current and B that responsive to voltage. A moves the limit indicator C through a cam face on the part D, so that it takes up the correct position on the scale E, corresponding to the value of the current flowing. The movement of the voltage pointer F is independent of that of C, but coincidence of its position with that of C completes a circuit, if necessary, which rings a bell or makes a record, or otherwise gives an indication that the limiting conditions have been passed. The alarm will sound until the current has been reduced to a safe value or the battery circuit broken. Where it is permissible, as is frequently the case, to make the final allowable potential differences directly proportional to the current, the link between the current coil and the limit indicator may be omitted, the latter being fixed directly on the coil.—*London Electrician*, June 19, 1914.

**Copper-Nickel-Manganese Resistor Alloy.**—GEORGE L. GRAY.—An account of an investigation the object of which was to find the effect of the addition of manganese in various quantities upon the resistivity and temperature coefficient of copper-nickel alloys. The chief results are as follows: Within the limits covered by the investigation the addition of manganese to the alloy of copper and nickel at any concentration causes an increase in resistivity. The conclusion of Liebenow that the curve of temperature coefficients is of the same general shape as that of conductivities is confirmed in the case of alloys of copper, nickel and manganese. The conclusion of Liebenow that an increase of resistivity is accompanied by a decrease of temperature coefficient is in general confirmed for the alloys of copper, nickel and manganese. The curves obtained indicate that there is an alloy containing approximately fifty-five parts copper, forty-five parts nickel and fifteen parts manganese, which has a specific resistance of about 70 microhms per centimeter cube. The temperature coefficient of this alloy is zero at 20 deg. C. This alloy is a much better resistor than any of those used at the present time for precision apparatus. It should replace all other alloys which are at present used in this field. Further work will be done upon it to extend its use commercially.—*Rensselaer Polytechnic Institute, Engineering and Science Series*, No. 4, 1914.

#### Units, Measurements and Instruments

**Testing of Electric Properties of Insulating Materials.**—A. SCHWABER.—The author points out that the

"perforation stress" (the perforation voltage per centimeter of thickness) of an insulating material does not completely determine its insulating qualities. The author proposes to determine the perforation stress indirectly as follows: In Fig. 2 *a* is the dielectric whose insulating qualities are to be determined. It is placed between a spherical electrode *b* and a plate electrode

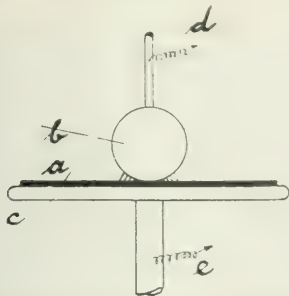


FIG. 2—EXPERIMENTAL ARRANGEMENT

*c*, and connections to the alternating-current supply are made at *d* and *e*. If the voltage is low, nothing happens, but when it is above a certain value there is a brush discharge, as indicated in the illustration. The voltage is kept constant for a certain time and after the current has been interrupted it will be found that the brush discharge has produced on the dielectric a marked space in the form of a circle which is called the "brush circle." The diameter of the circle is measured. The voltage is then raised somewhat higher and kept constant again for some time. The brush discharge is then found to produce a "brush circle" of a larger diameter. This experiment is repeated for higher and higher voltages and a diagram is plotted with the diameters of the circles as abscissas and the voltages as ordinates. It will be found that the curve changes its form somewhat where the brush discharge passes over into another form of discharge ("büschel" discharge), and again when it changes into spark discharge. These experiments are repeated with spherical electrodes of different diameters, the author using diameters of 1, 2, 5, 10 and 15 cm. In this way a series of curves is obtained, and from this series of curves new curves may be plotted which connect the characteristic points at which one form of discharge changes into another form of discharge. The author thinks that these curves define very fully the insulating character of a dielectric.—*Elek. u. Masch.* (Vienna), June 7, 1914.

#### Telegraphy, Telephony and Signals

*Inductive Effects of Traveling Waves on Telephone Lines.*—KARL WILLY WAGNER.—Among the problems which are at present of particular interest, the disturbances in telephone lines caused by induction from high-tension transmission lines in the neighborhood have led to many discussions between telephone engineers and transmission engineers. These disturbances are due to various causes and not all of them are thoroughly understood. Those caused by transient traveling waves in the high-tension lines are least understood. The author shows how the traveling waves induced in the telephone lines can be calculated. In the first part he gives the theory of the traveling waves in a system of any number of lines in parallel. In the second part he applies the theory to various examples. He calculates the induction for the case where the telephone line is insulated and also for the case where it

is earthed through a resistance, a condenser or a choking coil. He further calculates the induction caused by the sudden voltage rush due to the breakage of an insulator of the high-tension line. He also discusses the effect of an earthed ground wire on the induction phenomenon and the production of coupled oscillations in the case of resonance. The paper is highly mathematical; in the present instalment the general theory is given, with its application to a few special cases. The article is to be continued.—*Elek. Zeit.*, June 4, 1914.

## Book Reviews

**ELECTRIC LIGHT AND MOTOR WIRING.** By George J. Kirchgasser. Milwaukee, Wis.: Electroforce Publishing Company. 142 illus. Pocket size, leather. Price, \$1.

A vest-pocket book on this subject prepared to be especially useful to the workmen actually making the installation. The print is large, the use of mathematics is reduced to a minimum, the illustrations are prepared with a view to showing just how the work should be done, and the book is substantially bound in leather. One can scarcely agree with the statement in the preface that there is no other up-to-date volume describing the different wiring systems in detail and the National Electrical Code requirements regarding them, but the book is one of at least a few that do this in an excellent manner.

**DIE WISSENSCHAFTLICHEN GRUNDLAGEN DER ELEKTROTECHNIK.** By Prof. Dr. Gustav Benischke. Berlin, Germany: Verlag von Julius Springer. 606 pages, 551 illus. Price, 15 marks.

This is the third edition of Dr. Gustav Benischke's treatise on the fundamental principles and theory of electricity and magnetism. The subject is covered in a thorough and masterly manner, and although the author does not pretend to treat of the more practical aspects of electrical engineering, his book is an excellent text for engineering students as well as being a work of reference for engineers whose knowledge of fundamental theory does not always meet the requirements when a new line of work has to be undertaken. In a work of this description one does not expect to find much that is new in the matter of material, or original in the presentation of the subject; but, with the aid of good illustrations and diagrams and the introduction of the calculus when necessary, Dr. Benischke has covered the ground in a sufficiently comprehensive manner without being tedious or losing touch with the subject as a whole by going into unnecessary detail. This work does not belong to the class of elementary or preparatory books, but at the same time it does not assume much previous knowledge of physics or chemistry on the part of the reader, and each subject is taken up from the beginning. The ground covered includes: Fundamental principles of magnetism and electricity; electrostatics; the electric current, its nature and effects; electrochemistry (theory of primary and secondary batteries, and electrolysis); magnetic field due to electric currents; magnetic induction; electrodynamics; induced emf; single-phase currents; mutual induction-transformers; condensers; transient phenomena; wave shapes and harmonic analysis; polyphase currents; the passage of electricity through non-conducting mediums, Roentgen rays; sparking distances in air; porcelain insulators; the mercury-vapor lamp; principles of electric measurements; magnetic measurements, and the absolute and practical systems of units.



# New Apparatus and Appliances

## An Illustrated Descriptive Record of Recently Developed Manufactured Products of Interest to Electrical Readers

### Electric Suction Cleaner

The vacuum cleaner shown in the accompanying illustration is equipped with three rubber wheels, one of which, the rear wheel, is adjustable, making it possible to raise or lower the nozzle to suit the thickness of the



ELECTRIC SUCTION CLEANER

rug or carpet. The device weighs 11.5 lb. and is 7.5 in. high. The bag is double and dust-proof and the nozzle is 11 in. long and 0.5 in. wide. Oiling is accomplished by means of a wick held against the bearing by a spring. The fan is a one-piece aluminum casting. The motor is rated at 1/12 hp and operates on both direct current and alternating current. This cleaner and the motor used in running it are being manufactured by the Birtman Electric Company, Chicago, Ill.

### Electric Tolling Bell

An electric tolling bell for use as a time signal or fire alarm in factories is being placed on the market by the General Electric Company, Ltd., Witton, Birmingham, England. By means of a time-switch or clock the bell can be rung at predetermined intervals.



ELECTRIC FACTORY BELL

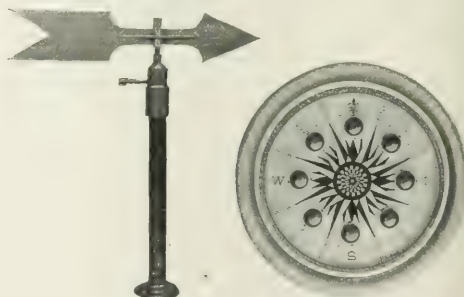
The striking hammer is connected to a rod which is screwed into an armature whose movement is controlled by a powerful electromagnet. In the top of the hammer rod is fixed an insulator arm with a metal project-

ing blade near the end. This blade passes in one direction along the length of the lower strip of metal which is attached to one of the poles of the electromagnet and connects this pole with the upper spring contact. On the return stroke the blade passes over the projection of the upper spring contact and the electric circuit is broken until the swing of the pendulum again makes contact. An insulating stud is provided to prevent the upper spring contact from touching the lower one when the connection is not made between them by the projecting blade on the arm fastened to the hammer rod.

The "Kingsway" electric tolling bell, as it is called, is made in two sizes. In the first or bracket type, shown in the illustration, the gong is approximately 12 in. in diameter and averages 42 lb. in weight. The energy required is 1 amp at 15 volts. In the second bell, which is more powerful, the gong averages 132 lb. in weight and measures approximately 17 in. in diameter.

### Electric Weather Vane

Apparatus is now available which will indicate electrically at any convenient point the direction of the wind as determined by a remotely located weather vane.

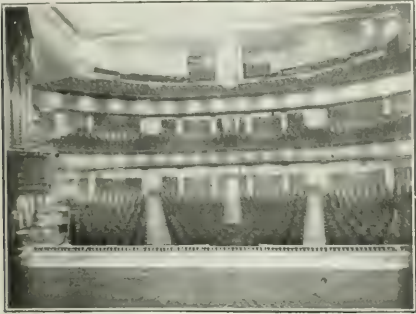


ELECTRIC WEATHER VANE

The movable element of the operating device consists of the vane proper, vertical shaft, inverted hood and brush-holder. The stationary part comprises two concentric vertical tubes (the inner one containing a bearing point covered with oil) and a commutator. The indicating device consists of a compass dial with an electrically illuminated lens at each of the eight major points of the dial. One terminal of each of the lamps illuminating the lenses is connected to a common conductor leading to a source of energy and thence to the inner tube of the operating device and the brush-holder. The other terminals of the lamps are connected respectively to the eight segments of the commutator. As the vane shifts with the wind the brush moves accordingly, making contact with the commutator segment connected to the proper point on the compass. The device is manufactured by Shotwell Electric Weather Vane, Inc., 32 Broadway, New York.

**New Lighting for Old Theater**

A new system of lighting was recently installed in the Pitt Theater, Pittsburgh, Pa. The main ceiling of this theater is about 40 ft. high. The main floor measures 80 ft. by 100 ft. and the first balcony 35 ft. by 100 ft. Three glass bowls, each equipped with a



INTERIOR OF PITT THEATER, PITTSBURGH, PA.

500-watt lamp, hang 20 ft. from the ceiling. In front of the second balcony are fourteen 8-in. glass acorns equipped with 40-watt lamps. In front of the first balcony are seventeen glass panels with two 16-cp carbon straight-filament lamps and Frink reflectors behind each panel. From the ceiling over the first balcony are hung four bowls with 250-watt lamps. In the first-floor corridor there hang five bowls with 250-watt lamps, and at the foot of the stairs are glass urns with 150-watt lamps.

The glass for the bowls, acorns and panels is the so-called "Parian" ware. Frink reflectors are used over the ticket window, around the inner edge of the marquee, and inside the framework of the billboards in front. The fixtures for this installation were furnished by the H. W. Johns-Manville Company, New York.

**Diesel Engines**

Four-cycle Diesel engines with ratings of from 40 hp to 1000 hp and two-cycle engines of the same type with ratings up to 3000 hp are being placed on the market by

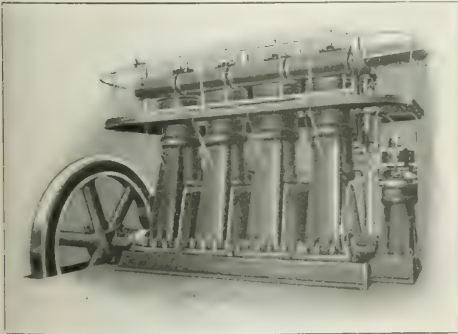


FIG. 1—FOUR-CYCLE, 500-HP DIESEL ENGINE

the McIntosh & Seymour Corporation, Auburn, N. Y. These engines are being built according to designs worked out by the Swedish Diesel Engine Company, Stockholm, Sweden. All the stationary engines, in-

cluding special high-speed four-cycle engines, are suitable for direct connection to electric generators. The speeds in general are lower than those used with directly driven generators in Europe. One of the chief characteristics of these "Swedish" Diesel engines, the

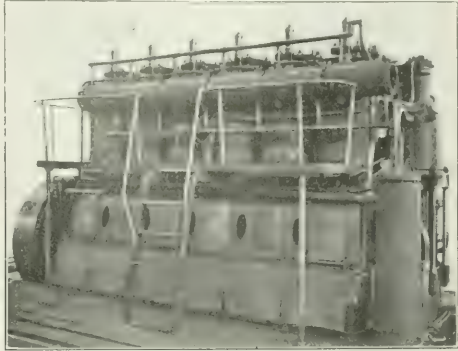


FIG. 2—STATIONARY ENGINE WITH SINGLE-BOX FRAME

manufacturers claim, is their freedom from cylinder wear together with their low consumption of cylinder-lubricating oil. Both the individual A-frame for each cylinder and the single-box type of frame for the entire unit are used. In Fig. 1 is shown a four-cycle, 500-hp stationary engine with individual frames for each cylinder. In Fig. 2 is shown a stationary engine with a single-box frame for the entire unit. Both types are equipped with directly connected multiple-stage air compressors for fuel injection.

**Acetylene Torch for Soldering Connections**

An improved method of soldering connections has been in use by the Quincy (Mass.) Electric Light & Power Company during the past three months, involving the practical abandonment of the gasoline torch and the use in its place of the torch and tank manufactured by the Prest-O-Lite Company,



ACETYLENE TORCH FOR SOLDERING CONNECTIONS

Indianapolis, Ind. As shown, the equipment consists of a tank and torch, to which the company, at the suggestion of its superintendent, Mr. F. W. Austin, has added an oak handle, 9 in. long and 1 1/8 in. in



diameter, and a pole clamp of inverted U-shape which greatly facilitates hanging the tank upon cross-arms when in the field. A rubber hose 4 ft. long and  $\frac{3}{4}$  in. inside diameter was also added by the company. The clamp is composed of three straight pieces, 6 in.,  $3\frac{1}{2}$  in. and 4 in. long and  $1\frac{3}{4}$  in. wide, the stock being  $\frac{1}{8}$  in. thick, and is riveted at four points to a cylindrical clamp provided by the Prest-O-Lite Company. The handle is clamped into the latter and held by wing nuts. The tank is 13 in. over all and 4 in. in diameter and contains acetylene gas under pressure. There is a gage at one end reading up to 250 lb. per sq. in. maximum, and a needle valve is provided in the outlet pipe at the other end. Six small holes in the head of the burner provide ingress of air. The torch can be lighted with a match and used without the slightest delay whenever the valve is opened.

The company has found that these torches save much time in soldering as compared with the gasoline outfit commonly employed, and that they are cheaper initially, as well as less expensive to recharge. A first-class gasoline torch costs about \$14, and the burner, if constantly used, must be replaced every three months or thereabouts by a new outfit costing about \$7.50. The present cost of the cylinders approximates \$10, the burners costing about 75 cents each in addition. It is probable that the complete outfit can be marketed for less than the cost of a gasoline torch. Recharging costs 50 cents per cylinder, and this has to be done about every ten days to two weeks.

In the field the flame of the torch is smaller than with the gasoline outfit; the amount of solder melted is correspondingly less for a given joint, and there is much less trouble from burning off paint and varnish on adjacent woodwork than with the gasoline equipment, whose large-sized flame is at times awkward. In using the Prest-O-Lite torch the ground-man merely attaches a rope to the device; then the torch is quickly hauled into place and hung on the cross-arm, and is instantly ready for service, without interruptions due to weather conditions. These torches are used in the power plant of the company and in soldering customers' services, as well as for general line construction and maintenance.

### Electrically Driven Air Compressors in Large Shipyard

The large motor-driven air compressor shown in the accompanying illustration is installed in an important shipbuilding plant in England. The machine itself is

of the two-stage inclosed type and includes an inter-cooler. Each line of parts comprises in itself a two-stage compressor, so that if desired the machine can deliver its full capacity of 2000 cu. ft. of air per minute, or any portion of it, when driven at a constant speed of 235 r.p.m. Forced lubrication is used throughout for all bearings.

The motor is started by a bank of oil-immersed starters shown in the foreground of the illustration. A main oil switch and the necessary instruments are mounted on a small panel.

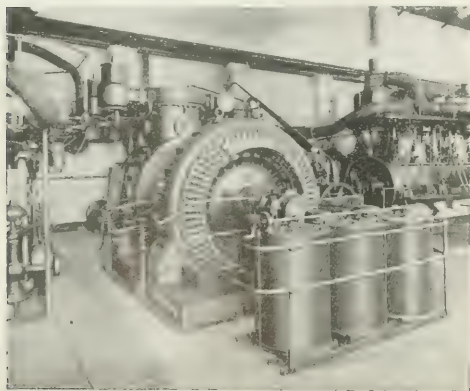
The compressor was built by Alley & McLellan, Ltd., Glasgow, Scotland, and is driven by a 360-hp induction motor operating on 440-volt, three-phase, forty-cycle energy. The General Electric Company, Ltd., of Wotton, Birmingham, England, manufactured the motor and switch gear for this installation.

### Steel-Shell Drawing Press

The drawing press shown herewith was recently built by the E. W. Bliss Company, Brooklyn, N. Y., and is said to be one of the largest presses of its kind in the world. The machine has an over-all height of 40 ft. and weighs approximately 650,000 lb. Large vertical steel rods are employed to take the working strain. This press is designed to draw steel shells as large as 48 in. in diameter. It will draw and lift out shells as deep as 40 in. and draw and push through shells 45 in. deep. Blanks as large as 64 in. in diameter and  $\frac{3}{16}$  in. thick can also be drawn.

The table carrying the die is operated by a powerful toggle mechanism which connects to two crank pins on the main gears. The plunger carrying the punch is operated by a steel crosshead which is connected by two double connecting rods to the crank pins on the main gears. The blank holder is stationary. The plunger and blank-holder adjustments are made by means of electric motors, a separate motor being used for each adjustment. Before adjusting, the blankholder is unlocked, and after adjusting it is locked by an electric motor. All motors for adjusting are directly attached to the machine.

The entire train of gearing is of steel with machine-cut teeth. The machine has three ratios of gearing—200 to 1, 100 to 1 and 67 to 1. By means of change gears, the speed of operation may be varied from 1.5 r.p.m. to 3 r.p.m. and 4.5 r.p.m. as required for the different classes of work. The crosshead and bed are counterbalanced by a hydraulic accumulator which may



MOTOR-DRIVEN AIR COMPRESSOR

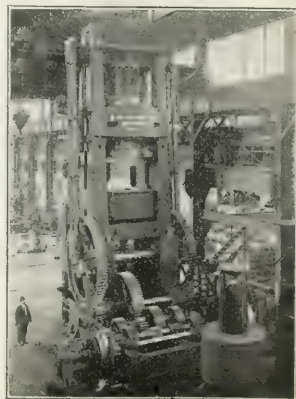


FIG. 1—REAR VIEW OF PRESS, SHOWING GEARS

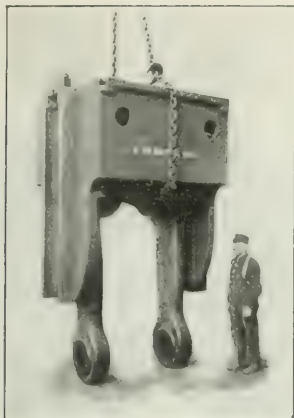
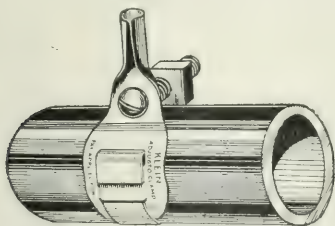


FIG. 2—DIE TABLE AND TWO CONNECTING LINKS

be placed above or below the floor line in any suitable place near by. The machine is driven by a 200-hp motor and is controlled by a hand-operated friction clutch of the double-grip type.

### Ground Clamp

The ground clamp shown in the accompanying illustration is made of solid copper and is designed for use with any size of pipe, armored cable or metal molding.



COPPER GROUND CLAMP

It is installed by bringing the end around the pipe and adjusting the bolt; then the free end of the slide is pulled around until it just bands the pipe. The surplus of the slide is next bent back and finally the clamp is fitted snugly against the pipe by tightening the screw.

S. Robert Schwartz & Company, 624 Broadway, New York, are the general sales agents for this ground clamp.

### Electric Gate Lock for Elevators

An electrically operated mechanism for locking gates opening onto elevator shafts, and which prevents any gate being opened except when the elevator floor is within three inches of the proper stopping position, is being manufactured by the Safety Appliance Company, St. Louis, Mo. The device consists of a small solenoid to the plunger of which is attached a pawl engaging with a slotted vertical rod which must be free to move before the gate can be opened. The entire mechanism, including the operating switch, is installed on the shaft wall at each landing. To open the gate the car must be within 3 in. of the landing when a mechanical floor trip



ELEVATOR SHAFT EQUIPPED WITH ELECTRIC GATE LOCK

closes the electrical contact on the shaft wall. An auxiliary switch is furnished with the apparatus so that the doors can be opened in an emergency if the car is stopped between floors.

### Lighting and Dimming Switch for Automobile Lamps

A lighting and dimming switch for use on automobiles, cycle-cars, motorcycles, etc., is being made by the Connecticut Electric Manufacturing Company, Bridgeport, Conn. The contacts are inclosed in a two-part receptacle of black composition. The handle can be placed in three different positions. The accompanying diagram shows one method of connecting the lamps of an automobile to the switch. With the handle in position No. 1 the head-lamps are off and the side and tail-lamps are on; in position No. 2 all lamps are off; in position No. 3 the side-lamps are off and the head-

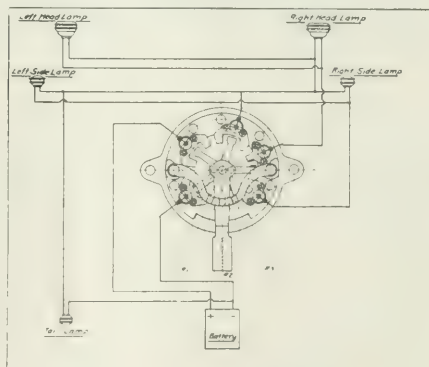


DIAGRAM OF CONNECTIONS

lamps and tail-lamps are on. By changing the connections the following arrangement can be obtained: With the handle in position No. 1, the head-lamps are dim and the side-lamps and tail-lamps are bright; in position No. 2, all lamps are off, and in position No. 3, all the lamps are bright. When no side-lamps are used the following combination can be had: Position No. 1,



head-lamps dim, tail-lamp bright; No. 2, all lamps off; No. 3, all lamps bright. This lighting and dimming switch, the manufacturers claim, is the only switch of its kind on the market with one handle which can be manipulated so as to obtain three lighting effects.

### Electric Hand Drier

The electric hand drier illustrated herewith consists of a casing mounted on a "sanitary" base with 12-in. legs, occupying an area 11 in. by 13 in. An opening is provided at the top, as shown, with suitable ducts and deflectors for distributing warm air to all portions of the hands. A foot pedal closes a quick-acting switch which puts in operation a blower that forces air through an electric heating element to the ducts and deflectors.

The device is particularly adapted for use in lava-



ELECTRIC HAND-DRYING APPARATUS

tories and surgical and dental operating rooms for quickly drying the hands after washing. In many factories and other places where large forces are employed the washrooms are equipped with roller towels, which, of course, are very unsanitary. Roller towels have been superseded to some extent by absorbent paper towels, although the initial expense and the cost of an attendant for keeping the washrooms supplied and removing the soiled and wet paper towels are rather burdensome. This electric hand drier is designed to take the place of the towels. This hand drier is perfectly sanitary, for it is unnecessary to touch any part of the device with the hands. It is put in operation by a pressure of the foot on a pedal, and the operation is discontinued by removing the foot. The hands can be thoroughly dried, it is declared, in from thirty to forty seconds, which is less time than is required to dry the hands with the same thoroughness with linen or paper towels. For each operation 11 watt-hours are taken on an average. This electric hand-drying device has been designed by Mr. J. M. Ward, office of superintendent of the District Building, Washington, D. C.

### Portable Test Bridge

A number of important improvements have been made in the portable decade pattern bridge manufactured by the Roller-Smith Company, 203 Broadway, New York City. Chloride-of-silver cells are now employed, and these are so arranged that any one or all



PORTABLE TEST BRIDGE

of them may be used. Provision is also made for the use of external cells if desired. The galvanometer has been so improved that its sensibility is now about 300,000 ohms, and a large opening for the scale enables readings to be taken quickly. External galvanometer terminals are also provided. The two contact keys are independent but are placed side by side so that they may be separately or simultaneously operated as desired. An externally operated zero adjuster is now provided with each set.

### Ornamental Street-Lighting Unit

New fixtures for ornamental street-lighting, designed for operation with both series and multiple circuits and with high-efficiency incandescent lamps, are being made by the General Electric Company, Schenectady, N. Y. There are two styles of these units, the only difference between the two being in the glassware equipment.

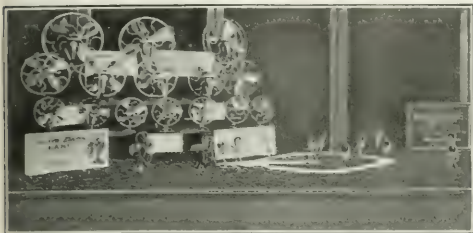


The glassware in one style consists of a medium alabaster globe which is so shaped that some of the light can pass upward and illuminate the building fronts. A small reflector is placed at the top inside the globe. The function of this reflector is to direct downward and make useful the light that would otherwise be lost in the bottom of the ventilator surmounting the globe. The other style of unit has a two-piece globe. The bottom part is made of crystal glass, rough inside, while the top is of "Pyro" glass. No reflector is used, as the top is made of dense glass with the inside glazed, thereby reflecting some of the light downward, although enough is filtered through to illuminate building fronts. Air enters the lamp chamber through small holes in the globe and leaves through concealed openings in the spun-copper ventilator at the top. A compensator is mounted inside the ornamental casing.

# Jobber, Dealer and Contractor

## Baseball "Fans"

The accompanying picture shows a tungsten-lamp ball game with a grandstand of electric "fans" to applaud the players, as exhibited in the window display of the Cincinnati distributing house of the Western



DISPLAY OF BASEBALL "FANS" IN CINCINNATI DEALER'S WINDOW

Electric Company. By a flasher arrangement each "player" lights up as he receives the "ball," and the fans are connected so as to applaud each "out." A description of a similar display in Louisville, Ky., was given in the *Electrical World* of June 14 and 28, 1913.

## Chicago Contractors Branching Out

Another evidence of the "forward movement"—if such it may be called—among electrical contractors all over the country is shown by the removal of the well-known Freeman-Sweet Company, of Chicago, from an upstairs location in the building at 538 South Dearborn Street, to the storeroom at 602 South Dearborn Street illustrated herewith. In this store, which has been attractively fitted up, the company displays a wide variety of electrical goods offered for sale.

Above the store on the second floor of the Transportation Building are the general offices of the com-



INTERIOR VIEW OF NEW STORE OF FREEMAN-SWEET COMPANY, CHICAGO

pany, with private offices for Mr. Ernest Freeman and Mr. Frank Z. Sweet. There are also a drafting room, consulting rooms and all the equipment needed for an up-to-date engineering and contracting business. The Freeman-Sweet Company is progressive, and on its

walls it displays certificates of membership in the Society for Electrical Development and the National Electrical Contractors' Association of the United States. Mr. Freeman is president of the latter organization.

## Executive Committee for Electrical Development in Chicago

At a meeting of the general Chicago committee of the Society for Electrical Development held at the Hotel Sherman on June 30 to meet Mr. George B. Muldaur, the field co-operator of the society, it was decided to appoint an executive committee of four to carry forward the work of the society in Chicago. This executive committee was constituted as follows: Mr. Ernest Freeman, president of the Freeman-Sweet Company, representing the electrical contractors; Mr. John F. Gilchrist, vice-president Commonwealth Edison Company, representing the central-station interests; Mr. W. W. Low, president Electric Appliance Company, representing the jobbers, and Mr. T. P. Gaylord, district manager for the Westinghouse Electric & Manufacturing Company, representing the manufacturers. Mr. Muldaur gave an outline of what has already been accomplished and of the work laid out to further the aims and objects of the society.

## Credit Given to Receivers Appointed by Court Only at Risk of Creditor

The important case of Miller vs. American Light & Fixture Company, decided recently in the Appellate Court of Illinois, is of particular interest to electrical credit men. As a petition for an appeal was made to the Supreme Court and there denied, the appellate decision may be taken as having the sanction of the highest court in that State.

In its opinion the court acknowledged, as the counsel had likewise, that no case had been found exactly in point for the decision. However, there were questions involved which had been repeatedly decided in this and other courts and as to which credit men generally are uninformed. In fact, a credit man would assume, as a rule, that whatever credit was asked by any receiver operating a business appointed under order of a court of equity should be granted without hesitation. The contrary, however, is the rule upon which the credit man should act upon such a request. As held in the decision cited, one deals at his peril who extends credit to a receiver, though appointed and authorized to act under order of court. For the court under ordinary circumstances has no responsibility and is not surety for the debts of the receiver, though authorized, nor are the parties to the litigation, nor the receiver, personally liable beyond the assets actually in his possession and control as receiver.

It is advisable, therefore, if doubt exist, that the property in the hands of the receiver be looked into by the prospective creditor before credit is extended by him to the receiver under any circumstances. For, as a rule, unless the property itself of which the receiver has good title proves sufficient upon liquidation to pay all the debts incurred by the receiver in his receivership, including his fees and expenses, the deficit is lost by the trusting creditors. The mere fact that the property in the hands of the receiver is insufficient to meet the expenses of the receivership, the court has affirmed repeatedly, does not render the complainant or person commencing the proceedings, and who had the receiver appointed, liable for such expenses. This risk is that of the creditors.



### Co-operating with Contractors at Muncie, Ind.

Enlisting the co-operative efforts of six of the city's representative electrical contractors, the Muncie Electric Light Company recently inaugurated a deferred-payment wiring campaign which promises to be quite successful. In addition to giving the owners of small homes a chance to secure electric service at a low rate, the campaign has brought the electrical contractors and central-station interests closer together than ever before.

Before beginning the campaign, Mr. Thomas F. English, manager of the lighting company, called a conference of the contractors. Among the firms which

#### SCHEDULE OF HOUSE-WIRING PRICES, MUNCIE, IND.

WIRING PRICES			SWITCH PRICES		
Out-lets	Contractor's Price	Company Price	Type	Contractor's Price	Company Price
3	\$9.00	\$9.93	Single-pole snap	\$1.25	\$1.40
4	10.85	11.95	Flush switch	1.75	1.95
5	12.66	13.90	Cellar outlet, complete with switch	2.00	2.20
6	14.43	15.90	Porch outlet, complete with flush switch	2.50	2.75
7	16.06	17.70	Porch outlet, complete with snap	2.25	2.50
8	17.91	19.70	Three-point push, flush	5.00	5.50
9	19.75	21.70	Three-point snap	4.50	5.00

#### CUSTOMERS' PAYMENT.

Houses of	Cash Payment	Monthly Payment
Three rooms	\$1.98	\$0.70
Four rooms	2.39	0.96
Five rooms	2.78	1.11
Six rooms	3.18	1.27
Seven rooms	3.54	1.42
Eight rooms	3.94	1.58
Nine rooms	4.34	1.73
Ten rooms	4.68	1.87
Eleven rooms	5.02	2.01
Twelve rooms	5.36	2.14

responded were Boone & Smith, the Electrical Construction & Supply Company, the Ideal Electric Shop, the Kimbrough Hardware Company, the Nutting Electric Company and Wise & Clark. These contractors fixed the wiring schedule as shown in the accompanying table and agreed that the lighting company should receive 10 per cent of the gross cost of wiring for handling each contract. The accompanying schedule shows the prices for jobs ranging from three outlets to nine outlets. When more than nine outlets are required on any one job, \$1.57 is added to the contractor's price and \$1.70 to the company's price for each outlet above nine.

Although these prices are designed to cover installations of drop-cords and sockets, they also apply to the charge for hanging fixtures where the customer decides to use fixtures. Upon the completion of the work, and following the city inspection, contractors are paid in full by the lighting company. The customer then pays the company 20 per cent of the amount of the bill in cash and the remainder in ten equal monthly payments. In special cases this time may be extended even longer.

Mr. Roy Thurman, new-business manager for the electric-service company, has full charge of giving out contracts, and ordinarily these are rotated regardless of their size. In order to facilitate the work of contractors, however, the lighting company may award a number of contracts in any part of town to one particular contractor, and he, having a number of contracts in the same vicinity, is spared the expense of re-haul-

ing tools and material. The limit of the number of contracts to be awarded in any group is ten. After one wiring firm has received several contracts in one vicinity, it is not awarded any additional contracts until the other co-operating firms have received an equal number.

Mr. English says that the owners of even the smallest homes in Muncie are taking advantage of this offer and that some of the new electric-service customers live in buildings which almost rival those described by Mr. S. E. Doane in his recent paper "Handling the Small Consumer in Europe," published in the *Electrical World* May 23. Although the ratio of population to consumers in Muncie is approximately six to one, forty-five contracts were secured under this plan during the first month of its operation. The contractors all express themselves as very much pleased with the scheme, and each one is working in hearty accord with the electric-service company. In addition to the forty-five contracts secured by the lighting company's solicitors, wiring firms report that the general publicity has increased their regular business.

### A Convenient Table for Electrical Contractors

To assist in laying out a wiring installation so that the potential drop within the premises will be less than 1 volt, Mr. M. D. Cooper, of the engineering department of the National Lamp Works, Cleveland, Ohio, recently presented the accompanying table before the annual convention of the Electrical Contractors' Association of Indiana. This table shows at a glance the current values which circuits of various sizes of wire and of various lengths will carry without exceeding the allowable 1-volt drop. The first jagged line at the left of the table denotes the limit of allowable carrying capacity given in the Underwriters' code. The second jagged line denotes the limit of current (6 amp) prescribed at 110 volts by the 660-watt-per-circuit rule.

Suppose, for instance, explained Mr. Cooper, that it is desired to install a lighting circuit 80 ft. in length. Following down the column headed "80" it is seen that with No. 14 wire a current of 2.5 amp gives a drop of 1 volt; with No. 12 wire 3.9 amp will produce a drop of 1 volt, and with No. 10 wire it takes 6.3 amp to pro-

Allowable Amperes for 1 Volt Drop

Length of Circuit in Feet	Length of Wire (Twice as Great)															
	15	20	25	30	40	50	60	75	100	125	150	200	250	300	400	500
No. 18	1.5	1.0	0.75	0.6	0.45	0.36	0.3	0.24	0.18	0.15	0.12	0.09	0.075	0.06	0.045	0.036
No. 16	2.0	1.5	1.1	0.8	0.6	0.48	0.38	0.3	0.24	0.18	0.15	0.12	0.09	0.075	0.06	0.045
No. 14	2.5	2.0	1.5	1.1	0.8	0.6	0.48	0.38	0.3	0.24	0.18	0.15	0.12	0.09	0.075	0.06
No. 12	3.0	2.5	2.0	1.5	1.1	0.8	0.6	0.48	0.38	0.3	0.24	0.18	0.15	0.12	0.09	0.075
No. 10	3.5	3.0	2.5	2.0	1.5	1.1	0.8	0.6	0.48	0.38	0.3	0.24	0.18	0.15	0.12	0.09
No. 8	4.0	3.5	3.0	2.5	2.0	1.5	1.1	0.8	0.6	0.48	0.38	0.3	0.24	0.18	0.15	0.12
No. 6	4.5	4.0	3.5	3.0	2.5	2.0	1.5	1.1	0.8	0.6	0.48	0.38	0.3	0.24	0.18	0.15
No. 4	5.0	4.5	4.0	3.5	3.0	2.5	2.0	1.5	1.1	0.8	0.6	0.48	0.38	0.3	0.24	0.18
No. 3	5.5	5.0	4.5	4.0	3.5	3.0	2.5	2.0	1.5	1.1	0.8	0.6	0.48	0.38	0.3	0.24
No. 2	6.0	5.5	5.0	4.5	4.0	3.5	3.0	2.5	2.0	1.5	1.1	0.8	0.6	0.48	0.38	0.3
No. 1	6.5	6.0	5.5	5.0	4.5	4.0	3.5	3.0	2.5	2.0	1.5	1.1	0.8	0.6	0.48	0.38
No. 0	7.0	6.5	6.0	5.5	5.0	4.5	4.0	3.5	3.0	2.5	2.0	1.5	1.1	0.8	0.6	0.48

TABLE FOR ELECTRICAL CONTRACTORS

duce a similar drop. If a 660-watt load is connected to the circuit the current at 110 volts will be 6 amp, hence No. 10 wire should be used to keep the potential drop within the desired limits.

Inasmuch as central stations' voltage tests are generally made at service entrance, it is important that the voltage drop between the entrance and the lamps should be kept as low as possible.

# Industrial and Financial News

## Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

**Plant for New Porcelain Insulator Company.**—Work is to begin at once at Youngstown, Ohio, on the plant of the Newby Process Insulator Company, recently organized for the purpose of manufacturing porcelain insulators and similar goods. The company has taken over the Newby Manufacturing Company, and increased the capital stock from \$10,000 to \$500,000.

**Addition to Ontario Generating Station.**—The Kaministiquia Power Company, Fort William, Ontario, has commenced installing an extra unit of 12,000-hp rating in its plant. This new unit has almost double the rating of any one of the three units totaling 22,000 hp that are now in operation. Some 350 men are now working on the building of the new aqueduct at Kakabeka.

**Small Variable-Speed Motors Selling Well.**—The business of the Kimble Electric Company, Chicago, for June, 1913, broke all previous records, but with the recent closing of the company's books for June, 1914, it has been found that the preceding year's record business was practically duplicated. Thus far, says Mr. J. K. Bass, general manager of the company, the business for 1914 has been good. The books show that the sales for this year are 15 per cent ahead of what they were for the corresponding six months of last year. The company's principal product is variable-speed motors.

**Distillery Uses Central Station Energy During Summer.**—The Louisville (Ky.) Gas & Electric Company, through Mr. Robert Montgomery, manager of the commercial department, has contracted with the Sunnysbrook Distillery Company of Louisville to supply its lighting load during the summer months when the plant of the distilling company is closed down. A motor-generator set renders the alternating-current service of the central station available for use by the distillery motors. Mr. Montgomery is negotiating with other local distilleries to supply the same sort of service.

**Electric Heating Business Soaring.**—Fourteen thousand square feet of additional space has just been rented by the Hughes Electric Heating Company in Chicago, in order to care for its rapidly growing business. With this additional floor space the company has now increased the size of its Chicago quarters 200 per cent during the past year. Growth in the Canadian factory of the company has likewise been rapid. Negotiations are now under way for the construction of a new building to be owned by the Hughes Electric Heating Company, and it is thought that the factory will be moved about Jan. 1, 1915. The company now employs 150 men.

**Diesel-Engine Set at San Francisco Exposition.**—A four-cylinder, 500-brake-hp Diesel oil engine built by the Busch-Sulzer Brothers Diesel Engine Company, St. Louis, Mo., is being installed in the center of the Palace of Machinery of the Panama-Pacific Universal Exposition, San Francisco, Cal. It was the first exhibit to be erected on the grounds, the foundation having been started on May 27. The engine will be directly connected to a direct-current generator which will operate in parallel with the electric-service system on the exposition grounds. The cylinders of the oil engine each measure 19.5 in. by 24 in. Both the cylinders and the exhaust manifold and piping are water-jacketed, thus affording maximum recovery of heat. The engine has a thermal efficiency of about 35 per cent. Approximately 48 per cent of the heat not converted into useful power is recovered in the cooling water.

**Long Life for High-Tension Rectifier Tubes.**—In the report of the People's Gas & Electric Company, Savanna, Ill., recently issued, it is stated that the average life of the

mercury rectifier bulbs used on its constant-current arc-lighting circuits for the last three years is 8398 hours, although they were guaranteed for an average life of only 500 hours. It should be noted that this life is not the individual life of bulbs but the average; some bulbs still in service have been operating in the neighborhood of 9000 hours. Mr. T. P. Bowen, manager of this company's plant, attributes this extra long life to the fact that the bulbs are operated, according to the instructions of the manufacturers, the Westinghouse company, on short-circuit for four or five minutes each night before throwing on the lamps. In addition to this treatment, the bulbs are occasionally taken from the tank and "rested" for a week or more and are also occasionally given hot-water baths.

**American Efficiency Survey of Motor-Car Units.**—An organization bearing the name "American Efficiency Survey of Motor Car Units" has come into existence, and, it is said, expects to announce itself soon in national advertising mediums as formed for "testing and proving the units which go to make up a motor car." It is said that this movement is the first step in an effort to establish independent disinterested standards of efficiency in the automobile industry, which in point of capital invested is second only to the steel industry in this country. Tests of the units of various manufacturers are to be conducted in the laboratories at Purdue University under the guidance of Profs. C. S. Benjamin, dean of the engineering schools; Louis E. Endsley, G. A. Young, M. J. Golden, C. Francis Harding and Robert G. Pilkington. According to the plans as announced, tests of all units are to be made, and after a comparison of results a silver trophy will be awarded to the manufacturer whose apparatus proves best. The manufacturer will also be allowed to use the insignia of the American Efficiency Survey in his advertising. Letter heads issued by the new concern bear the names of Messrs. Harry Newman, president; Kenyon W. Mix, vice-president; David Minard Shaw, vice-president and secretary, and Charles S. Castle, treasurer. The office of the American Efficiency Survey of Motor Car Units is at 30 North Michigan Boulevard, Chicago, Ill.

**Orders for Electrical Equipment.**—The following important orders have been received recently by the Westinghouse Electric & Manufacturing Company: The Charleston & Interurban Railway Company, Charleston, W. Va., one 300-kw rotary converter, three 110-kva transformers and one switchboard; the Atlantic Shore Railway Company, Kennebunk, Maine, one 300-kw rotary converter; the Benton Harbor & St. Joe Railway & Light Company, Benton Harbor, Mich., one 300-kw rotary converter; the United Gas & Electric Engineering Corporation, Baltimore, Md., three 1000-kw rotary converters; the Pacific Gas & Electric Company, San Francisco, Cal., one 1000-kw rotary converter, five 1000-kw generators, each on common base with five 1440-hp synchronous motors; the Jamestown, Westfield & Northwestern Railway Company, Jamestown, N. Y., one complete portable substation consisting of one 500-kw rotary converter, one 550-kva outdoor-type transformer, one two-panel switchboard and one substation car; the St. Paul Southern Electric Railway Company, St. Paul, Minn., one 300-kw rotary converter, three 100-kva transformers and one switchboard; the Philadelphia Rapid Transit Company, Philadelphia, Pa., two 3000-kw rotary converters and six 1100-kva transformers; the Northwestern Electric Company, Portland, Ore., one 75-kw generator on common base with an induction motor, and a switchboard; the Moir Hotel Company, Chicago, Ill., one 200-kw generator and two 400-kw generators; A. J. Anderson & Company (Tuberculosis Hospital), Louisville, Ky., one 75-kw generator and a switchboard.



**Electric Ambulance Popular with Physicians.**—Preference is being shown, it is reported, by many physicians in Louisville, Ky., for the Waverly electric ambulance of the Louisville Carriage & Taxicab Company. This vehicle is the only electric car of its type in the city, the others being gasoline-driven. The electric vehicle is considered especially preferable because of its easy control and smooth running and the impossibility of the driver jostling the patient unduly, however excited he may get.

**Orders for Hydraulic Turbines and Accessories.**—The I. P. Morris Company, Philadelphia, Pa., recently secured an order from the Turners Falls Company, Turners Falls, Mass., for three governor mechanisms and a central pumping system to be applied to three 9700-hp waterwheel units, the contract for which was received by the above company in October, 1913. This company has also been awarded contracts for the following equipment: The Columbia Mills, Inc., Minetto, N. Y., six 2200-hp vertical-shaft, single-runner turbines, designed to operate at a speed of 63.2 r.p.m. under a head of 17.5 ft., six governors and a central pumping system; the Canadian Light & Power Company, St. Timothée, Quebec, Canada, three 7200-hp horizontal-shaft, double-scroll-casing units, designed to operate at a speed of 150 r.p.m. under a head of 48 ft., and three governors. The latter order supplements an order for one unit of the same rating as those enumerated, which was placed with the I. P. Morris Company in February.

**Electrical Apparatus for Industrial Concerns.**—Indicative of activity in the industrial field and the increasing use of electrical apparatus, the following important orders recently received by the General Electric Company are of interest: Phillips Insulated Wire Company, Darlington, R. I., two 750-kva Curtis turbo-generators with a 17.5-kv exciter set, regulator equipment and switchboard; the Buffalo, Rochester & Pittsburgh Railway Company, Dubois, Pa., a 525-kva Curtis turbo-generator, a 400-kw motor-generator set, a 75-kva alternator, two 3-kw exciters, two 37.5-kva transformers and switchboard; the Apsley Rubber Company, Hudson, Mass., a 400-hp induction motor, 50-kva transformer and starting panel; the Husted Milling Company, Buffalo, N. Y., one 15-kva and two 200-kva transformers, and twenty-six motors ranging in rating from 5 hp to 100 hp; the American Optical Company, Southbridge, Mass., a 1250-kva, 3600-r.p.m., 600-volt Curtis turbo-generator; the Nairn Linoleum Company, Newark, N. J., a 4-ton electric storage-battery industrial locomotive; the Chicago & Western Indiana Railroad, Clearing, Ill., sixty-nine motors ranging in rating from 2 hp to 50 hp; the William R. Thropp & Sons Co., Trenton, N. J., 300-hp induction motor with controller and oil-switch; the Phoenix Portland Cement Company, Nazareth, Pa., a 140-kva synchronous motor, a 150-kva alternating-current generator, two 200-kva transformers and a switchboard.

**Electric Automobiles Make Long Trip.**—A 135-mile trip, from Los Angeles, Cal., to Riverside, Cal., and return, was recently made by ten Beardsley electric stock machines. Two days were taken to make the journey. All ten machines, it is reported, made a 100 per cent score, notwithstanding the fact that several of the cars were operated by inexperienced drivers. One car was driven by an aged man who had secured his machine only the day before starting the tour and who had had only one lesson of an hour's duration. The drivers of three of the machines were women, and they operated their machines the entire distance without a mishap, although this was the first trip of the kind that they had ever taken in any machine. The start from Los Angeles was made at 10 o'clock Saturday morning and was in charge of Mr. John T. Shannon, electrical engineer for the Beardsley Electric Company, 1215 West Seventh Street, Los Angeles. The first stop was made in Ontario, at a distance of 44 miles from Los Angeles. In many places the roads were heavy on account of the detouring necessary because of the construction of the state highway. The supreme test of the outbound trip came when, at the end of a long journey with many grades and across the sands, the final stretch was made up the famous Rubidoux grade into Redlands. The cars were recharged at Riverside, and at 11 o'clock the following morning the return journey was begun. An hour was taken at noon for lunch. The tourists arrived in Los Angeles at 3:30

p. m. with plenty of energy remaining in the batteries. It is the intention of the Beardsley company to conduct other tours of this character throughout the summer months.

**Electrically Equipped Mine at San Francisco Exposition.**—The United States Bureau of Mines has undertaken to construct, in co-operation with the mining industry and the manufacturers of mining machinery, an actual operating mine beneath the floor of the Palace of Mines and Metallurgy at the Panama-Pacific Exposition, to be held at San Francisco next year. Coal-mining operations will be reproduced by full-size workings in which mining machinery will be installed and operated. The walls of the mine will be covered with ore or coal typical of the mine illustrated. A number of mining companies have agreed to reproduce some of their stopes and to contribute the sum necessary to installation and operation of the exhibit. Mining machinery and appliances have been promised, including a mine cage and cars by the Joshua Hendy Company, a cage, hoist and motor by the Denver Engineering Works, locomotives by the Westinghouse Electric & Manufacturing Company pumps by Byron Jackson, air compressor, drills, drill sharpener and winze hoist by the Compressed Air Machinery Company, drills and coal cutters by the Ingersoll Rand Company and the Sullivan Machinery Company lamps by the Justrite Manufacturing Company and the Koehler Manufacturing Company, etc. There is little doubt that other necessary machinery and appliances, such as safety lamps, portable electric lamps, fans, mine telephones mine rescue apparatus, switches, track, etc., will be received as exhibits. The entrance to the mine will be through the Bureau of Mines space. Visitors will be attracted to it by being given portable mine lamps and by being lowered in a very slowly moving cage while a panoramic effect of the strata lining a mine shaft will pass by them so rapidly as to produce the illusion of descending to a considerable depth.

**Model Electric Home for Panama-Pacific Exposition.**—An attractive feature of the General Electric Company's exhibit at the Panama-Pacific Exposition will be an electrical home. Every practicable electrically operated labor saving device suitable for use about the household will be shown in actual service. The "home electrical" will be a full-sized house, consisting of a living-room, dining-room, breakfast room, bedroom, bath, kitchen, laundry and sewing room. Nearby will be the electrical garage, workshop, creamery, etc. The kitchen will be provided with an electric range for all cooking purposes, and with electrically driven machines for peeling vegetables, polishing silver, freezing ice-cream, driving cake and dough mixers, and doing other necessary work. In the electric laundry the clothes will be washed by means of electricity and ironed with electric flatirons. An adjoining room will have a electric refrigerating plant of household size for preserving foodstuffs and making artificial ice. The dining-room will be arranged to show how light lunches and suppers can be cooked with the electric chafing dish or the electric grill. The sewing-room will be equipped with a motor-driven sewing machine, a small fan and an electric pressing iron. Even the bedroom will have its modern electrical appliances—small fan, electric lamps, a heating pad and a milk warmer. In connection with this electrical home, and as a part of the exhibit, there will also be shown a garage with an electric runabout, battery-charging outfit, etc. Adjoining the garage there is to be a small workshop, completely equipped with electrically driven tools. A model dairy room with cream separator, churn, bottle washers, pumps and other small motor-driven machines such as are used almost daily on every country place will also be exhibited.

**Central-Station Business on the Pacific Coast.**—Central-station statistics for April received from the large central-station companies on the Pacific Coast indicate a better rate of increase over 1913 than that indicated by the March returns. This result is entirely in line with the reports from every other section of the country, and would seem that, satisfactory as was the March showing, the percentage rate of increase of this year's business over last year's is somewhat better than was indicated solely by the March returns. A good idea of general conditions in the Pacific States can be obtained from a scrutiny of the operating data of the Pacific Gas & Electric Company, the

Southern California Edison Company and the Puget Sound Traction, Light & Power Company. Whereas for March the combined gross income of these three companies was only 2.6 per cent in excess of 1913—\$2,480,837 against \$2,418,522—April's showing is more satisfactory, and the combined total is found to stand at \$2,490,528 against \$2,387,381—an increase of 4.3 per cent. It is practically certain that if the segregated figures for electric sales could be obtained a rate of over 5 per cent increase would be shown. The great San Francisco system, for instance, derives only one-half of its total revenue from the sale of electricity for lighting and motor service, the balance accruing from gas, water and railway service. The *Electrical World* has received April data from two other large systems in the Pacific States, each having an energy output in excess of 13,000,000 kw-hr. a month. These companies obtained an increase of 6 per cent in energy sales and 8.5 per cent in output. The station output of the Pacific Gas & Electric Company is known to be over 50,000,000 kw-hr. a month and the output of the Los Angeles and Seattle companies can also be estimated pretty closely, so that 116,000,000 kw-hr. may be taken as the combined station output of these five Pacific companies for April, 1913. This is somewhat in excess of 60 per cent of the entire lighting and motor-service business of the Coast States, and upon this fairly representative basis the estimate may be made that the central stations on the coast in April of this year received 5 or 6 per cent more revenue from the sale of energy than in 1913. In any consideration of electrical conditions in the Pacific States, however brief, one is invariably led to the conclusion that the future will be able to take care of itself very satisfactorily, and that the present stability—and even prosperity—of the operating companies there is much more securely established than would be indicated solely by figures of present expansion. Even on the somewhat narrow basis of gross earnings, the large companies in California, Washington and Oregon may be shown to be doing, under the circumstances, fairly well; but, aside from that, it is impossible to neglect the fact that the physical properties of the companies are in magnificent shape for meeting future needs, and that for the next few years the ratio of net to gross must inevitably advance. Recently very heavy investments have been made in the properties, and the directors of the companies have had a difficult task in providing the necessary amount of new capital. The financing, however, has by now been skillfully and successfully carried out, and it requires no unusual gifts of foresight to predict that, as business generally on the coast comes back to a more normal condition, and as the expansion of population and the industries are reflected in the gross income of the electrical utilities, the latter will in future be able to show an even more favorable balance-sheet than they have in the last few years. The opinion may be hazarded that at the present time the plant factor (or, in other words, the average load to generating equipment rating) is lower on the coast than anywhere in the East, and it is entirely possible that as this factor rises the large Pacific companies will be able to show some expansion statistics which will be comparable only with the wonderful record set by North and South Carolina during the last decade.

**Summary of Central-Station Data for April.**—The foregoing estimates of electrical growth on the Pacific Coast may be compared with those already given by the *Electrical World* for other sections of the country. The following percentages of increases, for April, 1914, over April of last year, are given as the values for (1) gross income from the sale of energy, and (2) total energy output in kilowatt-hours. The business of the electric-service utilities in the Middle Atlantic States has increased by 9.8 and 10.1 per cent; South Atlantic, 12.7 and 26.1; Central, 16 and 14; New England, 9 and 9.5, and Pacific and Mountain, 5 and 6 per cent. In this enumeration the South Atlantic States have been differentiated from the Middle Atlantic only for the purpose of emphasizing the fact that, from the standpoint of electrical growth, the South seems to be setting a faster pace than any other section of the country. The 26 per cent increase in output registered by the South Atlantic group is certainly indicative of wonderful electrical activity. The returns also indicate that there is no perceptible slackening in any of the states in the manufacturing belt, the

utilities in Ohio, Michigan and Missouri particularly seeming to increase their output at a very satisfactory rate. In all, the *Electrical World* has received reports from 130 companies or groups of companies for the month of April. In the aggregate these returns show that the gross income has increased from \$16,359,594 in April, 1913, to \$18,027,619 in April, 1914, or at a rate of 10.2 per cent; while the total energy output has increased in the same time from 634,005,739 kw-hr. to 722,952,419 kw-hr., or at a rate of 14.1 per cent. Included in these figures are the returns from the companies operating in eighty out of the first hundred cities, and it can be accurately estimated on the basis of energy

COMPARISON OF EARNINGS AND OUTPUT FOR MARCH AND APRIL, 1914 AND 1913, OF ALL OPERATING COMPANIES REPORTING TO THE ELECTRICAL WORLD

	GROSS EARNINGS FROM THE SALE OF ENERGY			TOTAL ENERGY OUTPUT IN KILOWATT-HOURS		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
March, 84 companies	\$16,891,235	\$15,559,191	8.7	730,843,220	642,291,906	13.8
April, 130 companies	\$18,027,619	16,359,594	10.2	722,952,419	634,005,739	14.1

output that the data relate to about 55 per cent of the entire lighting and motor-service business of the United States. It can thus be seen that for the month there was an increase in gross income for the whole industry of nearly \$3,000,000 over the same period last year. It is safe to say that, to finance this expansion, new working capital at the rate of some \$15,000,000 a month is required. These figures, of course, provide direct evidence of the comparative stability of the electrical industry in times of business depression, and furnish all the explanation required for the rapid advance that is being made by public utility securities to a position of high favor in the investment market. During the first six months of this year the total corporate financing of the United States amounted to \$990,000,000, divided roughly in the ratio of 52 per cent for railroads, 26 per cent for public utilities and 22 per cent for industrials. For the month of June the utilities absorbed some \$49,500,000 against only \$55,000,000 by all the railroad systems of the country, a great deal of this amount being for the refunding of maturing securities. There is much work to be done in driving home a realization of such facts and figures as these to the public and to the investor. To maintain the progress and to foster the growth of the electrical utilities a never-ending supply of new capital is required.

NEW YORK METAL MARKET PRICES

	June 30		July 7	
	Bid	Asked	Bid	Asked
Copper Standard spot*	13.50	13.50	13.45	13.50
Selling Prices				
	£	\$	£	\$
London, standard spot*	60	1 3/4	62	1 3/4
Prime Lake .....	13.75	to 14.00	14.00	to 14.25
Electrolytic .....	13.40	to 13.50	13.70	to 13.80
Casting .....	13.25	to 13.35	13.55	to 13.65
Copper wire base .....	to 11 3/4		to 14.71	to 15.12 1/2
Lead .....	40.00	to 45.00	40.00	to 45.00
Nickel .....	7.00		7.00	
Sheet zinc, f.o.b. smelter .....	5.00	to 5.10	5.00	to 5.10
Spelter, spot .....	30.35	to 30.50	31.95	to 32.20
Tin, spot*	17.50	to 17.75	17.50	to 17.75
Aluminum .....	17.50	to 17.75	17.50	to 17.75
Prompt delivery .....	17.50	to 17.75	17.50	to 17.75
Future .....				

\*OLD METALS

Heavy copper and wire .....	12.00	12.25
Brass, heavy .....	8.25	8.50
Brass, light .....	7.00	7.25
Lead, heavy .....	3.60	3.80
Zinc, scrap .....	3.75	3.85

\*COPPER EXPORTS

Total tons to July 7 .....	5,493
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\*From daily transactions on the New York Metal Exchange.



## Corporate and Financial

**The Northern Colorado Power Company.**—In a letter to the holders of certificates of deposit of the Equitable Trust Company of New York, representing first-mortgage 5 per cent bonds and preferred and common stock of the Northern Colorado Power Company, Messrs. Albert M. Chambers and Albert Rothbarth, the readjustment committee, give notice that they have declared the plan for readjustment, dated July 22, 1913, effective and operative. The letter further states that the holders of all the bonds, two-year 6 per cent secured notes and secured demand notes, and more than 98.5 per cent of the stockholders, have assented to the readjustment plan.

**Annual Report of the J. G. White Companies.**—The annual report of the J. G. White companies was submitted as an amalgamated balance sheet of the J. G. White Engineering Corporation and of the J. G. White Management Corporation as of Dec. 31, 1913, and of J. G. White & Company as of Feb. 28, 1914. The balance sheet shows that the cash in banks, in branch offices and on hand was \$553,942, and bills and accounts receivable, after making what the officers believed to be ample provision for all doubtful accounts, were \$596,574, the total current assets being \$1,150,516. The total debts of the company were \$553,069. The companies' profits during the year were \$349,070. After deducting dividends the sum of \$179,938 was added to the surplus account. The last account was reduced to \$159,260 by a committee of the directors, in order to make ample provision for shrinkage in value of securities due to the prevailing market conditions. Mr. J. G. White, chairman of the board of directors, stated that, in spite of the adverse business conditions, the results of the year's business of the engineering corporation and the management corporation were satisfactory. It is believed that the formation of these two companies to take over the engineering and management business, heretofore conducted as departments of the parent company, has resulted in materially increasing the efficiency of the organization and strengthening the position of the companies.

**Pacific Gas & Electric Company.**—The Railroad Commission of California has authorized the company to carry out its new financing plan as follows: The company may issue \$5,000,000 general and refunding mortgage gold bonds, the commission to determine in a supplemental order the minimum price at which they are to be sold. The company may issue \$12,500,000 of its newly created first preferred 6 per cent stock at not less than \$82.50 per share and may issue as much more as may be necessary to exchange its old issue of \$10,000,000 preferred stock for the new preferred stock after July 1, 1916, at the rate of ten shares of old stock for ten and one-quarter shares of new stock. Also the company may issue \$1,159,800 common stock for the reimbursement of moneys expended for the retirement of bonds through sinking funds from Jan. 1, 1914, to April 30, 1914, and to provide cash for meeting certain sinking-fund payments. The proceeds from the sale of the general and refunding bonds and the first preferred stock are to be applied to the extent of \$7,000,000 for the retirement of one-year notes now outstanding, to the extent of \$4,586,661 for the reimbursement of the company's treasury for advances heretofore made for construction, and the balance is to be utilized for future additions and improvements. In its decision the commission complimented the company upon its plan to sell its new first preferred stock, and said: "The plan is in accord with suggestions for junior financing which have been made by this commission from time to time to various public utilities and is worthy of emulation, in so far as applicable, by other utilities."

**Annual Report of the Montreal Light, Heat & Power Company.**—The directors of the Montreal Light, Heat & Power Company give the following as the financial statement for the year ended April 30, 1914: Gross revenue, \$6,245,697; operation and maintenance, \$2,778,451; depreciation and renewal reserve, \$600,000, making net revenues of \$2,867,246. The fixed charges were \$467,977, making a net income of \$2,399,269. With \$1,700,000 paid in dividends, the surplus from the year's operations amounted to \$699,269. An appropriation of \$10,000 was made for the officers' and employees' pension fund, so that the amount transferred to general surplus was \$689,269. In his report Presi-

dent H. S. Holt stated that the gross revenue and surplus earnings showed substantial and satisfactory increases over previous years, even though the operating expenses were increased by advanced prices for raw materials and low-water and ice conditions at the company's hydroelectric plants, necessitating extended operation of the steam plant and purchase of additional energy. The net revenue and net income when compared item for item with last year's account show substantial increases. The accrued surplus is brought up to \$4,210,512. The depreciation reserve is invested in the revenue-earning plant. During the year \$1,700,000 of new capital stock was issued to shareholders and \$100,000 to employees. The proceeds of this and cash on hand will be absorbed in extensive additions to plant and property which it is estimated will cost \$2,500,000. The new steam reserve plant at La Salle is well under way. It is equipped for 25,000 hp and designed to have ultimately 50,000 hp. The new steel-pole transmission line between Cedars Rapids and Montreal will be completed simultaneously with the hydraulic development of the Cedars Rapids Manufacturing & Power Company with which the company has contracted for part of its power supply. A reduction of 0.4 cent per kw-hr., or 2 2/3 per cent, will be made for overhead service. Mr. Holt expresses the regret of the directors that they cannot consistently reduce the electric-lighting rate for underground service. In fact, the great difference in costs for this class of service as demonstrated by the cost of the new civic conduits and equipment will render it necessary to establish some fair differential to offset the additional expense entailed.

**The Wisconsin-Minnesota Light & Power Company Merger.**—The Wisconsin-Minnesota Light & Power Company (until recently the La Crosse (Wis.) Gas & Electric Company) has taken over all the properties formerly owned or controlled by the Chippewa Valley Railway, Light & Power Company and the Chippewa Valley Construction Company. The new company, under the authority of the Railroad Commission of Wisconsin, has increased its capital to \$20,000,000. The change was made by the American Public Utilities Company, managed by Kelsey, Brewer & Company. The company now serves a population estimated to exceed 90,000. The largest of the company's hydroelectric plants is the Cedar Falls plant, which has a capacity of about 5500 hp. At present the total capacity of all the company's steam and hydroelectric plants is approximately 14,000 hp, which, President Joseph H. Brewer writes, can ultimately be increased by the development of the company's present water rights to over 100,000 hp. Most of the sixteen cities and towns served by the company are in Wisconsin, while the business in Minnesota is confined to selling energy at wholesale to other public service corporations in Red Wing, Wabasha and Lake City. All of the common stock is owned by the American Public Utilities Company, as is also a portion of the preferred stock. Of the latter \$1,500,000 will be sold to the public by Paine, Webber & Company, of Boston, and \$2,265,000 of the first and refunding 5 per cent thirty-year bonds will be marketed through the Harris Trust & Savings Bank, of Chicago. These bonds are being offered at 93% and interest. Mr. Blaine Gavett, secretary of the American Public Utilities Company, mentions two important business possibilities: "The hydroelectric generating stations of the company are within about 90 miles of the twin cities, St. Paul and Minneapolis, and also the iron country along the northern Wisconsin-Michigan border is within reach by the construction of a transmission line. The extension of the present high-tension lines to serve the city of La Crosse will have an immediate effect on the total electrical output of the hydroelectric stations. The territory on both sides of the Mississippi River between La Crosse and the twin cities abounds with excellent energy possibilities. It is our expectation to develop this business as rapidly as conditions will permit." The officers of the new company are Mr. Joseph H. Brewer, president; Messrs. W. B. Parsons and A. E. Pierce, vice-presidents; Mr. Blaine Gavette, secretary; Mr. C. A. Boalt, treasurer; Mr. W. J. Ripley, assistant secretary and treasurer. The directors include all the officers except Mr. Ripley, and Messrs. Charles B. Kelsey, A. W. Higgins, John H. Blodgett, Joseph S. Hart, George A. Whitworth and Charles McPherson.

## Business Notes

**The Edward J. Hunt Manufacturing Company**, of Newark, N. J., has taken over the business formerly carried on by Edward J. Hunt.

**The Carbo Steel Post Company**, of Chicago, Ill., has removed its main office from Chicago Heights, Ill., to 879 Rand-McNally Building, Chicago.

**The Barden Electric & Machinery Company**, of Houston, Tex., has abandoned its contracting department and is now engaged exclusively in the jobbing business.

**The American Engine & Electric Company**.—Harry J. Marks has been advanced from the position of manager of the New York office of the American Engine & Electric Company to that of sales manager of the company. He will divide his time between the New York office, at 90 West Street, and the main office at Bound Brook, N. J.

**The United Light Company**, of Cincinnati, Ohio, has been organized to take the place of the United Gas Lighting Company. The officers are: President, W. H. Odell; vice-president, I. R. Balcom, and secretary and treasurer, W. R. Divers. The charter of the concern provides that it may manufacture, buy, sell and maintain gas and electric appliances.

**The Freeman-Sweet Company**, electrical contracting engineer, Chicago, has moved from its former place of business at 538 South Dearborn Street and has taken offices on the second floor of the Transportation Building, 608 South Dearborn Street. The company also has a room on the first floor of the same building, in which it maintains an appliance sales room.

**Buffalo Electric Vehicle Company**.—W. A. Zimmerman, formerly secretary and general manager of the Mercury Manufacturing Company, has been made director of sales and publicity for the Buffalo Electric Vehicle Company, Buffalo, N. Y. F. C. Brown, formerly district manager for the Chase Motor Truck Company, has been made sales manager of the truck department of the Buffalo Electric Vehicle Company.

## Trade Publications

**Link Belt**.—Section A of Catalog No. 110, a recent publication of the Link-Belt Company, Chicago, Ill., describes detachable link-belts.

**Portable Tools**.—The Stow Manufacturing Company, Binghamton, N. Y., describes motor-driven portable tools in its latest four-page folder.

**Marine Boilers**.—Scotch marine boilers with water backs are referred to in a pamphlet sent out by the Murray Iron Works Company, Burlington, Ia.

**Brushes**.—The Nungesser Carbon & Battery Company, Cleveland, Ohio, has prepared Catalog No. 5, giving information on various grades of brushes.

**Fuel-Oil Engine**.—Bulletin No. 2 of the Covington Machine Company, Covington, Va., contains descriptions of fuel-oil engines and includes operating data thereon.

**Water-Tube Boilers**.—The fifth edition of Bulletin No. 2 has been issued by the A. D. Granger Company, New York. It refers to Oswego internally fired water-tube boilers.

**Armored Conductors**.—The prices of flexible steel conduit, fittings, etc., are listed in a pamphlet being distributed by the Pacific States Electric Company, San Francisco, Cal.

**Automobile Electric Equipment**.—A. J. Picard & Company, 1720 Broadway, New York, call attention in a folder recently issued to their supply of automobile electrical equipment.

**Pneumatic Tires**.—The pamphlet issued by A. J. Picard & Company, 1720 Broadway, New York, contains a price list and table of carrying capacities of Firestone pneumatic tires.

**Vacuum Cleaner**.—A leaflet issued by the Sterling Machine & Stamping Company, Wellington, Ohio, sets forth briefly the superior features of its "Brilliant" suction cleaner.

**Electric Specialties**.—Catalog D of the Alter Light Company, 827 Loomis Street, Chicago, Ill., illustrates electric fixtures, heating appliances, wiring material and other specialties.

**Electric Drill**.—A portable electric drill equipped with ball bearings is described in Circular E-1, issued by the Independent Pneumatic Tool Company, Chicago, Ill.

**Mechanical Refrigeration**.—A refrigerating plant operating on exhaust steam is described in Bulletin No. 16, issued by the Carbondale Machine Company, Carbondale, Pa.

**Electric Vehicle Equipment**.—Data regarding electric vehicles is contained in Catalog 3002-A, Section 3223, of the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.

**Motor Drive**.—Motor drive for laundry machinery is discussed in Catalog 3002-A, Sections 3164 and 3082, of the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.

**Storage Batteries**.—Titan storage batteries for electric vehicles are the subject of a well-prepared thirty-two-page catalog published by the Titan Storage Battery Company, Newark, N. J.

**Electrically Heated Linotype Pot**.—An electrically heated wicker-type linotype pot is described in Publication No. 1531 of the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.

**Industrial Locomotive**.—Leaflet No. 3723, describing Baldwin-Westinghouse industrial locomotives, has been issued by the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.

**Motion-Picture Equipment**.—Electrical equipment for motion-picture theaters is described in Folder No. 4277 of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

**Lighting Fixtures**.—The National X-Ray Reflector Company, Chicago, Ill., has issued twelve pages showing new "Eye Comfort" lighting fixtures for inclusion in a binder previously provided.

**Heating Devices**.—A set of advertisements has been prepared by the American Electrical Heater Company, Detroit, Mich., for use by dealers and contractors in promoting the sale of heating devices.

**Portable Ozonators**.—Price List No. 852 and Descriptive Bulletin No. 49,000, relating to portable ozonators, have been issued by the Sprague Electric Works of the General Electric Company, New York.

**Indirect-Lighting Units**.—In two bulletins recently issued by the Mohrlite Company, San Francisco, Cal., numerous illustrations of attractive indirect-lighting units and indirect-lighting installations are shown.

**Laundry Machinery**.—The Hurley Machine Company, Clinton and Monroe Streets, Chicago, Ill., has issued a sixteen-page booklet illustrating the Thor washing machines and giving a brief talk on its advantages.

**High-Voltage Insulator Pins**.—So-called "Keystone" truss or high-voltage insulator pins and other transmission-line specialties are described in a catalog issued by the Electric Service Supplies Company, Philadelphia, Pa.

**Railway Data**.—The relative costs of operation of different railway systems are compared in Westinghouse Railway Data Exchange No. 8, recently issued by the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.

**Electric Control**.—An article by Mr. H. F. Stratton, "Lifting the 130,000-lb. Quebec Bridge," recently published in the *Engineering Magazine*, has been reprinted in pamphlet form by the Electric Controller & Manufacturing Company, Cleveland, Ohio.

**Gages**.—The Bristol Company, Waterbury, Conn., in Bulletin No. 189 illustrates and describes its recording differential-pressure gages and recording flow-rate meters, float type, models 1010 and 1110. Bulletin No. 188 refers to recording differential-pressure gages and flow-meters.

**Power-Plant Appliances**.—A number of bulletins containing illustrations and tables have been brought out by the Sims Company, Erie, Pa., under one cover. The titles of these bulletins are as follows: "Closed Feed-Water Heaters," "Open Feed-Water Heaters," "Hot-Water Generators and Converters," "Clean E-Z Steam Tube Storage," "Price Lists and Tabulations," "Laundry Heaters," "Steam Separators," "Exhaust Heads," "Oil Extractors," "Oil Filters," "Low Water Alarms" and "Compound Feeders."



**Oil Engines.**—The McIntosh & Seymour Corporation, Auburn, N. Y., has issued Bulletins No. 51, 53 and 54 relating to Diesel oil engines.

**Telephone Cable.**—The Western Electric Company, New York, has published a booklet describing the manufacture of lead-covered telephone cable.

**Small Tungsten Lamps.**—H. W. McCandless & Company, New York, have sent out folders on miniature automobile and candelabra tungsten lamps.

**Electric Toaster Stove.**—A folder describing its combined toaster stove is being distributed by the American Electrical Heater Company, Detroit, Mich.

**Automobile Horn.**—A leaflet recently issued by the Automobile Supply Manufacturing Company, Brooklyn, N. Y., tells about its "Apollo" electric horn.

**Wall Boxes.**—The Machen & Mayer Electrical Manufacturing Company, Philadelphia, Pa., has issued a folder describing its Uni-Sectional steel wall boxes.

**Motor-Operated Drills.**—Portable motor-driven drills are described in the pamphlet issued by the United States Electrical Tool Company, Cincinnati, Ohio.

**Cable-Splicing Joints.**—Applications of the Matthews cable-splicing joints are described in a pamphlet issued by W. N. Matthews & Brothers, St. Louis, Mo.

**Oil Fuse Cutouts.**—Circular No. 150 of the D & W Fuse Company, Providence, R. I., describes oil-immersed fuse cutouts adapted to high-tension service.

**Engineering Service.**—H. M. Byllesby & Company, Chicago, Ill., are sending out a placard briefly describing a large electrical development which they have made.

**Crane Motors.**—Leaflet 2364-A issued by the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., contains information on direct-current crane motors.

**Rope Drive.**—Bulletin O of the Mesta Machine Company, Pittsburgh, Pa., states the advantages of rope drive and contains data on the life of manila transmission rope.

**Data on Insulation.**—A booklet of forty-eight pages, issued by the Dielectric Manufacturing Company, St. Louis, Mo., bears the title "Data on Dependable Insulation."

**Cables.**—Steel-tape-armored cables are discussed in Bulletin No. 680-1, issued by the Standard Underground Cable Company, Pittsburgh, Pa. Ten illustrations are shown.

**Underground Gasoline Tanks.**—A recent catalog of the Wm. B. Scaife & Sons Company, Pittsburgh, Pa., describes underground gasoline storage tanks and garage air tanks.

**Voltage Regulator.**—A pamphlet discussing characteristics and applications of the Thompson voltage regulator has been issued by the Thompson-MacArthur Company, Buffalo, N. Y.

**Steel-Taped Cable.**—The Simplex Wire & Cable Company, Boston, Mass., will furnish on request a booklet on the uses of steel-taped cable and the cost of installing this product.

**Electric Signs.**—The Sun Electrical Company, Ltd., 120 Charing Cross Road, London, has published a catalog on electric signs equipped with mechanical and thermo-flasher devices.

**Electric Fans.**—Catalog No. 14-F of the Menominee Electric Manufacturing Company, Menominee, Mich., contains a brief description and the price list of several sizes and types of fans.

**Auto-Starters.**—Auto-starters for polyphase induction motors are described in Leaflet No. 3512-A, issued by the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.

**Busbar Supports.**—A leaflet referring to unit-type high-tension busbar supports and a portable phase-rotation indicator has been issued by the Delta Star Electric Company, Chicago, Ill.

**Radio Receiving Head Set.**—Head-receivers for radiotelegraphy are described in the pamphlet issued by the Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y.

**Pole-Top Switches.**—The Railway & Industrial Engineering Company, Pittsburgh, Pa., has issued a leaflet giving

the cost, durability, reliability and application of Burke pole-top switches.

**Refractory Materials.**—In a leaflet circulated by the Laclede-Christy Clay Products Company, St. Louis, Mo., the company points out the particular industries to which its products are adapted.

**Glass Fixtures.**—Placards illustrating and briefly describing some of its glass products are being circulated by the Gleason-Tiebout Glass Company, 71 West Twenty-third Street, New York.

**Electroplating Machines.**—The Munning-Loeb Company, Matawan, N. J., in its Bulletin No. 400 illustrates and describes its "Nonesuch" electroplating machine and "Nonesuch" carboy rockers.

**Heating Devices.**—The Menominee Electric Manufacturing Company, Menominee, Mich., has sent out some leaflets on electric shoe and hair driers and a flatiron designed for heating curling irons.

**Laboratory Apparatus.**—Pamphlets and leaflets are being sent out by the Arthur H. Thomas Company, Philadelphia, Pa., describing laboratory apparatus, including high-temperature electric furnaces.

**Automobiles.**—The seventeenth annual announcement of new models of Waverley automobiles has been issued by the Waverley Company, Indianapolis, Ind., in a well-printed, fully illustrated pamphlet.

**Plastic Cement.**—S. A. Industries Chimiques, Chiasso, Switzerland, have issued a pamphlet written in French describing the characteristics and preparation of a plastic cement for fastening insulators to pins.

**Conveyors.**—Book No. 195 of the Link-Belt Company, Philadelphia, Pa., shows a class of machinery that has been developed for handling newspapers, magazines, stereotype plates and various packages in printing establishments.

**Concrete Products.**—The National Reinforced Concrete Pole, Pipe & Pipe Company, Denver, Col., is sending out an illustrated twenty-seven-page booklet describing the R. M. Jones method of manufacturing concrete poles, piles and pipes.

**Meters.**—Ampere-hour and two-wire watt-hour meters are described in Bulletins No. 38 and 39 of the Sangamo Electric Company, Springfield, Ill. An addendum to Bulletin No. 36 contains a brief description of all types of ampere-hour meters. Another pamphlet describes ampere-hour meters for electric vehicles.

## New Industrial Companies

The Acme Electric Storage Battery Company, of Chicago Ill., has been incorporated with a capital stock of \$14,000 to manufacture and deal in storage batteries. The incorporators are Roy Brundage MacDowell, Sidney J. Hall and A. C. Hunt.

The Bacht Medical Apparatus Company, of Brooklyn N. Y., has been incorporated by R. S. Padgett, C. Dooley and L. Sherman, of Brooklyn, N. Y. The company is capitalized at \$50,000 and proposes to manufacture and deal in electric and medical apparatus, etc.

The Niagara Battery Company, of Buffalo, N. Y., has been chartered with a capital stock of \$5,000 to manufacture and deal in storage batteries. The directors are George H. Woodward, H. Barton Parry, E. C. Schlenker, J. N. Alcott and E. L. Marshall, all of Buffalo.

The Safety Fire Door Company, of Brooklyn, N. Y., has been chartered with a capital stock of \$50,000 to manufacture safety fire doors, light ironwork, mechanical and electrical appliances, etc. The incorporators are T. Raskin, I. Raskin, of Brooklyn, and A. Warshaw, of the Bronx.

The Standard Electric Stove Company, of Toledo, Ohio has been incorporated with a capital stock of \$100,000 to manufacture an electric stove that may also be used as a fireless cooker. The company has leased a building at Jackson and Twelfth Streets, Toledo. The directors are P. C. Tiedman, president; S. L. Kelly, Charles S. Turner, Luther D. Smith and F. M. Bostater.

## Personal Mention

**Mr. J. F. Thomson** has been elected president of the Darien (Ga.) Ice & Light Company.

**Mr. Lloyd S. Purall** has been appointed manager of the Leavenworth (Kan.) Light, Heat & Power Company.

**Mr. O. E. Green** has been appointed superintendent and manager of the municipal electric-light plant, Lyons, Ga.

**Mr. C. Hill** has succeeded Mr. C. A. Marbin as local manager for the Kansas Gas & Electric Company at Cherryvale, Kan.

**Mr. W. Allester**, formerly city electrician at Ladysmith, B. C., is now operating engineer of the local municipal plant.

**Mr. H. C. Strong** has been appointed vice-president of the Citizens' Light, Power & Water Company, Ketchikan, Alaska.

**Mr. J. P. Walters** has succeeded Mr. M. Laas as local manager of the Iowa Railway & Light Company at Blairstown, Ia.

**Mr. W. H. Tucker** has been appointed secretary and general manager of the Columbiana (Ala.) Ice, Light & Power Company.

**Mr. D. H. Johnson** has succeeded Mr. J. H. Humphrey as superintendent of the Butler (Pa.) Light, Heat & Motor Company.

**Mr. Robert J. Markley** has been appointed manager of the commercial department of the Shenango Valley Electric Company, Sharon, Pa.

**Mr. William M. Hope** has been appointed general manager of the Phoenix Company, which supplies electric service at Harrington, Del.

**Mr. S. R. Bertron, Jr.**, has succeeded Mr. Thomas Rhodes as manager of the Consumers' Electric Light & Power Company, New Orleans, La.

**Mr. H. C. Hoagland** has been appointed general manager of the Fort Smith (Ark.) Light & Traction Company, succeeding Mr. J. Walter Gillette.

**Mr. Hugh S. Riddell**, formerly contract agent of the Greenfield (Mass.) Electric Light & Power Company, is now superintendent for the company.

**Mr. E. E. Robinson** has been appointed superintendent of the Southern Sierras Power Company's plant at Elsinore, Cal., succeeding Mr. P. L. Nourse.

**Mr. D. R. Kennedy** has succeeded Mr. Fred Coats as superintendent of the Southern Sierras Power Company's hydroelectric plants at Bishop, Cal.

**Mr. E. B. Korst** has resigned as manager for the Central Illinois Public Service Company at Pittsfield, Ill., to open an electric shop at St. Augustine, Fla.

**Mr. W. O. Brooks** has been appointed operating engineer of the Abbeville (Ga.) Electric Light, Water & Power Company as successor to Mr. J. J. Peterson.

**Mr. J. D. Hayden** has succeeded Mr. C. E. Shelton as superintendent of the plant operated by the Mountain Lake Park Association, Mountain Lake Park, N. Y.

**Mr. R. L. Brooks** has been appointed manager and superintendent of the Abbeville (Ga.) Electric Light, Water & Power Company, succeeding Mr. C. A. Childs.

**Mr. A. W. Burke** has been appointed superintendent of distribution for the Wilmington & Philadelphia Traction Company, Wilmington, Del., succeeding Mr. D. L. Ott.

**Mr. C. B. Arnold** has been appointed operating engineer of the Intermountain Railway, Light & Power Company, Laramie, Wyo., successor to the Laramie Electric Company.

**Mr. S. G. Cunningham** has been appointed purchasing agent of the Arkansas Valley Railway Light & Power Company, Pueblo, Col., succeeding Mr. George W. Milliken.

**Mr. S. N. Clarkson**, assistant sales manager of the Union Electric Light & Power Company, St. Louis, Mo., is absent on a visit to his relatives in Australia. Mr. Clarkson sailed by way of San Francisco, Honolulu, Pago Pago and Sydney.

**Mr. Guy E. Tripp**, chairman of the board of directors of the Westinghouse Electric & Manufacturing Company,

sailed for Europe on the *Vaterland* on July 7. He expects to be away about five weeks, and will combine business and a vacation.

**Mr. R. E. Thompson** has been appointed superintendent and chief engineer of the Fort Smith (Ark.) Light & Traction Company, succeeding Messrs. L. R. Robertson and A. Patterson, who were chief engineer and electrical engineer respectively.

**Dr. Robert H. Whitten** has resigned as librarian-statistician of the New York Public Service Commission, First District, in order to become secretary of the committee on city plan of the Board of Estimate and Apportionment of New York City.

**Mr. R. W. Chisholm**, formerly vice-president of the Colorado Springs (Col.) Light, Heat & Power Company, has been appointed vice-president of the Intermountain Railway, Light & Power Company, Laramie, Wyo., successor to the Laramie Electric Company.

**Mr. Leland D. Wood** has been appointed manager of the Taunton (Mass.) municipal lighting plant, succeeding Dr. M. C. Golden. Mr. Wood is a graduate of the Massachusetts Institute of Technology and has been until recently employed by the Brockton (Mass.) Edison Electric Illuminating Company.

**Mr. Ernest Lunn**, until recently storage-battery engineer of the Commonwealth Edison Company and president of the Walker Vehicle Company, has resigned those positions and has become chief electrician of the Pullman company, with office in the Pullman Building, Chicago. This change took effect on July 1. Mr. Lunn is an associate of the American Institute of Electrical Engineers and has taken an active interest in the affairs of the Electric Vehicle Association of America.

**Mr. Elmer A. Sperry**, the successful tests of whose aeroplane-stabilizing device at Bezons, France, were noted in our issue dated June 27, was awarded the first prize of 50,000 francs in the aerial security contest held at Bezons on July 2. Mr. Sperry was born on Oct. 12, 1860, at Cortland, N. Y., and received his engineering education at Cornell University. He served as electrical engineer for the Sperry Electric Company, the Standard Electric Company, the Sperry Electric Mining Machinery Company, the Sperry Engineering Company and the Sperry Electric Railway Company, and is now president and engineer of the Sperry Gyroscope Company, Brooklyn, N. Y. Mr. Sperry returned to America July 8 on board the White Star liner *Olympic*.

**Mr. Francis A. Vaughn**, who has been appointed to the newly created position of engineer of the street-lighting survey, Milwaukee, Wis., is vice-president-elect of the Illuminating Engineering Society for the Chicago Section. He

is also a member of the firm of Vaughn, Meyer & Sweet, consulting engineers, Milwaukee. Mr. Vaughn was graduated from the electrical engineering course of the University of Wisconsin in 1895. Subsequent to that time he was employed in the testing department of the Standard Telephone Manufacturing Company, Madison, Wis., as draftsman with the Gibbs Electric Company, Milwaukee, and for fourteen years with the Milwaukee Electric Railway & Light Company. In the latter organization he passed successively through the operating, engineering, meter-testing and distributing departments. Mr. Vaughn is a Fellow of the American Institute of Electrical Engineers, and a member of the National Electric Light Association and the Illuminating Engineering Society. He is president of the Milwaukee Electrical League and has served as trustee of the Engineering Society of Wisconsin and chairman of the Wisconsin Electrical Association committee on revision of the Wisconsin Railroad Commission's electric-service rules.



FRANCIS A. VAUGHN



## Construction

### New England

**NASHUA, N. H.**—The Public Service Commission has approved the purchase of the property of the Nashua Lt. Ht. & Pwr. Co. by the New England Electric Pwr. Co., of Manchester. The transaction has been authorized to issue \$250,000 in capital stock, of which the stock of the Nashua company and the remainder to pay off outstanding indebtedness and for the erection of a transmission line between Manchester and Nashua.

**BOSTON, MASS.**—Bids will be received by the schoolhouse commission of the city of Boston, 120 Boylston Street, Boston, until July 17 for furnishing and installing wiring and electrical material in Mechanical Arts High School, Belvidere Street.

**DALTON, MASS.**—The contract for equipping the finishing mill of the Old Berkshire mill in Dalton for electrical operation has been awarded to the Albert V. Phillips Electrical Machine Works, of Pittsfield. General Electric motors and transformers will be used.

**GARDNER, MASS.**—Arrangements have been made by the Board of Aldermen and the Gardner El. Co. for the installation of 59 additional lamps. J. D. Whittemore is superintendent of Gardner El. Co.

**GEORGETOWN, MASS.**—The State Legislature has passed the bill which allows the town of Georgetown to sell electricity in Rowley and in a part of the town of Newbury.

**LExINGTON, MASS.**—Plans are being considered for installing an ornamental lighting system through the center of the town and around the Lexington battle green.

**HARTFORD, CONN.**—The Connecticut Co., it is reported, is contemplating making extensive changes to its power plant on Commerce Street.

### Middle Atlantic

**ALBANY, N. Y.**—Bids will be received by the trustees of public buildings, Capitol, Albany, until July 20 for lighting fixtures, gas piping, electrical wiring and a moving motor generator for the New York State Capitol. Bids will also be received at the same time and place for electric wiring for book stacks for the State Educational Building, Albany. Plans and specifications may be obtained at the office of Lewis F. Pilcher, state architect, Capitol, Albany.

**BATAVIA, N. Y.**—The Genesee Lt. & Pwr. Co., of Batavia, is installing an electric distributing system in the village of East Pembroke. The East Pembroke Canning Co. recently signed a contract with the company for electric service.

**BROOKLYN, N. Y.**—The American Mfg. Co. has decided to abandon its private power plant and has contracted with the Kings County El. Lt. & Pwr. Co., of Brooklyn, for energy to operate the factory, the minimum demand to be at least 3,000 kw. with a maximum of 4,000 kw. The cost of the change is estimated at about \$80,000.

**CANAAN, N. Y.**—The Lebanon Pwr. & Ltg. Co., recently organized, has purchased the old Quebec City mill and street-lighting rights in Canaan. The company, it is understood, proposes to furnish electricity in Canaan and the Lebanon Valley. Fred Munch, of Dalton, Vermont, is president.

**CLYDE, N. Y.**—The Village Board has entered into a contract with the Central New York Gas & El. Co., of Geneva, for lighting the village park for a period of five years. Ornamental lamps are to be placed at intervals of 50 ft. around the edge of the park.

**LESTERSHIRE, N. Y.**—Preliminary arrangements are being made by the Binghamton Lt. Ht. & Pwr. Co., of Binghamton, for the installation of a new street-lighting system. Under the new contract the company will furnish 150 street lamps.

**LOCKPORT, N. Y.**—The Buffalo, Lockport & Rochester Ry. Co., reported to be working in conjunction with the International Ry. Co., has closed a contract with the Niagara, Lockport & Ontario Pwr. Co., for use of the transmission-line right-of-way of the Buffalo State of Buffalo to Niagara, with a view of constructing an electric railway from Buffalo to Niagara Falls.

**MALONE, N. Y.**—Bids will be received by E. C. Rider, superintendent of Northern New York Institution for Deaf-Mutes, Malone, until July 22, for furnishing electric generating equipment for the Northern New

York Institution for Deaf-Mutes. For details see proposal columns.

**MALONE, N. Y.**—The Public Service Commission has authorized the Malone Lt. & Pwr. Co. to issue \$50,000 in capital stock and \$345,000 in bonds, the proceeds to be used to purchase the property and franchises of the Franklin County Hydraulic Co., which operates a hydroelectric plant and transmission lines.

**NEW YORK, N. Y.**—Bids will be received by C. B. J. Snyder, superintendent of school buildings, Department of Education, Park Avenue and Fifty-ninth Street, New York, until July 20 for installing electric equipment in new Public School 56, located on East 207th Street, borough of the Bronx, for installing electric equipment in new Avenue, Queens Borough, and for installing electric equipment in new Public School 96, located at the corner of Rockaway Road and extension of Avenue, borough of Queens.

**POUGHKEEPSIE, N. Y.**—Preliminary surveys, it is reported, are being made by Runyon & Carey, engineers, of Newark, N. J., for the proposed municipal electric-lighting system in Poughkeepsie. D. W. Wilbur is mayor.

**SOUTHOLD, N. Y.**—The Town Board has granted the Consumers' Gas Co. a franchise to furnish electricity in Southold and Greenport villages. The company, it is reported, has taken over the holdings of the Cutchoque El. Co., of Southold.

**SYRACUSE, N. Y.**—The Public Service Commission has granted the Syracuse Ltg. Co. permission to issue \$34,000 in bonds for extension and improvements.

**WELLSVILLE, N. Y.**—The Wellsville El. Lt. Ht. & Pwr. Co. has recently installed three 100-hp boilers. John K. Cochran is superintendent.

**ALBION, PA.**—The Albion Lt. & Pwr. Co. has purchased a boiler within the next three months; also within the next two months a line of heating and cooking devices, etc. The company has recently installed some tub transformers. H. H. Flower is treasurer. The company has filed an amendment to its charter increasing the capital stock to \$100,000.

**BIRDSBORO, PA.**—The Council is contemplating calling an election to submit the proposal to make an appropriation for the installation of a municipal electric-light plant to the voters.

**CORRY, PA.**—Within the next three months the Corry City El. Co. expects to erect 22 miles of transmission lines connecting towns; also to purchase generating, auxiliary and switching equipment for a central station to furnish electricity in Corry and Union City. The company will also purchase material for distribution systems necessary to operate the consolidated plants. The controlling stock of the Corry City El. Co. and the Union City El. Co. has been purchased by the Interstate El. Co., 115 Broadway, New York, N. Y., of which A. E. Pitkin, of New York, is treasurer. B. E. Waltz is local manager.

**ERIE, PA.**—The contract for laying out district system in State street has been awarded to Joseph McCormick & Brother, of Erie. B. E. Briggs is city engineer.

**KITTANNING, PA.**—The City Council has decided to abandon the proposal to construct a municipal electric-light plant for the present.

**MECHANICSVILLE, PA.**—The Borough Council has granted the Eastern Pennsylvania Lt. Ht. & Pwr. Co., of Pottsville, a franchise to construct transmission lines to supply electricity in Mechanicsville.

**PITTSBURGH, PA.**—The City Council has passed an ordinance requiring all electric and telephone wires to be placed in underground conduits.

**RIDGWAY, PA.**—Plans, it is reported, are being considered for the erection of a central power station near Ridgway which will furnish electricity in Ridgway, Johnsonburg and St. Mary's.

**TARENTUM, PA.**—Bids will be received by the Tarentum Borough Council, Tarentum, for construction of approximately 400 ft. of 12-in. sanitary sewer, including treating plant with necessary piping, valves and mechanical and motor-driven centrifugal pumps. Plans and specifications may be obtained from Leo Hudson, consulting engineer, House Building, Pittsburgh. W. F. Denny is president of Council.

**WILKES-BARRE, PA.**—A company is being organized by M. J. Lewis, an attorney, and Clarke S. Totten, an illuminating engineer, to construct a plant to furnish electricity and steam heat to commercial buildings bounded by South Main, Northampton and Franklin Streets and Anhauser Lane.

**BUTLER, N. J.**—At a special election held June 30 the proposal to issue \$30,000

in bonds for the installation of a municipal electric-light plant was carried.

**NEWARK, N. J.**—Bids will be received at the Board of Street and Water Commissioners, City Hall, Newark, until July 16 for lighting the streets of the city with 3,000 arc lamps of 2000 cp, and approximately 200 incandescent lamps, with option by mutual agreement to install nitrogen lamps of 400 cp, 600 cp and 1000 cp, type C Mazda lamps of 20-amp type operating on  $\frac{1}{2}$  in. alternating-current series circuits, with all-night and every-night service, for alternative terms of three and five years from Sept. 1, 1914; also to supply 200 incandescent lamps per year for the General Electric flame-arc type now used on Market Street, Newark. M. R. Sherard is chief engineer.

**BALTIMORE, MD.**—The contract for replacing steam apparatus with electrically driven machinery in engine and boiler rooms of the Belvedere Hotel has been awarded to Chataud & Norris, Continental Building, Baltimore. Electricity will be secured from local transmission lines. William H. Hager is manager of hotel.

**FROSTBURG, MD.**—The Public Service Commission has approved the sale of the property of the Frostburg Illg. & Mfg. Co. to the Hagerstown & Frederick Ry. Co., of Frederick. Authority was also given to the railway company to issue \$50,000 in bonds, of which \$35,000 will be used to pay for the property and the remainder for improvements to its plant.

**CLARKSBURG, W. VA.**—Plans are being prepared by Sidney B. Martin, Penn Building, Pa., for the erection of a power plant for the Clarksburg Gas & El. Co., to cost about \$100,000. The equipment to include pumps, turbines, condensers, centrifugal pumps, boiler-feed pumps, feed-water heaters, high-pressure steam piping, etc.

**FAIRMONT, W. VA.**—The Fairmont & Clarksburg Pwr. Co. has applied to the Public Service Commission to authorize to construct a dam at Tygart's Valley, to furnish water for a large hydroelectric power plant which it proposes to build.

**WHEELING, W. VA.**—The Neff-Burns El. Co., recently organized, will operate a plant at the various manufacturing and electrical appliances, which will be equipped with electrically operated machinery. E. W. S. Neff, William J. Burns and others are interested in the project.

**WASHINGTON BARRACKS, D. C.**—Bids will be received at the United States Engineer Depot, Washington Barracks, until July 23 for furnishing one direct-current 10-amp switchboard. For further information address Lt. Col. Joseph Kuhn.

### North Central

**CADILLAC, MICH.**—The Commonwealth Pwr. Co., of Jackson, has purchased the right of way for a transmission line to Cadillac for a transmission line. The company is planning to furnish electricity in Cadillac generated at the Stronach Dam on the Manistee River.

**DETROIT, MICH.**—Plans are being considered by the Grand Laundry, Lafayette and Brooklyn Avenues, Detroit, for the installation of an electric plant to furnish electricity for lamps and motors for the laundry.

**DETROIT, MICH.**—Preparations are being made to double the output of the Ford Motor Co. in Detroit, at a cost of about \$50,000. The plans provide for the erection of two new buildings, 100 ft. long, 900 ft. long and six stories high, costing about \$500,000 each, and a power house, 85 ft. long, 150 ft. wide and 240 ft. long, to cost approximately \$1,500,000, which will be equipped with a 3,000-hp gasoline engine. Two of the buildings are nearly completed.

**FENTON, MICH.**—The property of the Fenton Lt. & Pwr. Co. will be sold by F. A. Beal, receiver, at auction on July 1.

**JACKSON, MICH.**—The city of Jackson has recently entered into a new contract with the Commonwealth Pwr. Co., of Jackson, for a period of ten years, which provides for the installation of an ornamental lighting system in the business section. Tungsten clock lamps will be used.

**ST. CLAIR HEIGHTS, MICH.**—The Village Trustees are considering the installation of a new lighting system. Francis J. Miller is president of board.

**WYANDOTTE, MICH.**—Bonds to the amount of \$40,000 have been voted to improve the municipal electric-light plant and water-works system.

**ARCHBOLD, OHIO.**—Within the next six months the Archbold El. Lt. & Pwr. Co. expects to erect 10 miles of transmission lines and to purchase poles, wire, trans-

formers and lightning arresters for same. R. S. Rodenhuis is general manager.

**ATHENS, OHIO.**—The Ohio El. Pwr. Co. is now erecting a central electric power plant at Floodwood, will soon establish a central office in Athens.

**CANTON, OHIO.**—The Canton El. Co. has purchased a 7500-kw General El. Co. (not yet installed). The company is now installing three 2000-kva, 22,000/11,000-volt, three-phase transformers. The addition to substation to provide space for these transformers is nearly completed.

**CANTON, OHIO.**—O. C. Barber, of Canton, who operates an electric power plant at Howards, in connection with a lime plant, is making investigation with reference to enlarging the plant to furnish electricity to a number of cities and towns for municipal, industrial and domestic purposes. The cost of the plant is estimated at \$25,000.

**CINCINNATI, OHIO.**—Plans are being considered by the city officials for submitting to the voters at the election to be held next November the proposal to issue bonds for the construction of a rapid-transit system in the old canal bed in Cincinnati. The cost of a subway system in the canal bed, exclusive of power plant and equipment, is estimated at \$7,000,000 and the power plant, equipment, downtown loop and other accessories, exclusive of rolling stock, will bring the total cost to between \$10,000,000 and \$12,000,000.

**COLUMBUS, OHIO.**—The City Council has authorized a bond issue of \$18,000, the proceeds to be used to purchase new equipment for the municipal electric-light plant, in order that the old lamp lighting system in the city may be extended.

**FREMONT, OHIO.**—The Ohio Lt. & Pwr. Co. is contemplating doubling the output of its local plant.

**JEWELL, OHIO.**—The Ridgewillie Lt. & Pwr. Co. recently organized, is contemplating the erection of a transmission line from Jewell to Ridgewillie. D. D. Dooty, of Defiance, and John Dooty, of Napoleon, are officers in the company.

**LIMA, OHIO.**—The Western Ohio R.R. Co., of Lima, it is reported, is contemplating extending its transmission lines to furnish electricity for lamps and motors in Pemberton, Quincy, Rosewood, DeGraff and Jewett.

**LIMA, OHIO.**—The Lima committee, it is reported, will recommend submitting to the voters at the November election the proposal to issue \$76,000 in bonds to establish an ornamental lighting system in the business district and for the installation of an electric generating plant in the East Lima water station to supply electricity for maintaining the lamps; also to light the city parks, bridges and other municipal property.

**LOVELAND, OHIO.**—The property of the Loveland Citizens' El. Co. has been sold by Arthur E. Jones, receiver, to Fred Faber, representing the bondholders, for \$75,000. The company will be reorganized.

**MARIETTA, OHIO.**—Within the next few months the Board of Public Service expects to purchase one 150-kw, two-phase, 60-cycle motor generator and one 300-hp water-tube boiler. The installation of an ornamental lighting system is also under consideration. J. A. Schlumberger is superintendent.

**MARTINS FERRY, OHIO.**—The Wheeling El. Co. of Wheeling, W. Va., has submitted a proposal to the Board of Trustees of Public Affairs offering to furnish electricity to Martins Ferry.

**MARYSVILLE, OHIO.**—Within the next two months the Massillon El. & W. Co. expects to erect about 12 miles of transmission lines and six 13,000-volt to 23,000-volt transformers; also to purchase 460 poles, 6000 ft. of wire and 36 miles of copper wire. Mayne Mackan is superintendent.

**MASSILLON, OHIO.**—The Massillon El. & Gas Co. has taken out a permit for the erection of a new factory gas power house on South Erie Street to cost about \$20,000. R. A. Brooks is general manager.

**MIDDLEPORT, OHIO.**—The Ohio River Ry. & Pwr. Co., of Pomeroy, has petitioned the Public Utilities Commission for permission to purchase the electric line owned by Richard Ellis, of Middleport, at \$30,000.

**PRAIRIE DEPOT, OHIO.**—Within the next two months H. L. Wilson, proprietor of the local electric plant, expects to purchase a new oil engine, to replace steam engine, and a 220-volt, direct-current generator.

**SPENCERVILLE, OHIO.**—At an election held recently the proposal to issue \$10,000 in bonds to rebuild the municipal electric-light plant was carried.

**SPRINGFIELD, OHIO.**—Plans, it is re-

ported, are being prepared by Robert C. Gotsdalk, architect, for the construction of a power plant at Wittenburg College.

**STUEBENVILLE, OHIO.**—The City Council is contemplating extending the electric-lighting system on Market and Fourth Streets.

**URBANA, OHIO.**—Under the new franchise granted the Urbana Lt. Co., all the wires of the company in the business district are to be placed underground at once.

**WARREN, OHIO.**—The plan of the Western Reserve Steel Co., which is being erected in Warren, will consist of six sheet mills, three roughing mills and three cold mills, which will be driven by a 1600-hp motor. The millaries will be located in the sheet-mill departments, including cranes, shears, lathe, machine shop, stokers, etc. In addition to the sheet mill the company is enlarging shop, planing, roofing and corrugating department. Electrical equipment has not been purchased. About 7,000,000 kw of electricity per year will be required to operate the plant. The millaries are located with 33 Trumbull Pub. Ser. Co., of Warren, for electrical energy. The steel plant is situated about 2 miles from the central station of the Trumbull company, which will erect a double feed wire to the steel works. C. G. Thomas is president of the steel company.

**ASHLAND, KY.**—We are advised that Rufas Vansant is not interested in the project to establish an electric-light plant and water-works system in Ashland, as reported in the issue of June 13.

**BURKESVILLE, KY.**—A franchise has been granted to George H. Greenup and others, of Elizabethtown, to install and operate an electric-light plant and water-works system in Burkessville.

**DANVILLE, KY.**—The capital stock of the Danville Lt. Pwr. & Trac. Co., it is reported, has been increased from \$50,000 to \$100,000.

**HAZARD, KY.**—The Hazard Deane Coal Co. is reported as installing a new power plant at its mines, near Hazard.

**HAZEL, KY.**—The Commercial Club has appointed a committee to make investigations as to the cost of establishing and maintaining an electric-light plant and water-works system.

**LA GRANGE, KY.**—The Louisville Ltg. Co. has been granted a permit to enter the town of La Grange to furnish electricity for lamps and motors.

**LEXINGTON, KY.**—The contract for installing an electric light and heating plant at the Transylvania University has been awarded to Frank Corbin.

**OWENSBORO, KY.**—Work has begun on the construction of the distributing system of the municipal electric-light system. New material, including poles and wire, etc., will be ordered, with authority to make cut-offs on every branch. Asa Williams is superintendent.

**BAINBRIDGE, IND.**—At a meeting of the business men, held recently, it was decided to enter a contract for electric lighting to the Roachdale Lt. & Pwr. Co. of Roachdale. The Roachdale Co., it is stated, is building a new plant at a cost of \$18,000.

**CORYDON, IND.**—The Interstate Pub. Ser. Co., of Indianapolis, which has acquired the property of the Corydon Lt. & Wtr. Co., it is reported, has prepared tentative plans for the extension of a high-tension transmission line from New Albany to Corydon, along the Corydon pike. This line would furnish electricity to towns and farmers along the route as well as in Corydon. It is understood that steps have been taken to secure franchises in Edwardsville, Georgetown and Nashville.

**CHICAGO, ILL.**—The Pub. Ser. Co. of Northern Illinois, of Chicago, is reported to be contemplating the construction of a large dam and power plant on the Des Plaines river, 10 miles east of Morris.

**DIXON, ILL.**—The Illinois Public Utilities Commission has issued a certificate of convenience and necessity permitting the Illinois Northern Utilities Co., of Dixon, to erect a transmission line from Fox River, Mo., from Morrison to Prophetstown, from Sandwich to Hincley, from Belvidere to Marengo, and from Genoa to Kirkland.

**EAST DUBUQUE, ILL.**—The contract between the City Council and the United El. Co. of Dubuque, Ill., which provides for furnishing electricity for lighting purposes and for pumping water for the city has been approved by the Public Utilities Commission of Illinois.

**LA CROSSE, WIS.**—The La Crosse Gas & El. Co. has changed its name to the Wisconsin-Minnesota Lt. & Pwr. Co. and has acquired the property of the Chippewa Valley Lt. & Pwr. Co., of Eau Claire, and valuable water-power rights on the Chippewa, Flambeau, Red Cedar and Menominee Rivers,

capable of developing 100,000 hp. The new company proposes to develop these water-powers to generate electricity to operate the utilities now controlled by it and also to erect a transmission line to St. Paul and Minneapolis.

**LYONS, WIS.**—Permission has been granted C. E. Partee, secretary of the Burlington El. Lt. & Pwr. Co., representing the Wisconsin Gas & El. Co., of Kenosha, for the erection of a transmission line through Lyons. The Wisconsin company proposes to furnish electricity in Elkhorn, Lake Geneva and Delavan. By this arrangement both Lyons and Springfield will be furnished with electric service.

**MILWAUKEE, WIS.**—A committee has been appointed by the Twelfth Street Advancement Association to investigate the question of improving the street-lighting system.

**SUPERIOR, WIS.**—Plans have been submitted to the City Commission by W. H. Winslow, general manager of the Superior Ry. & Lt. Co., for improving the street-lighting system. The company proposes to replace the present arc lamps with the new nitrogen tungsten lamps.

**WEYAUWEGA, WIS.**—The Weyauwega El. Lt. Co. is planning to install a new generator in its water motor and also to install meters and establish a day service.

**COTTONWOOD, MINN.**—The Council is reported to have granted a franchise to B. Cleland and E. Hanson, of Crookston, S. D., to install an electric-light plant in Cottonwood.

**ELBOW LAKE, MINN.**—The town has voted to sell the municipal electric-light plant. The Otter Tail Pwr. Co., of Fergus Falls, it is reported, will purchase the system.

**LAKE BENTON, MINN.**—Plans are being considered for the installation of an electric-light plant in Lake Benton. L. W. Liddle is reported to be interested.

**SLAYTON, MINN.**—The Council has granted Victor Klinger a franchise to operate an electric-light plant in Slayton for a period of 25 years.

**DELMAR, IA.**—The Maquoketah Lt. & Pwr. Co., of Maquoketah, has been granted a franchise to furnish electricity in Delmar for a period of 25 years.

**LADORA, IA.**—The installation of an electric-lighting system here is under consideration. Robert Shedenhelm, of Ladora, is reported interested in the project.

**LE MARS, IA.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until July 23 for construction, complete, including mechanical equipment, lighting fixtures and approaches, of the United States post office at Le Mars. Plans and specifications may be obtained at the above office or from the custodian of site at Le Mars. O. Wenderoth is supervising architect.

**NASHUA, IA.**—The Cedar Valley Pwr. Co. of Charles City, which recently took over the local electric-light plant, it is reported, will build a new concrete dam and install an additional electric generator.

**WYOMING, IA.**—At a special election held recently the voters have granted a franchise to William G. Dows, Isaac B. Smith and John A. Reed to construct and operate an electric-light plant in Wyoming as carried.

**BRUNSWICK, MO.**—The Brunswick Lt. & Wtr. Co. is installing a 72-in. by 18-in. boiler and an 11-in. by 18-in. Murray Corliss engine in its power plant. The company changed hands on May 1. The new officers are: J. H. Nickell, president, and J. W. Nickell, vice-president, secretary and manager, and J. W. Nickell, treasurer.

**CABOOL, MO.**—At an election held recently the proposal to issue bonds for the installation of a municipal electric-light plant was carried.

**CLARENCE, MO.**—Bonds to the amount of \$10,000 have been voted for improvements to the municipal electric light plant in Clarence.

**COLUMBIA, MO.**—Negotiations have about been completed, it is reported, between the Commercial Club of Columbia and W. J. Delaney, Frank Kidd and J. E. Trescott, of St. Louis, and F. S. Mordaunt, of Chicago, for building and equipping an electric railway, including power house.

**HAMILTON, MO.**—A franchise, it is reported, has been granted to C. A. Martin and T. D. Parr to operate an electric-light plant in Hamilton.

**NEW LONDON, MO.**—The Public Service Commission has issued a certificate of public convenience authorizing the North Missouri Lt. & Pwr. Co. to install a plant and furnish electric power in New London. The company will distribute electricity generated at the power dam on the Mississippi River at Keokuk, Ia.



**ST. LOUIS, MO.**—The Board of Public Improvements has decided to have 3 miles of overhead electric light and power wires on Grand Avenue placed underground in 1915.

**CASSELLTON, N. D.**—Within the next two months David Leach and Chester Hallett, owners of the local electric-light plant, expect to install a 25-hp Fairbanks-Morse oil engine and a 15-kw, 220-volt direct-current generator to take care of the day load. Ten additional street lamps are being installed. Through error this item appeared under Casselton, N. B., in the issue of July 4.

**ELLENDALE, N. D.**—Within the next two months the Ellendale El. Co. expects to install a new electric-light plant in Ellendale. G. F. Phillips is secretary and manager.

**FESSENDEN, N. D.**—Steps have been taken, it is reported, to organize a company to establish an electric-lighting system in Fessenden. J. Eursma, R. H. Smith and others are interested. The company will be capitalized at \$15,000.

**STANLEY, N. D.**—Bids will be received at the office of W. C. Gibb, county auditor of Mountrail County, Stanley, N. D., until Aug. 3 for plans and electrical work and heating and ventilating for the county court house. Plans and specifications may be seen at the above office or at the office of Buchner & Orth, architects, St. Paul, Minn.

**ADAMS, NEB.**—At an election to be held during this month the proposal to issue bonds for the installation of a municipal electric-light plant will be submitted to the voters. Johnson & Johnson, of Falls City, are engineers.

**BRUNSWICK, NEB.**—Application has been made to the Village Council by Johnson & Anderson for a franchise to furnish electricity for lighting the village. They are planning to install an electric plant in connection with their garage and if granted a franchise will build a plant of sufficient output to supply electricity for street, commercial and domestic lighting.

**GENOA, NEB.**—The city of Genoa is installing a new series street-lighting system, consisting of 80-hp and 250-cp nitrogen tungsten lamps, a 10-kw Western Electric regulator and panel. O. B. Miller is superintendent.

**LYONS, NEB.**—Bonds to the amount of \$15,000, it is reported, have been voted for the installation of a municipal electric-light plant in Lyons.

**ARKANSAS CITY, KAN.**—At an election held June 11 the proposal to issue \$28,000 in bonds for a municipal electric-light plant was defeated. The proposal, it is said, will be again submitted to the voters in the near future.

**ARMA, KAN.**—At an election to be held July 14 the proposal to issue \$8,000 in bonds for the installation of a municipal electric-light plant in Arma will be submitted to the voters.

**GARDEN CITY, KAN.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until July 29 for construction complete, including mechanical equipment, lighting fixtures and approaches, of the United States post office at Garden City, Kan. Drawings and specifications may be obtained at the above office or from the custodian of site at Garden City. O. Wenderoth is supervising architect.

**LEAVENWORTH, KAN.**—The Brighton coal mine, situated near Leavenworth, has been taken over by W. J. Squires, of Kansas City, and the mine has been rebuilt and a power plant will be erected and the mine equipped with electrically driven machinery. The cost of the proposed improvement is estimated at about \$50,000.

**OLATHE, KAN.**—The City Council has entered into a contract with the Olathe El. Lt. & Pwr. Co. for furnishing electricity for operating the pumping station for a period of four years.

**STUMMERFELD, KAN.**—The contract for the construction of a local electric-lighting system and 18 miles of transmission line has been awarded to the Bushong Electrical Works, of Ottawa. D. L. Stromquist, consulting engineer, has charge of the work.

### Southern States

**CLINTON, N. C.**—The power plant of the Sampson Pwr. Co., of Clinton, recently destroyed by fire, has been rebuilt and is nearly ready to put in operation. A 75-kw, three-phase, 2200-volt Crocker-Wheeler generator, with Westinghouse alternating-current switchboard, has been purchased. The old engine was repaired. G. E. Petty is secretary and manager.

**HEITFORD, N. C.**—The Council has engaged the J. B. McCrary Co., of Atlanta, Ga., to take charge of the construction of the municipal electric-light plant, for which \$12,000 in bonds was recently voted.

**HOT SPRINGS, N. C.**—The Industrial Pwr. Co., of Hot Springs, contemplates the development of a small water-power on the French Broad River, and will probably later develop a much larger one on the same river. The first development, located near Hot Springs, will consist of four or five units, probably vertical waterwheels, directly connected to umbrella-type generators, two units being installed at first and the others later on. Water will operate under a 4-ft. head; each unit will have a rating of 400 or 500 hp. The company will probably acquire a larger water-power on French Broad River, an effective head of 85 ft., being available with approximately 2000 second of water available. Archibald Nichols is president and James E. Rector secretary, both of Asheville.

**KINSTON, N. C.**—Bonds to the amount of \$100,000 have been voted for improvements to the municipal electric-light plant and other municipal improvements.

**LENOIR, N. C.**—The property of the Citizens El. Pwr. Co. of Lenoir has been taken over by Ashley & Co., of New York, N. Y. The company has recently established a day service. G. H. Aubrey, of Atlanta, Ga., is president, and E. C. Ivey, of Lenoir, secretary and treasurer.

**SCOTLAND NECK, N. C.**—Bids, it is reported, will be received at the office of the Mayor until July 23 for equipment for the municipal electric-light plant, including a 400-hp steam engine and a 250-cp 110-volt generator (engine type), with exciter and switchboard.

**ORANGEBURG, S. C.**—In a decision handed down by Judge Bowman the validity of a franchise for the installation of a plant of the water and light plant near the river by the city was upheld.

**MILLEDGEVILLE, GA.**—Plans are being considered by the Oconee River Mills, of Milledgeville, for the development of a hydroelectric plant to be located on the site formerly occupied by the milling department.

**QUITMAN, GA.**—The city of Quitman is contemplating issuing bonds to the amount of \$3,000, for proceeds to be used for improvements to the municipal electric-light plant. A. W. Voight is city clerk and treasurer.

**JACKSONVILLE, FLA.**—The Stribling Water Pwr. Co. of Jacksonville, recently incorporated with a capital stock of \$10,000, proposes to develop water-power and to manufacture motors for developing power from steam and water. The officers are S. L. Stribling, president and general manager; Paul C. Marion, vice-president; A. N. Dobbins, secretary, and N. W. Marion, treasurer.

**COOKEVILLE, TENN.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until July 30, for the construction complete, including mechanical equipment, lighting fixtures and approaches, of the United States post office and court house at Cookeville. Drawings and specifications may be obtained at the above office or from the custodian of site at Cookeville. O. Wenderoth is supervising architect.

**DYERSBURG, TENN.**—Within the next six months the city of Dyersburg expects to erect 10,000 ft. of No. 8 and No. 10 steel wire, including single-pole wire, and to purchase two weather-proof wire, and switches, to be used on 2200-volt circuits, 40 kva in pole transformers and one carload of poles. S. R. Blakeman is superintendent.

**MARYVILLE, TENN.**—The property of the Rockford El. Co., of Maryville, it is reported, has been purchased by W. E. Hunter, of Knoxville, representing an Eastern syndicate. The new owners have also applied for a charter for the Maryville Ice and Cold Storage Co., which proposes to erect an ice and cold storage plant, to be equipped with electrically operated machinery.

**SPRINGFIELD, TENN.**—The City Commissioners are considering issuing bonds to the amount of \$10,000 for extensions and improvements to the municipal electric-light plant. G. B. Shawver is superintendent.

**BAY MINETTE, ALA.**—At an election to be held July 27 the proposal to issue \$5,000 in bonds to install an electric-light plant will be submitted to the voters. Edgar E. Kay, of Tuscaloosa, is consulting engineer.

**DADEVILLE, ALA.**—The Alabama Pwr. Co., of Birmingham, it is reported, is contemplating a hydroelectric development at Cherokee Bluff on the Tallapoosa River. The proposed plant will be 1.9 ft. long and 300 ft. high. Electricity generated at the

plant will be transmitted to Dadeville and other towns in Tallapoosa County.

**GADSDEN, ALA.**—The Alabama Pwr. Co. is contemplating extending its transmission lines from Gadsden to Hartselle, for which surveys have already been made. Negotiations are under way to supply electricity in Guntersville and other towns in the northern part of the State.

**GURLEY, ALA.**—It is reported that H. A. Smith, owner of the local electric-light plant (which was recently destroyed by fire) will rebuild plant. New equipment, including steam engine, boiler, generator and alternator, will be purchased.

**JACKSON, MISS.**—The question of purchasing the property of the Capital Lt. & Pwr. Co., of Jackson, to be owned and operated by the municipality is under consideration.

**FORT SMITH, ARK.**—The City Commissioners have engaged the city electrician and the city engineer to prepare the estimate of the cost of installing and maintaining a municipal electric-light plant.

**MENA, ARK.**—The Century Engineering & Construction Co., recently granted a franchise in Mena, will install an electric plant to furnish oil engine and generator. Thayer, of Mena, is president, and P. O. Benson, of Mena, is engineer in charge of work.

**ALEXANDRIA, LA.**—Plans are being considered by C. Raxdale, superintendent of the municipal electric-light plant, for installing electric lamps on Third Street from Jackson Street to Lee Street, and probably from Jackson Street to Casson Street.

**JONESBORO, LA.**—The installation of an electric-light plant and water-works system in Jonesboro is under consideration. M. C. Jenkins, care of Tremont Mill, is reported to be interested in the project.

**WINNSBORO, LA.**—The installation of an electric-light plant in Winnsboro is under consideration. Carl Ship is reported interested in the project.

**DAVIS, OKLA.**—The Davis El. Lt. Co. soon expects to purchase a 30-kw generating set consisting of a 30-hp engine and generator (three phase, 60 cycles, 2200 volts).

**LAWTON, OKLA.**—The Comanche Lt. & Pwr. Co., of Lawton, is preparing to discard its steam plant here and to install Busch-Sulzer Brothers Diesel engines and Westinghouse generators. A new brick power house will be erected and the electric distribution system will be rebuilt. John C. Keys is general manager.

**MANGUM, OKLA.**—The City Council has decided to submit the proposal to install a municipal electric-light plant in Mangum to the voters.

**MARLOW, OKLA.**—The city of Marlow expects to purchase within the next two months a 75-kva generator and a 100-hp gas engine. L. A. Prichett is superintendent of the municipal electric-light plant.

**PAULS VALLEY, OKLA.**—The Wichita El. Pwr. Co., of Pauls Valley, expects to purchase a 250-kw generator and engine within the next 60 days. The company also expects to erect an ice plant this fall. R. K. Keck is secretary.

**CLEBURNE, TEX.**—Steps have been taken by the Cleburne Commercial Club for the installation of an ornamental street lighting system in the business district.

**GAINESVILLE, TEX.**—The Texas Pwr. & Lt. Co. has begun work on the erection of an electric-light plant in Gainesville, to cost about \$50,000. The company, it is stated, will also erect similar plants in Denison and two or three other North Texas cities.

**HICO, TEX.**—The Central Texas Pwr. & Transmission Co., of Hico, recently organized, has taken over the property of the Hico El. Lt. & Pwr. Co. The company is capitalized at \$100,000 and proposes to do business in the counties of Erath, Hamilton, Bosque, Somerville, Comanche and Eastland. The power plant and main office are in Hico. H. Gleason is secretary and manager.

**MAGNOLIA SPRINGS, TEX.**—The Houston Lig. & Pwr. Co. has applied to the City Council for a franchise to furnish electricity here. Magnolia Springs has not a post office.

**MARBLE FALLS, TEX.**—Application has been filed with the State Board of Water Engineers by R. E. Johnson, of Marble Falls, for water-power rights to operate an electric-light plant here.

**MARBLE FALLS, TEX.**—The Colorado River Pwr. Co., which is building a large hydroelectric plant on the Colorado River in Marble Falls, is preparing plans to construct a large dam and hydroelectric plant on the San Saba River. C. H. Alexander, of Dallas, is president of the company.

MOUNT CARMEL, PA.—The Mount Carmel Pub. Utilities & Public Ice Co. has been chartered with a capital stock of \$300,000. The officers of the reorganized company are: J. M. Mitchell, president



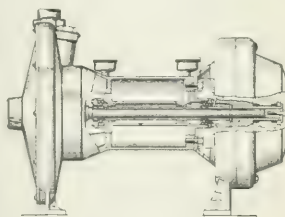
# Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED  
JUNE 26, 1914

[Prepared by Robert Starr Allen, 16 Exchange Place, New York, N. Y.]

- 1,101,523. VAPOR ELECTRIC DEVICE; F. Conrad, Swissvale, Pa. App. filed Jan. 7, 1911. Electric containing cup with inlet and inclined trough for conducting condensed vapors around inner side surface of cup.
- 1,101,527. ELECTRIC HEATING DEVICE; H. W. Denhard, San Francisco, Cal. App. filed Oct. 31, 1911. Current automatically controlled by the object to be heated.
- 1,101,533. WIRELESS TELEGRAPHY; L. De Forest, New York, N. Y. App. filed June 20, 1906. Concentrates the signal waves in a definite general direction.
- 1,101,540. CONTACT-MAKING MECHANISM; C. I. Hall, Chicago, Ill. App. filed Dec. 30, 1912. Clock-driven.
- 1,101,550. ELECTRICALLY HEATED APPARATUS; T. Hoock, Bayenthal, Germany. App. filed Oct. 23, 1912. Cooking oven of the "heat-storage" type.
- 1,101,551. MELTING FERROMANGANESE; E. Humbert, Chicago, Ill. App. filed July 18, 1913. Maintains a covering layer of carbonaceous material upon the ferromanganese while molten.
- 1,101,554. ELECTRIC-RAILWAY SWITCH; D. W. Johnson, Saginaw West Side, Mich. App. filed March 1, 1913. Motor-operated, train-controlled.
- 1,101,555. WRAPPING AND UNWRAPPING MACHINE; C. Kuentzel, Akron, Ohio. App. filed May 12, 1913. For operating on cable tires, etc.
- 1,101,575. AUTOMATIC CURRENT CUT-OFF FOR ELECTRIC APPLIANCES; U. S. Smith, Sacramento, Cal. App. filed July 31, 1913. Prevents overheating of electric irons, etc.
- 1,101,579. FLEXIBLE ELECTRIC CONDUCTOR; I. Steinberger, New York, N. Y. App. filed July 3, 1911. Trolley wire consisting of copper sheathing over steel supporting wire.
- 1,101,618. MOTOR GENERATOR; C. W. Drake, Chicago, Ill. App. filed Oct. 1, 1911. Steam turbine separated from generator by a connecting sleeve containing the shaft bearings.
- 1,101,620. EXTRACTION OF A METAL BY ELECTROLYTIC EXHAUSTION OF A SOLUTION OF A SALT OF THIS METAL; N. H. M. Dekker, Paris, France. App. filed May 14, 1913. Anode dips in water separated from the cathodic bath by a porous wall.
- 1,101,629. ARC CONTROL MECHANISM FOR PROJECTORS; J. L. Hall, Schenectady, N. Y. App. filed March 10, 1908. Maintains arc of constant length by automatically increasing as well as diminishing the gap between the electrodes.
- 1,101,648. IGNITION APPARATUS; H. Lyon, Gloucester City, N. J. App. filed March 27, 1911. Hot-wire igniter for gas lamps.
- 1,101,665. VAPOR-ELECTRIC DEVICE; Y. Sakai, East Pittsburgh, Pa. App. filed Jan. 7, 1911. Buoyers interrupt the flow of condensed vapor to prevent same from completing circuit between outside and inside of cup.
- 1,101,666. TROLLEY POLE AND TROLLEY GUARD; T. Santore, Mount Braddock, Pa. App. filed July 3, 1912. Guard jaws opened and closed by lowering and raising of trolley pole.
- 1,101,669. CONTROLLER; L. L. Tatum, Milwaukee, Wis. App. filed Sept. 20, 1911. Compels attendance of operator until desired conditions obtain, as in centrifugal hydro-extractors.
- 1,101,670. RELAY; A. A. Tirrill, Schenectady, N. Y. App. filed April 27, 1903. For opening and closing any number of shunt circuits.
- 1,101,672. INDUCTION-MOTOR WINDING; J. E. Webster, Pittsburgh, Pa. App. filed July 6, 1908. Dovetail connection between conductor bars and end-ring segments of rotor.
- 1,101,679. SELECTIVE SIGNALING DEVICE; J. P. C. Bosward, New York, N. Y. App. filed April 1, 1913. Step-by-step circuit-closing device.
- 1,101,684. AUTOMATIC TELEPHONE-EXCHANGE SELECTOR; E. B. Craft, Hackensack, N. J. App. filed Feb. 26, 1912. For serving relatively large number of lines.

- 1,101,685. LIGHTNING ARRESTER; E. V. Craft, Hackensack, N. J. App. filed March 1, 1913. Vacuum type.
- 1,101,731. SWITCHBOARD PLUG; R. M. De Vignier, Hollis Terrace, N. Y. App. filed March 1, 1912. Multiple-conductor twin plug.
- 1,101,742. INCUBATOR; E. C. Hays, Waco, Tex. App. filed Jan. 28, 1914. Thermostatic control of electric heaters.
- 1,101,752. LIGHTNING ARRESTER; D. T. May, New York, N. Y. App. filed March 1, 1913. Vacuum type, for retaining arc at a definite point on the electrodes.
- 1,101,798. CONTACT-MAKING VOLTMEETER; C. J. Hejda, Chicago, Ill. App. filed Oct. 11, 1910. For maintaining voltage constant.
- 1,101,802. CONDUCTOR CLAMP; M. G. Kennedy, Syracuse, N. Y. App. filed Aug. 25, 1910. For securing vertical conductor to glass insulators.
- 1,101,814. BRUSH-HOLDER FOR DYNAMO-ELECTRIC MACHINES; A. N. Sammarone, Akron, Ohio. App. filed Oct. 31, 1913. Made from single piece of stamped and folded metal.
- 1,101,821. ELECTRIC HEATING DEVICE; T. Van Aller, Schenectady, N. Y. App. filed June 7, 1912. Heat of iron or other device governed according to the demand.
- 1,101,830. SUBMARINE SIGNAL-RECEIVING APPARATUS; C. Berger, New York, N. Y. App. filed Nov. 4, 1912. Supported in the open water immediately adjoining the ship's hull.
- 1,101,838. SLEET CUTTER FOR OVERHEAD TROLLEYS; J. E. Dozier, Lynn, Mass. App. filed Jan. 5, 1911. Special cutter insulated from trolley.



1,101,618—Motor-Generator

- 1,101,853. AUTOMATIC TELEPHONE SYSTEM; A. E. Keith and J. and C. J. Erickson, Chicago, Ill. App. filed Sept. 18, 1905. Calling-dial construction.
- 1,101,854. AUTOMATIC TRUNKING SYSTEM; A. E. Keith, Hinsdale, Ill. App. filed March 1, 1910. Embodies primary and secondary non-numerical trunking switches. (Fifty-four claims.)
- 1,101,858. PROCESS OF JOINING METAL; L. S. Lachman, New York, N. Y. App. filed June 16, 1910. Welds the rounded head of one member to the surface of the other member.
- 1,101,866. CIRCUIT-CLOSER; D. A. McVonnell, Arlington, N. J. App. filed Aug. 17, 1910. Push-button for electric
- 1,101,870. LOCK SWITCH; E. R. McKinzie, Memphis, Tenn. App. filed Dec. 8, 1913. Switch member turned by an inserted key.
- 1,101,892. PIPE-CONDUIT FITTING FOR ELECTRIC INSTALLATION; W. H. Vibber, New London, Conn. App. filed Sept. 26, 1913. Has a longitudinally divided two-part box.
- 1,101,897. REFILLABLE-CARTRIDGE FUSE; E. Alexander, Burlingame, Cal. App. filed Sept. 11, 1913. Eccentrically pivoted disks close the ends of the fuse casing.
- 1,101,914. APPARATUS FOR ELECTRIC SIGNALING; R. A. Fessenden, Brant Rock, Mass. App. filed March 31, 1908. Reducing station having a radiating conductor in close proximity to the earth.
- 1,101,915. WIRELESS SIGNALING; R. A. Fessenden, Brant Rock, Mass. App. filed March 8, 1909. Antenna having a large capacity, arranged horizontally and elevated but a short distance above the earth.
- 1,101,917. BRUSH-HOLDER; D. B. Flower, Glenside, Pa. App. filed Jan. 29, 1910. For street-railway motors; has tension-adjusting and tension-indicating means.
- 1,101,938. VOLTAGE REGULATOR; W. G. Kinton, Chicago, Ill. App. filed June 24, 1913. For telephone bell-ringing generator.
- 1,101,939. WIRE CONNECTOR; G. C. Knauff, Chicago, Ill. App. filed Feb. 17, 1913. Plug and socket for lighting systems of automobiles.
- 1,101,946. INDICATING ELECTRIC FUSE PLUG; J. H. Miller, Bridgeport, Conn. App. filed April 4, 1912. Fuse releases spring which throws out a protruding indicating point.
- 1,101,956. IGNITION DEVICE FOR EXPLOSIVE ENGINES; E. Podlesak, Tiffin, Ohio. App. filed Nov. 29, 1912. Make-and-break type.
- 1,101,958. SAFETY CIRCUIT CONTROLLER FOR TRAFFIC-CONTROLLING SYSTEMS; W. H. Reichard, Troy, N. Y. App. filed Dec. 13, 1911. For switches and signals.
- 1,101,963. DEVICE FOR SECURING CONDUCTORS TO JUNCTION BOXES; M. C. Rosenfeld, Cleveland, Ohio. App. filed Nov. 16, 1911. Cam nut clamps contractible part of the junction box sleeve upon the cable.
- 1,101,987. SIGNALING SYSTEM AND APPARATUS; C. E. Beach, Birmingham, N. Y. App. filed June 11, 1913. Fire-alarm box.
- 1,101,994. CENTRIFUGALLY OPERATED SWITCH; A. J. Brown, Milwaukee, Wis. App. filed Nov. 13, 1908. For short-circuiting the resistance as the motor approaches full speed.
- 1,101,997. ELECTROMAGNETIC BRAKE; N. E. Church, Pittsfield, Mass. App. filed March 20, 1913. Non-frictional means for reducing speed of a rotating shaft etc.
- 1,101,999. BURGLAR ALARM; W. E. Clark Sarana, Lake, N. Y. App. filed Aug. 16, 1912. For preventing safe-breaking in post offices, stores, etc.
- 1,102,000. VACUUM-CLEANER HANDLE; G. Clements, Chicago, Ill. App. filed Nov. 12, 1913. With inclosed switch and operating member projecting therefrom.
- 1,102,007. SOUND TRANSMITTER; W. H. Cotton, Chicago, Ill. App. filed Nov. 14, 1911. For concentrating sound wave in a telephone mouthpiece.
- 1,102,009. ELECTRIC LAMP; H. Csanyi, New York, N. Y. App. filed May 14, 1913. Circuit automatically interrupts when bulb is broken for mines.
- 1,102,010. PRIMARY BATTERY; H. Csanyi, New York, N. Y. App. filed July 3, 1913. Has gas-venting means operable in any inclined position.
- 1,102,073. SEPARABLE FIXTURE JOINT; D. Rizer, Elgin, Ill. App. filed Jan. 21, 1913. For preventing twisting of the conductor wires.
- 1,102,116. DYNAMO-ELECTRIC MACHINE; J. J. Wood, Fort Wayne, Ind. App. filed Aug. 26, 1913. Synchronous motor coupled to electric motor through resilient means.
- 1,102,119. BRUSH-HOLDER FOR DYNAMO-ELECTRIC MACHINERY; A. Aichele, Baden Switzerland. App. filed May 4, 1913. Brush can move at right angles along commutator surface.
- 1,102,126. WIRE CONNECTOR; E. C. Bates, E. T. Hagist and G. Neil, Philadelphia, Pa. App. filed Dec. 3, 1913. For clamping one cable at right angle to another.
- 1,102,164. SWITCHBOARD-CORD REEL; F. F. Parker, Chicago, Ill. App. filed May 27, 1907. For telephone cords; springs wind the reels.
- 1,102,184. DETECTOR FOR WIRELESS TELEGRAPHY; R. C. Browne, Salem, Mass. App. filed Aug. 15, 1907. Terminal containing oxide of zinc and opposing terminals consisting of an ore containing copper.
- 1,102,194. LIGHTING SYSTEM; E. B. Jacobson, Pittsfield, Mass. App. filed May 2, 1912. For automobiles.
- 1,102,209. ELECTROLYTIC PROCESS OF AN APPARATUS FOR PRODUCING COMPOUNDS; E. A. Byrnes (deceased), Washington, D. C. App. filed July 25, 1903. For electrolysis of alkali-metal salts.

# Electrical World

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## Responsibility of Directors

The scathing report of the Interstate Commerce Commission on the New Haven situation will be regarded generally as a warning to directors that the purpose for which they hold office is to direct. It is somewhat more than that, however. It is, in part at least, a plain exploitation for political uses of the troubles of a much-distressed property. It will not support the unfortunate security holders in their work of re-creating the property which government authorities in previous administrations helped to build up and which government authorities and Mr. Brandeis are now helping to tear down. The utmost that can be expected of the report in the way of sound influence is that it shall lead directors to a greater sense of responsibility. The director in the average company, which is dominated by a single strong man, will find little comfort in the conception of a director's duties which would require all of his time. However, it would be idle to say that directors cannot do more in the future to safeguard properties. They can do more, but in order to do it they will have to give time and thought far beyond their past ideas. With the hopes of the New Haven owners partly wrecked, the thing that is needed now is not so much recrimination and bitter reproach as wise counsel. Any one can see now that the expansion of the system went too far and too fast; but only a few appear to understand that constructive public support, not destructive criticism, is essential to the successful establishment of sound policies in place of past mistakes.

## Milestones in Progress

The electrical industry still progresses. Although there have been more than the usual number of hindrances recently, the commercial strength of the industry as a whole has not been disturbed seriously. The badly-advised unfortunate strikers in the Westinghouse Electric & Manufacturing Company plant at East Pittsburgh separated themselves from employment for over a month and are now back at work. Public utility holding companies were threatened in the pending legislation at Washington, but it is now believed that the final draft of the law will not apply equally to these properties and the monopolistic combinations in general under which the administration wants to prohibit some of the recent commission decisions have reduced rates materially, and have increased the uncertainty about other schedules. We do not hear so much of the properties which go on year after year with satisfactory working relations with the public, with many signs of a wholesome public policy and with gains in earnings

of the kind that promoters covet. It is somewhat like the difference between the bad news that the daily newspapers publish and the good news that they leave untouched. The untoward instances are noticed. The ordinary happenings belong to the humdrum of the day and escape attention. The little things that hamper electrical progress lose their influence when the totals of a year are compiled. If they are significant it is as tendencies which may become important in later years. They are not alarming, but they need watching in order that the industry may continue to grow along right lines.

## Telephone Values in New York

The pending valuation of the property of the New York Telephone Company is to be made with the cooperation of a number of men identified with the electrical industry. That the electrical industry has been drawn upon to so large an extent for advisers is natural. Although the specific problems involved are remote from those encountered in electric central stations, yet they are electrical in nature and involve broad principles which are not dissimilar from those that greatly concern the central stations. The interests of the telephone and central station are one where questions of public policy are concerned. Valuation and rate making are issues of this kind. The New York Telephone valuation throws a heavy responsibility on those charged with the work. If the result is acceptable to both the property interest and the public interest, it will be a worthy achievement.

## "Interlocking Directorates"

One truth that many of us have not yet fully accepted is that the seemingly complex public-utility problems of the present time must be solved finally on a sound basis of economics, without considering personalities, theories or prejudices. In the end, unless civilization is a mockery, substantial justice must prevail. This reflection arises on perusal of the "Preliminary Report of the Department of Public Service Upon Interlocking Control of Public Utilities in the City of Chicago." Mr. Montague Ferry, the first incumbent of the position of commissioner of public service recently created by the City Council of Chicago, has made a study of the ownership of various utilities, as ordered by that body. He finds that a comparatively small number of men are prominent, or perhaps dominant, in the affairs of the privately owned electric-service, gas, elevated-railway and surface-railway utilities of Chicago. Nothing



new is revealed in the report, but the facts are brought together in convenient form for ready reference. The conclusions of the commissioner are more in the nature of a warning than of criticism. He seems to be a little worried about the possible action of directors in the transportation companies in approving the purchase of electrical energy sold by an electric-service company in which they are also directors. But he admits that he cannot find that the actual prices paid are excessive. The facts in the case are that the electric-service company is engaged in producing and selling electricity, the railway companies in transporting passengers and the gas company in making and selling gas. Each utility has a separate work and must find its own economic level. The directors know this and exert all their efforts to develop each utility in its own field. In a city like Chicago gas and electricity are in competition to some extent, but less than might be supposed. For example, with a price of 80 cents, gas has practically a monopoly at the present time for domestic heating and cooking so far as electricity is concerned. Furthermore—and this is most important—there is in charge of the whole situation the Public Utilities Commission of Illinois, specifically created, as we understand, to see that justice is done to the public, to the stockholders of all the utilities and to the men who furnish the initiative and brains which result in efficiency and progress.

### Publicity for the Central Station

It is sometimes advantageous to look beyond one's immediate sphere of action to see what methods of increasing business are efficient from the general standpoint irrespective of location. A paper at the recent convention of the (British) Incorporated Municipal Electrical Association is especially aimed at the instructive matter of commercial development in places of moderate size. The author, Mr. W. A. Vignoles, engineer for Grimsby, brings to the front in a very effective manner the efforts made to build up business in a small community. The work was not conducted on a large scale, the advertising expense at the most amounting to scarcely \$1,500 a year, but the results proved conclusively that an increase in the advertising account, properly administered, results in increased business. For example, five years ago practically no advertising was done, about \$100 being spent on publicity. During that year the increase in the receipts from private consumers was less than \$200. The next year almost \$250 was spent, and more than \$4,500 appeared in the increase in revenue. Last year \$1,250 went into the advertising account, and more than \$10,000 was added to the income. Growth is always to be expected in a properly administered utility yet it does not come wholly without effort, and the increase in the income in this instance shows in each consecutive year the net value of publicity.

The methods employed at Grimsby, among which the meager expense was distributed, were thoroughly up-to-

date including the use of advertisements in local newspapers; small signs on factories operating motors; small signs on lamp-posts; posters on corporate property; personal facsimile letters; church and chapel magazines and bazar catalogues; exhibitions and demonstrations; pamphlets and leaflets; canvassing methods; two small advertising sheets; the loaning of apparatus for trial, and the issue of a consumer's guide. This is certainly a good showing for a modest plant.

One of the features of the campaign was systematic canvassing following up the advertising, in connection with a vigorous effort to secure the wiring of new houses. Free advice to consumers, systematic and prompt handling of complaints, and activity in getting out new appliances on trial, all played their part in the increase of business, but the main moral to be drawn from the whole discussion is the direct importance of advertising even when the amount spent is very modest. The plant in Grimsby has only about fourteen hundred consumers and a gross income of barely over \$100,000 a year and sells energy on the average at a little less than 4 cents per kw-hour, so that it is fairly typical of the smaller English plants. Before making comparison with American conditions, however, it should be noted that the gross income is about \$2500 per mile of distribution circuit throughout the territory covered, bespeaking a density of service that goes far to explain the good commercial results that have been reached. Such conditions also render intensive advertising easier than in the average scattered American plant, but the evidence is clear that it pays to conduct an active publicity campaign even on a small scale.

### The "Half-Watt" Lamp in Photography

Photographing by artificial light has always been somewhat troublesome. The older readers of this journal can easily remember the first beginnings of such work in the use of arc lamps in some of the well-known studios. In the current issue Mr. M. Luckiesh presents a valuable study of the use of the so-called "half-watt" lamp, the gas-filled tungsten-filament lamp, in photographic work. At present a large part of artificial light photography is accomplished by the aid of the mercury-vapor lamp which by reason of the enormous intensity of three lines in the blue-violet region produces powerful effects on the ordinary plate or printing paper. In many places it would be very convenient to employ incandescent lamps on account of their extreme steadiness and the ease with which they are used on alternating current the mercury-vapor lamps requiring special adaptation for this purpose. To judge from Mr. Luckiesh's results the new gas-filled lamps will prove to be of considerable practical value in photography. His curves show that they are very much better than the ordinary tungsten lamps and quite as good as the old direct-current open arc lamp. Comparing results on ordinary plates, even the half-watt lamp is considerably less effective in actinic value than is the mercury-vapor lamp, but makes up for the deficiency in

small measure by the ease with which concentrated illumination can be obtained by the use of reflectors.

A more interesting possibility resides in the use of a half-watt lamp in orthochromatic photography. Here the mercury-vapor lamp may be left out of account by reason of the lack of red rays which are necessary to a proper orthochromatic effect. The half-watt lamp used alone fails to produce a light well balanced for orthochromatic work. However, by the use of suitable screens, the light can be so toned down as to reproduce daylight. For suitable results orthochromatic photography by artificial light requires artificial daylight, or, to be more exact, artificial daylight modified to overcome the peculiarities of the sensibility inferred upon the plate by staining. It is not extraordinarily difficult to produce artificially a fair approximation to daylight. To obtain intense artificial daylight, however, requires a very large expenditure of energy and a somewhat formidable equipment, so that orthochromatic work by artificial light does not even now seem altogether satisfactory for general use. It is worth considering as an interesting experiment highly useful in certain cases, but the main point of the matter as set forth by Mr. Luckiesh is that the half-watt lamp affords an easily managed light source of satisfactory efficiency for ordinary photographic work. Perhaps the strongest point on the practical side of the matter is the ease with which the concentrated-illumination types of the half-watt lamp can be made to produce a flood of light on the objects to be photographed, so that by very simple apparatus one can obtain adequate lighting even for instantaneous work in the studio. For copying and enlarging processes the half-watt lamp should prove especially convenient, and Mr. Luckiesh's discussion of its peculiarities furnishes an admirable key to its successful use.

### British Municipal Undertakings

In the address of President R. A. Chattock at the convention of the (British) Incorporated Municipal Electrical Association were set forth some of the peculiar problems which have to be faced when municipalities undertake the operation of their public utilities. Even in Great Britain where municipal utilities are somewhat less strenuous than here the managers of municipal undertakings have troubles of their own which are worth comment. One of the facts mentioned is the trouble encountered through inability of municipal electric undertakings to enter upon a wiring campaign. Managers of American electrical energy supply stations usually are able to preserve amicable relations with the electrical contractors in their territory, but they do not hesitate, when occasion seems to require, to offer special inducements regarding wiring. The municipal engineer in England has practically no rights in this particular, and a vigorous attempt to obtain an act of Parliament to grant such rights was deftly lobbed out of sight by the electrical contractors. Competition ordinarily acts to secure

reasonably good results at a fair price, yet it does not bring prices down to the bed rock basis desirable in a new-business campaign.

There are directions in which the municipal engineers can display great activity, and it is interesting to note the vigorous work for electric vehicles, the committee of the Municipal Association having undertaken in a general way the same kind of new-business campaign pushed by the Electric Vehicle Association of America. It is notable that in England, as in this country, engineers are looking forward to the electric vehicle as an efficient earner for central stations, a position which it is already beginning to assume. A somewhat curious phase of municipal ownership, too, appears in the somewhat fervid discussion going on in England as to the desirability of the gas and electric services of the municipality being under the control of the same committee. In America with privately owned institutions in a large number of cities the gas and electric services are under absolutely the same management and the results seem to be rather satisfactory. It does not follow because the same company owns the two undertakings that both will not be developed properly, which seems to be the fear of our English friends under municipal ownership. In a large number of cases abroad the two enterprises are managed by quite independent municipal committees and on a basis that is almost if not quite competitive and sometimes actively so. The result is often startling in the matter of prices. In Birmingham, for instance, the average net price of gas is somewhat less than 40 cents a thousand cubic feet and that of electrical energy about 2.3 cents per kw-hr., the low rates in part being attributable to mutual competition. The municipalities make up the deficit by extra taxes in other ways. It must be far from consoling to those upon whom the taxes fall heavily to consider the advantages of their neighbors whom they are helping to supply with extra cheap energy.

It is striking to note also that there is under way at present in England a strong movement toward reducing still further the cost of energy supply by centralized undertakings such as are very common in private hands here. We have commented more than once on the London situation, but the same movement is in evidence everywhere and only awaits the action of Parliament to be put into effect. The sluggishness of this body and the disinclination of municipalities to surrender any portion of their individual control act to block the scheme. There is much to be said for the English form of Parliamentary government, but if every plan for the wholesale supply of electricity in this country had to be approved by Congress we fear that progress would be painfully slow. If local pride in municipal undertakings had also to be reckoned with, one would fear actual retrogression, if such a thing were possible. Altogether it is very evident that the municipal undertakings in England have troubles of their own, even though they may not be quite the same as those that are familiar on this side of the water.



# The News of the Week

## Activities and Events in the Electrical Field— Reports of Meetings—Commission Findings, Etc.

### End of Westinghouse Strike

The strike of employees of the Westinghouse Electric & Manufacturing Company at East Pittsburgh was called off by the men on July 9. The date set for return was July 13, but a large number of men reported on July 10 and 11. The works are now being operated on full time.

### A. I. E. E. Standardization Rules

At a meeting of the board of directors of the American Institute of Electrical Engineers held at the Detroit Convention on June 25, the report of the standards committee submitting to the board the "Standardization Rules" as recommended for adoption by that committee was presented. Consideration of this report was postponed to an adjourned meeting held in New York on Friday, July 10, and an invitation was extended to the members of the standards committee and representatives of other societies who had collaborated in the work of the committee to attend this meeting for the purpose of a thorough discussion of the matter. After a comprehensive discussion the following resolution was unanimously recommended to the Board of Directors for adoption:

"Resolved, that the rules reported by the Standards Committee be, and hereby are, adopted, to take effect on December 1, 1914, subject to editorial revision by the committee for the purpose of correcting errors and clarifying the real intent of the rules."

Later the Board convened in executive session and adopted the resolution as recommended. The Board also directed that the proposed rules be printed in the August issue of the Institute Proceedings.

Resolutions were then adopted by the Board of Directors expressing appreciation of the services rendered to the Institute by Dr. A. E. Kennelly, chairman, Professor C. A. Adams, Secretary, and the other members of the standards committee, and its various sub-committees, in performing the arduous duty of revising the rules. The National Electric Light Association and the Association of Edison Illuminating Companies were also thanked for their co-operation with the standards committee in connection with this work.

### Electrical Contractors' Association at Detroit

The fourteenth annual convention of the National Electrical Contractors' Association opened at Detroit, Wednesday morning, July 15, under most auspicious circumstances. By noon the registered attendance had reached 350, including about 100 ladies. It was expected, however, that even this number would be considerably exceeded by the time of the principal sessions.

A spirit of enthusiastic co-operation prevailed among the delegates and the convention hall was full, with many persons standing, when Past-president E. McCleary, Detroit, called the opening session to order. On behalf of the mayor of Detroit, Commissioner John Gillespie welcomed the visitors to the city, and President Ernest Freeman, Chicago, responded for the associa-

tion. Mr. John Trix, Detroit, vice-president of the National Association of Manufacturers, followed with an industrial talk, and Jupiter W. N. Matthews, St. Louis Mo., spoke for the Jovians. Mr. John E. Kinnane, chairman of the Michigan industrial accident board, discussed workmen's compensation and employers' liability.

In turning the meeting over to President Freeman Past-president McCleary presented the association's executive with a beautiful gold-mounted ivory gavel donated by the Michigan Electrical Contractors' Association. On behalf of the Detroit electrical contractor Mr. Waldo Turner then presented to Mr. and Mrs. McCleary a handsome cut-glass water set on a silver salver.

The Detroit Jovian League gave a complimentary luncheon for the visitors Wednesday noon, when about 400 men sat down in the main dining-room of the Hotel Cadillac. This luncheon was declared to be the second largest Jovian affair of the kind ever held. Mr. John M. Griffin of Detroit presided and Major Robley S. Stearns, New Orleans, was toastmaster. A number of speeches were made and much enthusiasm was manifested. In the afternoon the delegates held a business session, and in the evening there was a Jovian rejuvenation.

Exhibits of electrical products, devices, supplies, etc. were displayed by a number of manufacturers.

The program for the succeeding days included a elaborate plan of entertainment by the Detroit members. These events, together with the later sessions of the convention, will be reported in a following issue.

### Missouri Contractors Hold Short Business Session

Following a noon-day luncheon at the City Club at St. Louis, July 11, the members of the Electrical Contractors' Association of the State of Missouri held their annual meeting, the total attendance, including members and guests, being approximately thirty.

Bringing up the subject of classification of freight Mr. Fred Adam, St. Louis, cited the incident of the shipment of an unassembled switchboard or panel board on which the shipper was obliged to pay the same rate on disassembled material as would have prevailed had the switchboard been shipped complete. Other examples were also brought up to demonstrate the unfairness of the present classification. After some discussion it was declared to be the sense of the meeting that Mr. Adam be supported at the national Detroit convention in an attempt to have a committee co-operate with the freight rate classification committee in order that electrical contractors may obtain fairer treatment.

The actual business program of the meeting was short, and this fact was commented upon by members of the association, who declared that other State associations were paying much attention to the preparation of programs and were being adequately rewarded for their efforts. The officers of the Missouri association were therefore urged to secure good papers for the next session, to be held Dec. 19 at Kansas City.

Among the subjects which the association will take under advisement during the next six months will be the securing of a law for the licensing of contractors.

5 this end the legislative committee, of which Mr. J. Burns, of Kansas City, is chairman, has been continued.

The election of officers for the ensuing year resulted as follows: President, Mr. E. S. Cowie, Kansas City; vice-president, Mr. W. A. Koeneman, St. Louis; secretary, Mr. A. J. Burns, Kansas City; treasurer, Mr. J. P. Denton, Kansas City; sergeant-at-arms, Mr. W. C. Cook, Kansas City, and director, Mr. George Carrao, St. Louis.

### Preparations for Twelfth Annual Meeting of Jovian Order

Twenty local committees and the general committee composed of the chairmen of the local committees have been ardently working on the program for the twelfth annual Jovian meeting to be held in St. Louis, Mo., Oct. 14 to 16. Of the general committee Mr. H. J. Ittengill, president of the Southwestern Telephone & Telegraph Company, is chairman, and in his work he is assisted by Vice-chairmen A. C. Einstein, president of the Union Electric Light & Power Company, and V. N. Matthews, of W. N. Matthews & Brother, the reigning Jupiter.

Prominent in the committee work is the promotion committee, of which Mr. M. J. Wolf is chairman. Three hundred prominent Jovians in the United States and Canada are members of this committee and they in turn are creating enthusiasm among their local leagues. Master of transportation, Mr. Herman Spoehrer, St. Louis, has also been appointed with duties similar to those of the master of transportation for the National Electric Light Association. It is stated that a fare of ten cents per mile will be granted to all Jovians traveling to the convention. Estimates place the number of convention visitors at 1500, and it is said with confidence that there will be 1000 local Jovians in St. Louis before Oct. 14. There are now 764.

The Planters' Hotel will be the official headquarters of the convention, but the business meetings and rejuvenations will be held at a downtown theater.

One entire day has been set apart for the sessions of the commercial division. As now outlined the program for this day will include addresses by men prominent in the four leading divisions of the electrical industry, namely, central-station, manufacturing, jobbing and contracting. Thus far the names of the speakers have not been announced, but it has been decided that the representative of the central-station industry will speak on "The Jovian Order as a Connecting Link Between the Public Utility and Its Patrons;" the manufacturer, "The Patent Situation and Price-Making;" the jobber, "Salesmanship," and the contractor, "Relations Between the Several Branches of the Electrical Business." Mr. Bert Hubbard has also promised to be present and speak.

Approximately \$9000 has been subscribed to be spent for the entertainment of the Jovians during the meeting. As the program now stands the first entertainment feature will be a reception and ball at the Planters' Hotel the evening before the official opening. On the following day 400 automobiles will carry the Jovians and their guests to Sunset Inn, a beautiful summer resort on the Meramec River, 25 miles from St. Louis, where an informal dinner will be served. Following the official rejuvenation on Thursday evening a Jovian Entertainer minstrel performance, with Chief Stentor Sam A. Hobson as interlocutor, will be substituted for the usual "side-degree" work. Arrangements for entertaining the ladies have been made by a capable committee under the direction of Mrs. W. N. Matthews, wife of the reigning Jupiter.

### Pacific Coast Electrical Conventions at Spokane

The annual convention of the Northwest Electric Light & Power Association will be held at the Davenport Hotel, Spokane, Wash., Sept. 9, 10 and 11, in conjunction with the meeting of the Pacific Coast Section of the American Institute of Electrical Engineers.

Among the papers to be presented under the auspices of the Institute will be the following: "A Distribution System for Power Purposes," by Mr. F. D. Nims; "Electrical Application in the Lumber Industry," by Mr. E. F. Whitney; "Operation of the Butte, Anaconda & Pacific 2400-Volt Direct-Current Railway," by Messrs. J. B. Cox and C. A. Lemmon; "Considerations in the Control and Application of Electric Motors for Gold Dredges," by Mr. G. B. Rosenblatt; "The Effect of Delta and Star Connections Upon Transformer Wave Forms," by Mr. Leslie F. Curtis; "Transmission Economy," by Mr. Magnus T. Crawford, and "The Big Creek Development of the Pacific Light & Power Corporation," by Mr. Edward Woodbury.

Mr. Edward A. West, chairman of the program committee of the Northwest association, announces the following papers for the sessions of his organization which will hold one meeting jointly with the Institute Section:

"Rates and Physical Valuation," by Mr. W. W. Cotton, of the Portland (Ore.) bar; "A Balance of Stores System for Utility Companies," by Mr. Edward A. West, Portland, Ore.; "Out-door Type Transformer Stations," by Mr. J. C. Martin, Portland, Ore.; "Rates: A Résumé and Comparison of Rate Theories," by Mr. Stacy Hamilton, Portland, Ore.; "Extension of Electric Service into Small Country Communities and Rural Districts," by Messrs. M. C. Osborn and J. C. Davidson, Spokane, Wash.; "Wrinkles," by Mr. P. A. Bertrand, Aberdeen, Wash.; "Electric Development on the Pacific Coast," by Mr. W. E. Herring, Seattle, Wash.; "Electric Appliances," by Mr. W. B. Peirce, Spokane, Wash.; "Organization and Operation of Branch Offices and Plants," by Mr. Lewis A. McArthur, Portland, Ore.; "Public Policy Review," by Mr. F. T. Post, Spokane, Wash.

Mr. Norwood W. Brockett, of the Puget Sound Traction, Light & Power Company, Seattle, Wash., is secretary of the association.

### Supplemental Street-Lighting Contract for Chicago

The Sanitary District of Chicago has officially expressed its willingness to enter into a supplemental street lighting contract with the city of Chicago. The contract, which has been under consideration for some time, provides for the addition of 1000 arc lamps and also for changing and converting a system of approximately 1166 direct-current arc lamps and approximately 6328 alternating-current arc lamps, which are now a part of the street-lighting installation of the city, into an improved, modern alternating-current lighting system which shall consume an amount of electrical energy equivalent to that used by the present system. The work involved under this supplemental contract is to be completed by January 1, 1917, unless the Sanitary District is unavoidably delayed in carrying out the contract. It is provided that the arc lamps shall consume 450 watts at the lamp terminals. However, other forms of lighting units taking an equivalent amount of energy may be used if desired. The type or types of lamps to be operated under the contract are to be agreed upon by the electrical engineer of the Sanitary District (Mr. E. B. Ellicott) and the commissioner of gas and electricity of the city of Chicago (Mr. Ray Palmer).



### Prospect of Water Power Legislation

An agreement was reached at the White House in Washington on the night of July 15 in relation to the provisions that the Adamson bill and the Ferris bill shall contain when they come on the floor of the House of Representatives for debate. The bills will come up as soon as the conference reports on the appropriation bills are out of the way, probably around the first or middle of next week.

Both the Adamson and the Ferris bills will probably be passed by the House at this session. But it is now stated in Washington that unless President Wilson deems it is his duty to insist with Senate leaders that the bills in relation to water power subjects be passed at this session, both the Adamson and the Ferris bill will wait, so far as the Senate is concerned, until Congress convenes again in December.

During the conference, at which President Wilson acted as peacemaker between opposing views, it may be authoritatively stated that it was agreed that the Adamson bill shall cover streams which are actually navigable or will be made navigable by dams in the Eastern States as well as in the West, while the Ferris bill shall come into the House so phrased that it will cover only irrigation and power development on streams in the public lands. Many Western streams are not navigable and their chief value is for irrigation or water power, in the belief of those at the conference.

### Progress of Anti-Trust Legislation

The first signs of the deadlock that was predicted in some quarters for the anti-trust legislation in the Senate has developed. During the debate on the trade commission bill senators refused to continue the discussion of that measure on the floor without being informed what provisions similar to those in that bill will be brought in by the committees having in charge the Clayton bill and the railroad securities bill. This sign of dissatisfaction came about as the result, principally, of the small attendance of senators.

Senator Newlands, in charge of the trade commission bill, has been forced during the last week to be the mouthpiece on the floor of the Senate in relation to the Clayton bill and the railroad securities bill for committees with which he has nothing to do. He attempted on July 15 to set a day for voting on the trade commission bill, but the fatal "I object" was immediately forthcoming from a number of senators, any one senator having the privilege of thus blocking a vote.

Republican senators are remaining "on guard," and many Democratic senators are absent. Even among the latter, however, a disposition has developed in the last week not to pass the trade commission bill until it has been ascertained what the judiciary committee proposes to report in the way of a Clayton bill or substitute therefore as well as what the interstate commerce committee proposes to report in the way of a railroad securities bill or substitute therefor.

While Senator Newlands may continue to call up the federal trade commission bill from day to day as the "unfinished business" of the Senate, as he has the right to do, it appears to be doubtful if that measure will get to a vote without an agreement with senators who are interested in the other bills. A number of scheduled meetings of the committee having in charge of the securities bill have been postponed because of non-attendance of members. The judiciary committee is still working on the Clayton bill. Changes in the latter that were announced as having been made in committee are again under consideration.

As showing the interlocking nature of some of the

proposed legislation, it is pointed out that the judiciary committee is considering amendments to the Clayton bill which would make the proposed federal trade commission the medium of enforcement of certain of the provisions in the Clayton bill to the exclusion of the criminal penalties imposed by the Clayton bill.

Senator Cummins has been pressing certain amendments to this bill, holding that the enforcement of those provisions should be entrusted to the proposed federal trade commission. There are provisions in the Clayton bill relating to interlocking directors and holding companies, and under that bill those provisions are enforced through penalties; but Senator Newlands believes that if that bill is amended in such a way as to give the enforcement of those provisions to the proposed interstate trade commission, the same purpose will be served.

On the other hand, Senator Reed, as a member of the judiciary committee, announced during the week that it is very doubtful whether the judiciary committee will bring in a bill in such form that any part of the enforcement of the law when it is passed will depend upon the trade commission. Senator Reed, however, said on the floor of the Senate, that "we are proceeding here like sheep without a shepherd."

Senator Reed announced that there is no question in his mind but that the Senate would gain time if the federal trade commission bill were referred back to the committee and if the Senate were to pass a resolution requesting the interstate commerce committee and the judiciary committee to meet jointly to consider the federal trade commission bill and the Clayton bill.

### Payments Under Employees' Gratuity Plan in Cleveland

Fifty-six employees of the Cleveland Electric Illuminating Company received on July 13 their first payments on the ten-year employees' gratuity plan. The total amount paid was \$35,000, amounting to 5 per cent on the salaries of the fifty-six employees, with interest from the time the money was set aside for them.

Ten years ago President Scovil and Vice-president Lindsay formed a plan whereby the employees who had been with the company a year or more and had proved efficient and trustworthy should receive the same rate of dividend on their salaries as is paid to stockholders on their stock. However, only 3 per cent of this was to be paid annually, while the remainder was to be deposited in a bank and draw 4 per cent interest, the entire amount due each to be paid in ten years. For many years the company has earned 8 per cent on its stock and the employees were credited each year with 5 per cent on their salaries.

The employees who received their checks were the first to be enrolled. Now there are more than 650 persons receiving benefits under the plan, or about one-half the total number of employees, with the exception of officers who do not participate. The list includes a number of classes of employees, none being barred but the officer.

If an employee leaves the company under proper circumstances before the expiration of ten years, he receives the total amount accruing to his credit in the fund, but if he is discharged for cause other than lack of work he receives nothing and the sum credited to him is prorated among the other participating employees. Each employee participating is given a bar book, so that he may always know just how his account stands. The money is not paid until the expiration of ten years except when men leave the employ of the company.

The officers of the company feel that this plan will make better citizens of the employees, as well as increase their efficiency and raise the standard of the organization.

### Missouri Utility Association Committees

At a meeting of the executive committee of the Missouri Public Utilities Association held at St. Louis, July 8, it was decided to hold next year's meeting on board boat while journeying from St. Louis down the Mississippi River. Announcement of committees was also made by President Einstein, as follows:

Uniform electric rate schedules—Representatives of the Light & Development Company, of St. Louis, City Light & Traction Company, Sedalia, and the Mexico (Mo.) Power Company.

Workman's compensation act—Messrs. W. A. Layman, St. Louis, chairman; F. B. Adams, St. Louis; Bruce Cameron, St. Louis; Lynton T. Block, St. Louis; L. P. Andrews, Sedalia; G. E. Hayler, Joplin; R. C. Rinehart, Kennett; I. R. Kelso, St. Louis; J. M. Scott, Kansas City, and W. R. Schneider, St. Louis.

Program—Messrs. J. H. Van Brunt, St. Joseph, chairman; V. L. Elbert, St. Joseph, and S. W. Henderson, Excelsior Springs.

Membership—Messrs. J. C. Hall, St. Louis, chairman; H. W. Wiswell, St. Louis; E. S. Seely, Chicago; Fred Johnson, St. Louis, and C. R. Croninger, St. Louis.

Reincorporation—Messrs. John C. Hall and Hermann Spoehrer, St. Louis.

Legislation—Mr. J. C. Hall, St. Louis; Senator A. E. L. Gardner, Webster Groves, and Senator S. E. Bronson, Ozark.

Uniform classification of accounts—Mr. P. J. Kealy, Kansas City, general chairman. The personnel of the committee is divided into three sections as follows: Depreciation—Messrs. P. J. Kealy and J. M. Scott, Kansas City; R. C. Russum, Joplin; C. E. Brenton, St. Louis, and C. E. Foster, St. Joseph. Historical matters—Mr. Hugo Wurdack, St. Louis; Senator S. E. Bronson, Ozark; Messrs. Adrian Steele, De Soto; F. B. Saunders, Chicago, and J. C. Hall, St. Charles. Simplifying classifications—Messrs. Edwin Gruhl, St. Louis; V. L. Elbert, St. Joseph; S. W. Henderson, Excelsior Springs; J. W. Achelpohl, Jefferson City, and S. B. Irelan, Sedalia.

### Right of Consumer to Energy in New York

The New York Public Service Commission's decision in the case of Mr. C. Perceval versus the New York Edison Company has been overruled by the Appellate Division. Mr. Perceval applied to the company for a supply of energy for lighting, motor service, storage and refrigerating purposes. When a contract of standard form was sent to him he struck out the clause forbidding the use of other energy without the previous consent of the company, since he had already contracted for energy from 7 a. m. to 5.30 p. m. from an adjoining building which had a plant. The company declined to supply energy for only certain hours, and Mr. Perceval applied to the commission. The decision upheld the company.

The court declares that in consideration of the privileged position of the company, not the least of which is the right to use public streets and highways for conduits, it is bound to serve impartially every member of the community who demands service. It may establish reasonable regulations which the consumer must observe, but the requirement that a consumer must take all his energy from one company or receive none is declared to be not in any proper sense a regulation re-

specting the use of the service, but a purely arbitrary attempt on the part of the company to insure to itself a monopoly of furnishing energy. If that were permissible, the court holds, the company could also refuse to furnish energy to a consumer who is manufacturing for himself part of what he needs, and this had already been severely condemned upon grounds of public policy. Moreover, if the company had established the fact that the hours during which the supply was asked were those of greatest demand this condition could have been met by a special rate.

### Steam Reserve Plant Maintained by Baltimore Electric Railway Company

In the annual report of the United Railways & Electric Company of Baltimore Mr. William A. House, the president, says that the Pratt Street power station has been maintained in a high state of efficiency in order that the company may be prepared for any emergency that might arise as a result of failure of water-power energy from the plant of the Pennsylvania Water & Power Company, from which the major part of the requirement of energy is now being supplied.

Improved automatic devices have been installed in the high-tension system in the Pratt Street power station for the protection of the incoming alternating-current feeders and rotaries in the various substations. The benefits derived from the installation of this apparatus became apparent as the work of installation progressed. Interruptions have been materially reduced and in the greater number of instances entirely eliminated, even when severe surges occurred on the water-power company's lines. In addition to these protective devices, the motive-power department of the Railways & Electric company designed, constructed and installed an automatic device to open the field circuits on the alternating-current generators at Pratt Street in case of overload, or if when operating in parallel with the water-power company's system there is a loss of power.

### Decision of California Commission in Antioch Rate Case

The Railroad Commission of California handed down its decision in the case of the town of Antioch versus the Pacific Gas & Electric Company on July 6, reducing the rates for lighting from 8 cents per kw-hr. for the first 30 kw-hr. per month to 7 cents for the first twenty hours and altering the steps so that whereas heretofore a consumption of over 30 kw-hr. a month entitled the consumer to a rate of 7 cents for the next 70 kw-hr. per month the rate is now 4 cents for the next 980 kw-hr. The distinction between residence and commercial lighting has been abolished and a rate of 3 cents per kw-hr. made effective for all electrical energy consumed for lighting purposes a month in excess of 1000 kw-hr. A rate of 3¼ cents has been established for municipal street lighting as against a flat rate of \$128 a month. The rates for energy for motor service have been revised, but the company will not suffer any substantial loss in revenue from this class of load. The case is one of the most important yet decided by the commission and involved a tremendous amount of labor, necessitating an investigation of the entire hydroelectric system of the Pacific Gas & Electric Company and also that portion of its plant which is engaged in the production and transmission of electrical energy produced by steam as the local distribution system in the town of Antioch. Over 600 pages of statistical information was submitted by the utility. Before pass-



ing on the issues of fact the commission gave consideration to certain fundamental principles involved under the heads of basis of return, going concern value, depreciation, reserve and rate of return.

The commission brushed aside the contention of the company that it must use as a basis of return the reproduction value new of the company's system plus an allowance for going concern value as without warrant. The commission holds that a utility is entitled to a reasonable return upon money honestly and wisely expended for the public and that the effects of abnormal conditions, bad management, poor judgment and lack of ordinary care and foresight must be borne by the utility and not by the public. In developing this phase of the subject Mr. Max Thelen, the commissioner who wrote the opinion, suggested that in many respects the relationship between utility and its consumers may be compared to that existing between principal and agent. This doctrine of agency was characterized by Mr. John M. Eshleman, president of the commission, as dangerous and the commission modified its decision in that regard, holding that the Supreme Court would not countenance any finding to the effect that owners of a public utility hold such property as agents.

Mr. Eshleman, in his concurring opinion said that in arriving at a fair return two things must be kept in mind. One that under private ownership the commission must be generous to get public utility work done and money invested in such enterprises, and two, that it must always have in mind the comparison between the conditions that would exist if public ownership were resorted to and those that confront one under private ownership; and if it be found that the amounts exacted under private ownership are excessive in comparison with what might be expected under public ownership, then the latter will result.

The basis on which a return was allowed by the commission was in general the estimated cost to reproduce the physical elements of the property new as of Dec. 31, 1911 (the original cost not being available) plus a proper allowance for overhead percentage plus the actual expenditure for additions and betterments properly chargeable to capital account from Jan. 1, 1912, to Jan. 1, 1914. The commission holds that it would be difficult for the Pacific Gas & Electric Company to prove that any allowance should be made for cost of developing the business in view of the fact that its last report shows that of its net earnings in the last eight years, 21 per cent was paid out in cash dividends and 79 per cent was reinvested in the property, applied in the reduction of funded debt or expended for other corporate purposes. The average cost of energy deliverable at the substation from hydroelectric plants was given as \$.0048 and from steam station to transmission lines \$.0124. The general summary, giving the cost of production and transmission, including purchased energy from other companies, shows that the average total cost of energy deliverable to substations is \$.007312 per kw-hr. The cost of energy based on the maximum simultaneous demand of all substations is as follows: Demand cost, \$.213 per kw, and energy cost, \$.003314 per kw-hr. Thus determined the various load factors of the different towns served are automatically taken care of.

Having determined the cost of delivering electrical energy at substations the commission ascertained the cost of distribution in Antioch. The total average cost based on present load factors and assuming an increase of 10 per cent with no allowance for going concern was found to be 5.546 cents per kw-hr. at consumer's meters and 3.75 cents per kw-hr. for street lighting under present conditions. On this basis the rates as given in the opening paragraph were established.

## PUBLIC SERVICE COMMISSION NEWS

### California Commission

The Railroad Commission has rendered a decision in the complaint brought by the city of Monterey against the Coast Valleys Gas & Electric Company. Monterey is one of the cities that has vested its control over public utilities in the commission. The city charged that the gas company's rates were unreasonable. The gas company denied this and asked the commission to fix rates which would allow a return of 10 per cent on the full estimated reproduction cost of its property. The rates as finally determined by the commission will reduce the maximum rate charged by the gas company from \$1.50 to \$1.30 per 1000 cu. ft. It is estimated that the rates as established by the commission will allow the gas company a return of 8 per cent on the commission's valuation of the property.

The commission has rendered a decision authorizing the Southern California Edison Company to sell its electric distributing system in San Fernando, Los Angeles County, to the Pacific Light & Power Corporation

### Massachusetts Commission

Upon petition of residents of Cambridge, the Massachusetts Gas & Electric Light Commission has ordered a reduction in the maximum net price of energy from 10 cents to 9 cents per kw-hr., dating from July 1. Various street-lighting prices have also been scaled down. The Cambridge Electric Light Company supplies energy to Cambridge and the municipal plant of Belmont, serving a population of about 115,000. The previous rates were highly classified as regards street lighting, and the commercial rates included a variety of schedules for both light and motor service and for off peak loads. The company has not had a written contract for street lighting since 1905.

Governor Walsh has sent a special message to the Legislature recommending that a law be passed by which the cost of maintaining the Public Service Commission shall be assessed upon the companies under the board's supervision. In the message it was pointed out that under existing laws companies under the supervision of the Gas & Electric Light Commission pay the cost of that board and that a similar statute regarding the Public Service Commission would save the state \$200,000 a year. The message was referred to the committee on railroads which voted to refer the matter to the next Legislature.

### New Hampshire Commission

The commission has issued the uniform classification of accounts for electric utilities, effective on July 1. The order of the commission provides that each company shall carry a "proper and adequate depreciation account."

### Missouri Commission

The Missouri Public Service Commission has issued tentative rules for regulating gas, electric and water service utilities companies. There will be an open discussion of these rules on July 28 and the order of the commission states that the rules shall be effective on Aug. 1.

Mr. A. C. Einstein, president and general manager of the Union Electric Light & Power Company, and also president of the Missouri Public Utilities Association has appointed a committee of members of the association to confer with the commission considering the advisability of making changes in the rules. The following organizations will be represented on the committee: Laclede Gas Light Company, St. Louis, by Mr. J. I. Bon Maur; Empire District Electric Company, Joplin

by Mr. G. E. Hayler; St. Joseph Water Company, by Mr. C. H. Taylor.

#### New York Commission

The Public Service Commission, Second District, has rescinded its recent order by which the New York Telephone Company was compelled to cease granting certain rates which the commission considered discriminatory. The withdrawal of this order at this time is due to the fact that the original order was so broad in its terms as to comprehend cases which the commission did not contemplate reaching.

#### Ohio Commission

At a continuation of the hearing of the Bucyrus Light & Power Company case members of the commission asked for information as to the rate of return demanded by the investment public on public utility securities. Messrs. Claude Meeker and Gilbert H. Fuller, Columbus brokers, said that stockholders should receive at least 8 per cent; Mr. Fuller thought that the return should be from 8 per cent to 10 per cent.

Mr. Fuller said that such an agitation as is now taking place in Toledo over the rate of fare on the railway makes investors cautious. He declared that there is a popular demand for lower rates rather than good service. Commissioner Doty objected to this statement and referred Mr. Fuller to Cleveland. He said that if a guarantee could be given that all agitation would result in as little disaster as at Cleveland, the consequences might not be serious.

Mr. Thomas H. Hogsett, representing other electric companies, said that there are many natural hazards in the municipal utility business, such as the failure of the city to grow as rapidly as expected or to grow at all, or to grow in a direction different from what was expected, all of which should be taken into consideration in rate-making. Mr. Hogsett introduced for the record information in regard to the rate-making practices of the Wisconsin commission.

The commission appears to have agreed on a rate of 5 per cent for depreciation and that an amortization fund should be accumulated. The depreciation in the Bucyrus plant was found to be 5.44 per cent annually. The hearing will be continued on July 21.

#### Wisconsin Commission

The first part of the annual report of the Wisconsin Railroad Commission for the year ended June 30, 1913, has been completed. It reviews the duties which the commission is now directed by law to perform and the methods of procedure involved. These duties include the following: Regulation of railroads and other carriers; regulation of public utilities; regulation of water-powers; administration of the stock and bond law; administration of the law regulating the sale of corporate and other securities.

The calendar for the year shows a total of 473 cases set for hearing, of which number 156 involved matters pertaining to public utilities. In this connection attention is called to the fact that, in addition to the purely formal cases, the commission has handled a vast amount of informal matter and has held many informal conferences of which no record has been kept. The report further notes the increasing service which the commission is rendering by sitting in the capacity of arbitrator on matters of dispute which lie entirely outside of its jurisdiction.

During the year 1305 complaints and applications were filed, or an increase of 210 over the preceding year. Of this number 134 were formal utility complaints and 209 were informal ones. Of the rate cases, forty-three were applications for an increase in rates, eighteen for a decrease in rates, and eight were inves-

tigations made by the commission on its own motion. The commission issued 184 formal decisions on railway cases and 73 on utility cases. Three valuations were made for purpose of municipal purchase.

Issues of securities were authorized as follows: Stocks, \$8,288,332; bonds, \$18,617,500; equipment trust certificates, \$10,220,000; notes, \$3,530,000.

The Wisconsin Railroad Commission has authorized the Madison Gas & Electric Company to issue \$808,000 of 5 per cent bonds, to be exchanged for a like amount of 6 per cent bonds now outstanding. The exchange is to be made on the basis of 89.98 per cent of the new issue for the old issue at par.

The Menominee & Marinette Light & Traction Company has been granted authority to issue \$150,000 common stock. The proceeds are to be used in retiring bonds, notes, etc., all of which represent indebtedness incurred by extensions and improvements.

The commission has empowered the River Falls Power Company to issue \$20,000 of 6 per cent bonds to provide funds for the construction of a transmission line from Hastings, Minn., to Pine Bend, Minn., and to provide substation and power house equipment.

## Current News Notes

**HOUSEWIRING RESULTS AT LOUISVILLE, Ky.**—The housewiring campaign of the Louisville Gas & Electric Company has entered its sixth month with a total of \$52,703 in installation contracts.

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**STEALING TELEPHONE POLES.**—Next to stealing a red-hot stove, perhaps the most unusual feat in larceny is purloining telephone poles. The police of Detroit recently arrested two men on this charge. The culprits were seen, according to the accusation of their captors, dragging four telephone poles from a railroad car. The loot was taken to a nearby factory yard and sawed up into stove lengths.

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**COURSE IN ELECTRICAL SALESMANSHIP FOR HIGH SCHOOL BOYS.**—A course in salesmanship for high school boys has been inaugurated by the Edison Electric Illuminating Company of Boston. In its announcement the company explains that it has positions during the summer months for boys who have completed their junior year. Applicants who make good will be given permanent positions at the end of their senior year.

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**TWO-YEAR ELECTRICIAN'S COURSE AT TEXAS A. & M. COLLEGE.**—Prof. F. C. Bolton, of the Texas Agricultural & Mechanical College, College Station, Tex., announces that, beginning with the next school year, a two-year course for electricians will be offered by the department of electrical engineering. Similar courses are now offered in textile engineering and in agriculture. Fears were at first entertained that the short course might attract most of the students away from the longer four-year course in electrical engineering, but every effort will be made to urge matriculants to select the latter unless so limited by time and funds that the short course becomes necessary.

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**RECEPTION TO ST. LOUIS COMMISSIONERS TO SOUTH AMERICA.**—On the evening of July 21, at the Sunset Hill Country Club, the Business Men's League of St. Louis will give a dinner and reception to the seven members of the St. Louis commission who have just returned from a tour to South America to investigate



trade conditions. Mr. W. A. Layman, president of the Wagner Electric Manufacturing Company, is a member of the executive committee of the Business Men's League, and Mr. H. J. Pettengill, president of the St. Louis League of Electrical Interests, Jovian Chapter, is one of the signers of the invitation to the dinner.

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DRAFTS FROM ELECTRIC FANS.—In answer to an inquirer who asks what, if any, danger there is in sitting in front of an electric fan in operation, and if it is true that this practice is apt to give one consumption or pneumonia, Dr. W. A. Evans, the health adviser of readers of the *Chicago Daily Tribune* and other newspapers, says: "At this season of the year everything can be said in favor of, and nothing against, sitting in front of a fan. In winter the air may remove the heat from the skin faster than the body can supply it. A cold may result. The danger from consumption or pneumonia is nil."

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ELECTRICAL "ROUGH ON RATS."—It is a progressive crew that runs the Pennsylvania station at Fort Wayne, Ind., as is confirmed by the fact that they believe in "doing it electrically." Not long ago rats entered the basement of the new station through the coal chute and gave considerable trouble until the stationmen got together and constructed an electric chair especially designed for rats. The "chair" consists of an iron plate with a steel spike suspended above it, both the plate and spike being connected to the two wires of an electric circuit. With the spike baited with a piece of cheese, the rodents which venture upon the plate and reach upward complete an electrical circuit through their bodies and thus become their own executioners.

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ELECTRICAL ENGINEERING DEPARTMENT AT THE UNIVERSITY OF PENNSYLVANIA.—The departments of mechanical and electrical engineering at the University of Pennsylvania have heretofore been under the joint direction of the Whitney professor of dynamical engineering. From the beginning of next year the department of electrical engineering will be on an independent and co-ordinate footing with the departments of civil and mechanical engineering. Dr. Harold Pender, professor of electrical engineering, Massachusetts Institute of Technology, and director of the research division of the department of electrical engineering, will become professor in charge of the department of electrical engineering at the University of Pennsylvania next fall.

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RADIO TOPICS BEFORE INTERNATIONAL ELECTRICAL CONGRESS.—A feature of the International Electrical Congress to be held at San Francisco, Sept. 13 to 18, in connection with the Panama-Pacific International Exposition, will be the section devoted to radio telegraphy and telephony, the rapid development of which during recent years already entitles it to take a place among the important engineering branches. At the time of the last international congress in America, that held at St. Louis in 1904, "wireless" was just emerging from the experimental and academic stage, whereas today, only ten years later, a current register of commercial radio installations lists 5000 land and sea stations, to say nothing of the host of amateur sets in every civilized country. Leading radio engineers of the world have been invited to contribute papers to the 1915 Congress at San Francisco.

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CHICAGO ENGINEERS AND OTHERS ON EUROPEAN TRIP.—A large party of Chicago men have sailed from New York to make a tour of several weeks in Europe.

The party is of a composite nature and embraces engineers, city officials, civicists, educators and others, who intend to investigate various engineering, civic and sociological problems. Included in the delegation are Mr. B. J. Arnold, chairman of the Board of Supervising Engineers, Chicago Traction; Mr. Walter L. Fisher, attorney for the Citizens' Terminal Committee; Mr. John F. Wallace, chairman of the Railway Terminal Commission; Mr. L. E. McGann, Commissioner of Public Works of the city of Chicago; Mr. H. C. Barlow, traffic director of the Chicago Association of Commerce; Mr. George E. Hooker, civic secretary of the City Club; Mrs. Ella Flagg Young, superintendent of schools; Alderman Eugene Block, chairman of the local transportation committee of the City Council, and a number of other aldermen and citizens. One subject to be investigated is the municipal railway terminal problem.

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## SOCIETY MEETINGS

ST. LOUIS SECTION, A. I. E. E.—The next session of the St. Louis Section of the American Institute of Electrical Engineers will be held at the Engineers' Club, St. Louis, Oct. 12. Mr. F. J. Bullivant is chairman of the Section and Mr. A. McR. Harrelson is secretary.

\* \* \*

INDIANA CONVENTION.—The next annual convention of the Indiana Electric Light Association will be held on Sept. 24 and 25, probably in Terre Haute, Ind., although it is possible that the location may be changed. Mr. Thomas Donohue, of Lafayette, is secretary of the association.

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VEHICLES IN STORAGE WAREHOUSE SERVICE.—Mr. William P. Kennedy, consulting transportation engineer, New York City, addressed the New York Furniture Warehousemen's Association at Lake Hopatcong, N. J., July 13 on the subject, "Electric Vehicle Application to Storage Warehouse Service."

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OHIO ELECTRIC LIGHT ASSOCIATION.—As noted on page 1429 of the June 20 issue of the *Electrical World*, the Ohio Electric Light Association will hold its twentieth annual convention at the Breakers Hotel, Cedar Point, Ohio, July 21 to 24. On Thursday evening of the convention week the Jovians will have a rejuvenation. Mr. Thomas F. Kelly, who is statesman for the Dayton district, will have charge of the initiation.

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JOVIANS AT INDIANAPOLIS.—Members of the Jovian Order at Indianapolis, Ind., meet for luncheon every Monday at the Hotel Severin, Indianapolis. At a recent session Mr. Norman A. Perry, secretary of the Indianapolis Light & Heat Company, described a miniature electric lamp of his invention. At the luncheon of July 13 the scheduled speaker was Mr. Charles W. Miller, former district attorney in charge of the dynamite-conspiracy cases at Indianapolis.

\* \* \*

OFFICERS OF ST. LOUIS SECTION N. E. L. A.—The annual election of officers of the Union Electric Light & Power Company Section of the National Electric Light Association, held June 27 following the annual dinner, resulted as follows: President, Mr. W. L. Berry; first vice-president, Mr. D. A. Scullin; second vice-president, Mr. W. L. Rose; secretary, Mr. O. C. Small; treasurer, Mr. C. L. Brennaun; executive committee, Messrs. J. E. Hillemeier and S. N. Clarkson (one year), and Messrs. G. S. Hessenbruch and E. H. Tenney (two years). At present the section has 215 members.

## The Boston Edison General-Service Buildings—II

**Methods of testing meters—Provisions for arc-lamp repairs—Handling incandescent lamps for customers—Transportation department and electric garage. By H. S. Knowlton**

**I**N the preceding section of this article there were outlined the general features of the new million-dollar general-service buildings of the Edison Electric Illuminating Company of Boston. The structures of this group provide for the storage of equipment and supplies, and also house the maintenance and transportation departments, a detailed description of which appears in the following paragraphs.

The arc-lamp shop in Building No. 3-1 is of particular interest, containing as it does carefully planned storage facilities and also testing and maintenance equipment. Perhaps the most striking feature is an overhead testing frame 35 ft. long, built of timber and carried from the ceiling by iron pipe. The frame is composed of two panels hung about 4 ft. apart and cross-connected by angle-irons, each panel resting on a 3.5-in. by 8-in. horizontal timber base, on the under side of which are mounted porcelain terminal blocks and hooks for lamp suspension. One side of the frame is wired for series lamp testing and the other for multiple tests. On the series side six alternating-current and twelve direct-current lamps can be tested at once, and on the multiple side eight alternating-current and fourteen direct-current lamps may be simultaneously operated. The circuits are carried along the outside of each panel on

porcelain insulators, jacks being provided for the insertion of series lamps. Taps from a balanced three-wire system are arranged for the multiple equipments. The multiple circuits are laid out as return loops, thus equalizing the voltage drop, and from these all taps are carried to double-pole knife switches mounted on the side of the panel base and including an ammeter jack in each tap. The multiple lamps are hung on 18-in. centers and the series lamps on 20-in. centers. The lamps are hung with their tops about 6 ft. above the floor and a guard rail is provided in front of the series section of the frame to safeguard persons approaching it. A special 6.6-amp direct-current circuit is run from the arc-lamp shop to the laboratory in underground cable, a short-circuiting switch being placed on the test frame for this service. Two tub transformers, of six lamps and twenty-five lamps rating respectively, are mounted in the arc-lamp shop to provide current for series-lamp testing, and a rectifier installation is included for direct-current work. The shop is supplied with 115/230-volt, three-wire, direct-current service; with three-phase, 220-volt energy, and with single-phase, three-wire, 110/220-volt energy, the latter being used for operating small motors.

Unit lamp racks are a striking feature of this depart-



FIG. 19—GENERAL VIEW OF ELECTRIC GARAGE, EDISON SERVICE BUILDINGS



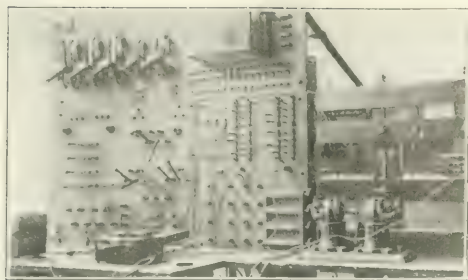


FIG. 20—SWITCHBOARD IN METER SHOP

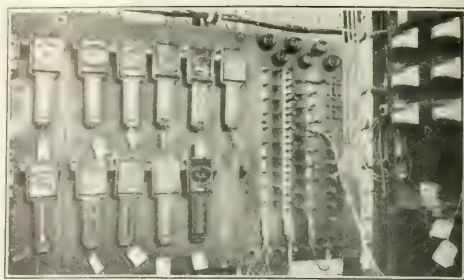


FIG. 22—DEMAND-METER TEST PANELS

ment. These are built of structural-steel channels and angles, the standard sections being 10.5 ft. high above the floor, arranged in three tiers and fitted with hooks 10 in. apart horizontally, there being two rows of hooks per tier. A section 14 ft. long carries ninety-six lamps. The horizontal members of the frame are built of 2-in. by 2-in. by 3/16-in. angles; the columns are of 4-in. by 1 1/2-in. channels, from 3/8 in. to 1/4 in. thick, and the horizontal members are tapped every 2 in. to enable the hook spacing to be varied if desired. Each tier is 3 ft. 6 in. high. The shop contains one rack for repaired lamps, situated near the central entrance so that time is saved in withdrawing such stock for field service, and one rack installation for defective lamps, the capacity of the latter being 300 lamps when hung 10 in. apart on centers. The defective-lamp rack is served by a ladder running between adjacent stands, and all such racks are anchored into the ceiling by appropriate structural connections.

A section of the shop is set aside for the repair of flatirons and time switches, with stock bins for small parts. Excellent facilities for bench work are also provided. Carbons, globes and other fittings are stored in racks in a screened-in stockroom at one side of the shop, with movable-ladder service and tanks for globe washing. The latter work is done by a brush belt driven by a 1/6-hp motor, the brush being 3 1/2 in. in diameter and 5 1/2 in. long and able to care for 200 inner globes per hour. A special eighteen-compartment adjustable storage bin for carbons is in use. Baskets holding twenty-four inner globes each are filled in this department. The inner globes are sent out with the lower electrodes in place to save time in the field.

The shop equipment includes a 14-in. engine lathe driven by a 1.5-hp motor through a belt whose horizontal and vertical tension adjustment can be made by set screws while the machine is running; a bench grinder with polisher and emery wheels mounted on a single shaft and direct-driven by a 3/4-hp motor; a 1-hp motor-driven jeweler's lathe and small drill, and a dust extractor for arc-lamp cleaning. The latter consists of

two metal compartments 7.5 ft. long over all, each forming a tapering funnel leading to an exhaust pipe equipped with a 12-in. "Massachusetts" fan directly driven by a 1.5-hp motor which forces the dirt out of doors when dislodged from the lamps by compressed air. The lamps are hung by hooks 14 in. apart on pipe carried across the top of the cleaning chambers, and bulky material is caught on screens at the bottoms of the chambers, the heavier dirt falling into receptacles. The screens are each 16 in. by 41 in. in dimensions and of 5/16-in. mesh; the cleaning chambers are 38 in. high, and the compressed air is delivered at 25 lb. pressure from hose nozzles connected with outlets near the two compartments. An acid room for globe cleaning is also provided. This has two sinks and a vat and is ventilated by connection to an exhaust-fan system.

#### Meter Department

The meter department occupies the space in Building No. 3-1 adjoining the arc-lamp shop and contains a general testing room in which are two alternating-current series meter test boards able to care for twenty-four meters each, a test board for individual meters of alternating-current and direct-current design, a direct-current meter test board, portable resistance test board, experimental quarters, japping space, and a vault containing distribution cabinets, rheostats, standard meters and special relay apparatus. All new meters are received and unpacked in the stockroom of the supply department and are then sent to the meter division for serial numbering and testing. The company uses both the indicating-instrument and rotating standard methods, and in the meter shop a special series method. About 20,000 meters are tested annually, and in the early fall 1000 meters are tested per week. Alternating-current meters are tested twelve at a time and direct-current meters five at a time. The equipment of the division for this rapid production is unique in central-station practice.

Series tests on alternating-current meters are conducted on two duplicate switchboards, each of which is

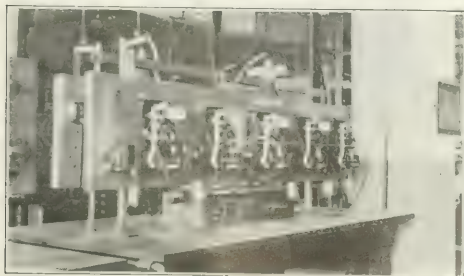


FIG. 21—SUSPENDED METER TEST BOARD



FIG. 23—PAINTING METERS WITH AIR BRUSH

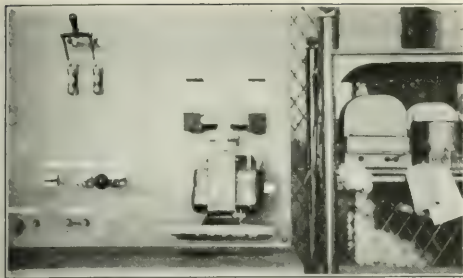


FIG. 24—SERIES-TRANSFORMER TEST PANEL

about 25 ft. long and holds twenty-four meters. In series with the meters under test is a master meter equipped with a contactor which makes a circuit for a short interval once each revolution. In making a test the observer presses a button on the test board, and when the circuit is completed by the contactor in the master meter the potential coils of the meters under test are energized by a special solenoid switch. The meters immediately begin to run. On the next and each succeeding contact of the master meter a ratchet is advanced one tooth, and after the meter has completed a certain number of revolutions, depending upon the meter under test, an arm on the ratchet operates a relay which opens the circuit of the solenoid switch and stops the meters.

The revolutions of the master meter on a full-load test are such that the meters under test will run exactly ten revolutions if correct. The meters are all started with a mark on the disk opposite a reference mark, and if they are correct the two marks are in alignment when the meters stop. The percentage error can be measured by a template, a disagreement of 1.5 in. being the equivalent of only 1 per cent error. On light-load tests only two revolutions are made and on power-factor tests ten revolutions. One man can test 120 induction meters per day with this equipment. The master meters and automatic contact equipment are all placed in the vault under glass, performing their services upon the mere pressing of a button.

The series boards are designed for the minimum number of switches, plug and clip contacts being freely used. A working shelf 15 in. wide is provided, at a height of 3 ft. above the floor. The board has two sections, one for 5-amp and the other for 50-amp maximum tests. Adjacent meters are connected by short jumpers, and the potential coils are connected with outlets at the top of the board by plugs and lamp cord, the series connections at the end of each group being plugged into receptacles near the bottom of the panel. At the center of the board are double-throw switches for variable-load and power-

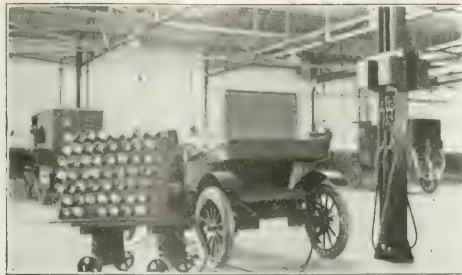


FIG. 26—BATTERY-DISCHARGING LAMP RESISTORS

factor tests. Fractional load tests are run at 20 per cent of rating, and the power-factor tests include 100 per cent and 50 per cent values. Ground tests can also be made at each board. Four buttons are sufficient to operate the automatic relays and master meters from convenient locations, and the operating simplicity of the boards in relation to the comprehensive results attained is remarkable.

The combination alternating-current and direct-current meter test board contains four panels for meters and one for series-transformer tests. Each of the former is provided with terminals from which different alternating-current pressures can be obtained, contacts for direct-current supply, and throw-over switches for carrying on tests under full-load and light-load conditions, at unity and 0.5 power-factor. The rotating standards are carried in boxes below the shelf and are read through openings in the latter. The series-transformer panel is also equipped with switches giving full and light load connections, with power-factor test. A special feature is the arrangement of copper clips 2 in. wide and 0.25 in. thick, 7 in. between centers and 6 in. high, on the front of the panel, so that a series transformer under test can be hung in place and the necessary contacts made between its terminals and the clips without the use of wiring or binding posts.

Four direct-current meter-test panels are provided in the meter division, each holding five meters and being suspended by piano wire, with a 50-lb. weight at each end to prevent swaying. The panels are each 18 in. high and 6 ft. 9 in. long and may be leveled by adjusting an arm connected with the weight at either end under the table below the suspended panel. Adjustable lamp holders are provided for each panel above the meters, a 25-watt lamp in a conical shade sufficing for the work on each panel. The room also contains a switchboard 14 ft. long and 4 ft. high used in testing Wright demand indicators, the board holding forty of these instruments placed 14 in. apart between centers. The instruments under test are hung on contact clips on the board, and

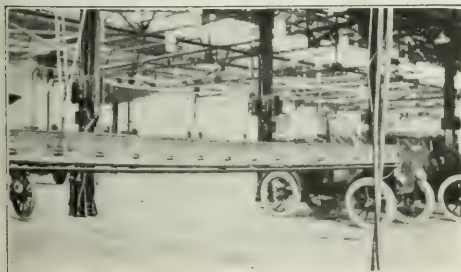


FIG. 25—REFLECTOR LAMPS FOR CAR WASHING

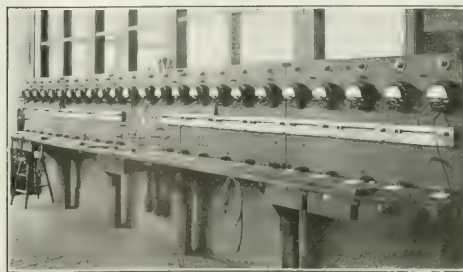


FIG. 27—SERIES ALTERNATING-CURRENT TEST BOARD



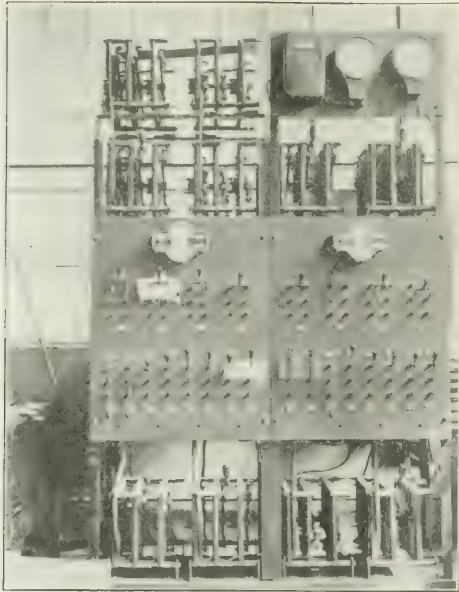


FIG. 28—"HOSPITAL BOARD" IN BATTERY ROOM

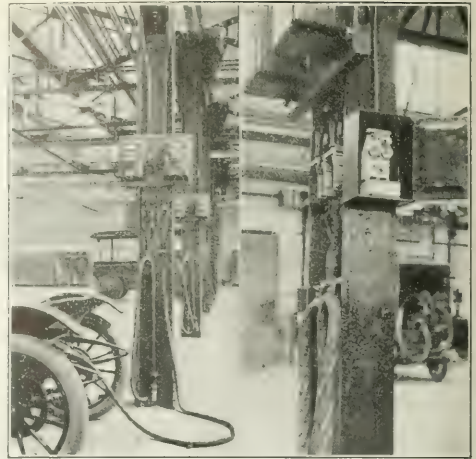
the circuits may be subdivided as occasion requires by switches on the end panel. Twenty indicators are usually tested at once, the run being for half an hour on a load which is adjusted by raising and lowering iron-wire cores in groups of reactance coils mounted against the wall. The cores can be set at any position by locking a handle eccentrically mounted against a corresponding piece of window cord which is run to the side of the switchboard over pulleys. A transformer giving about 500 amp maximum on the secondary at about 22 volts is installed for demand indicator tests. A buzzer connected with the relay vault service is automatically sounded every half hour to indicate the termination of the test.

The air-brush method is used for all painting and numbering of meters. The meter is placed in a sheet-iron ventilated box and the coat sprayed upon it by compressed air. Twenty-five meters have been stenciled in twelve minutes, compared with two hours by the former method of pasting on figures by hand. The division research room is equipped with a special test board used in calibrating relays, connected with the standard clock service of the laboratory, and wired for various voltage and current tests.

#### Incandescent Lamp Division

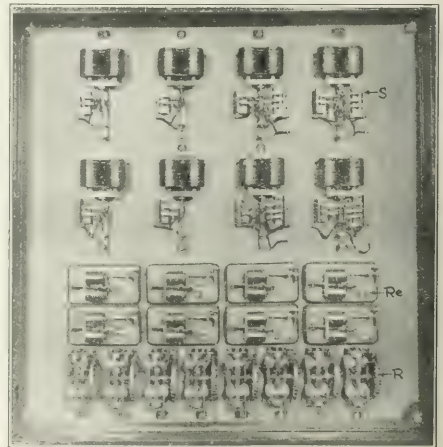
The incandescent-lamp division handles every detail associated with the supply of lamps to the company's customers and property, and maintains close relations with the stockroom, besides keeping exhaustive records of all installations and making tests of and classifying returned lamps. A force of forty-four employees is required in this division, including twelve in the office, seven in the stockroom and twenty-five on delivery work. Thirteen other employees in the suburban stores give a portion of their time to the division. Last year the company handled about 1,250,000 lamps. A stock of 300,000 lamps is carried by the company at the service buildings.

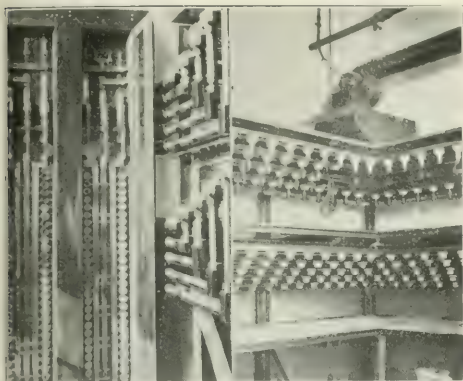
The quarters of the division include a photometer room, a general inspection room and a coloring room.

FIG. 29—TYPICAL CHARG-  
ING PANELFIG. 30—EXPLORING-LAMP  
TERMINAL BOX

The coloring room is of unusual interest and is about 15 ft. square. It contains a  $\frac{1}{4}$ -hp motor-driven exhauster and a lamp-dipping rack having a capacity of 700 outlets installed in two tiers, staggered and set in inclined banks over sand trays 30 in. wide. The lamp outlets are set 6 in. apart on centers; the banks are 12 in. high, and the clearance is 12 in. between the bottom of each bank and the tray below it.

The rows of lamps in each bank are about 7 in. apart, and the outlets are wired in thirty circuits from a panel box near the entrance of the room, each circuit being run in conduit to the nearest point on the rack and thence carried in sheet-metal channels to the group of outlets fed by it. The rack is about 4 ft. high over all and 26.5 ft. long, being carried around three sides of the room. All outlets and channels holding conductors are supported by an angle-iron structure 7 ft. high. With this arrangement the coloring material is applied to the lamp, while the latter is burning, by means of a receptacle which is pushed up to surround the bulb with

FIG. 31—AUTOMATIC EQUIPMENT FOR CONTROLLING METER  
REVOLUTIONS IN SIMULTANEOUS TESTING



FIGS. 32 AND 33—DISTRIBUTION PANEL AND LAMP-COLORING RACKS

minimum loss of time, and the drying process is much expedited, the average being about half an hour. Each circuit is separately fused.

The stockroom is arranged for the utmost convenience of handling supplies between the spur track entering Building No. 3-1 and the various departments. A chute is provided for delivering material in bulk to the basement, and a large space is available for carrying meters, lamps and other equipment and supplies for prompt shipment by means of electric trucks from the adjoining driveway. A typical meter rack is 10 ft. high by 15 ft. long and holds 440 5-amp meters hung 8 in. apart on centers. The rack is built of steel plates and angles and is 4.5 in. wide, the meters being hung in ten tiers on adjustable screws, so that any rack may be adapted to meters of different size. A typical arc-lamp rack, 15 ft. long and 10.5 ft. high, holds 108 lamps of the 6.6-amp magnetite type, spaced 18 in. apart on centers, the rack being built of angle-irons and 18 in. in width. An electric freight elevator is also provided for the stockroom.

#### Transportation Department

The automobile equipment of the company now consists of 141 machines, of which 81 are electric vehicles ranging from 700 lb. to 12,000 lb. in capacity. Twenty-

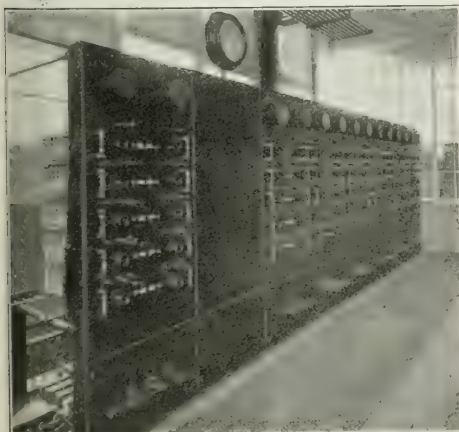


FIG. 34—EIGHT-PANEL SWITCHBOARD INSTALLED IN ELECTRIC GARAGE



FIG. 35—REPAIR SHOP IN ELECTRIC GARAGE

four of the "electrics" are passenger cars. Of the total equipment, 80.5 per cent is garaged at the service buildings. All departments of the company use the service of the transportation department, but the principal demand comes from the installation, maintenance, soliciting, collecting, electrical engineering, construction and generating departments. The garage is 336 ft. in length and 110 ft. wide, with a frontage of 110 ft. facing Massachusetts Avenue. Building No. 4 is three stories in height and contains offices for the car dispatchers, a gasoline garage, repair and paint shop, chauffeurs' assembly room, dormitories and storage room for robes, etc. A 5-ton Otis electric elevator connects the ground floor with the two upper stories, the platform measuring 11 ft. by 22 ft. in dimensions.

The gasoline garage is provided with a fireproof oil room where greases, oils, alcohol, etc., are stored. The repair shop, on the third floor, handles the maintenance of both gasoline and electric vehicles.

#### Electric Garage

The electric garage, comprising the larger part of Building No. 4-1, is 256 ft. long by 110 ft. wide and has a capacity of 110 vehicles without banking. The doors leading into the garage from the covered driveway between the garage and the stock house are hinged at their tops and balanced so that they can be operated with the utmost ease. Each car is assigned to a permanent stall or charging station. Each stall carries the car number and a circuit number which are repeated at the charging panel on the main garage switchboard. On a typical interior column are mounted four watt-hour meters, four sets of 100-amp fuses, four switches and four charging plugs, the instruments being carried on two panels 18 in. by 24 in. in dimensions and at a height of 6.5 ft. above the floor. A 7-in. by 9-in. outlet box for exploring-lamp service is also provided. A useful equipment employed at several points is a trough reflector containing fifteen lamps of 25 watts to 60 watts rating, spaced 12 in. between centers and raised or lowered by ropes carried to near-by columns. These reflectors are tin-lined and are of great convenience in car



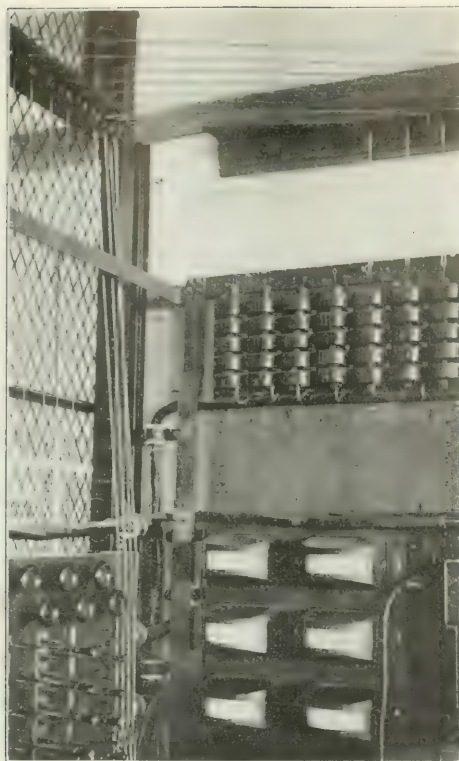


FIG. 36—ADJUSTABLE REACTORS, METER SHOP

washing. The garage floor is of concrete and is drained to the sewer at numerous points. Charging points are also installed on the garage walls. Each washstand is fitted with two independent swivel outlets, and two washers can work on a car independently.

The main switchboard is housed in a fireproof room 30 ft. long by 16 ft. wide and consists of eight panels mounted on a platform 12 in. above the garage floor. The charging circuits are carried to the stalls in the garage in conduit run under the floor. Cars are grouped so that each panel serves batteries of the same voltage. By the three-bus arrangement referred to in the description of the substation, the buses are normally supplied at 90 volts or 125 volts, and by double-throw switches at the bases of the panels any charging circuit can be supplied at either voltage. Additional voltage regulation is obtained by rheostats mounted behind the switchboard, and the circuit fuses are also situated here, being readily accessible for replacement. The buses at the rear of the board have cross-sections capable of carrying 4000 amp, and the rheostats are so arranged that any one may be removed without disturbing its neighbor by taking out three small screws and a taper pin. The heat dissipated by the rheostats is removed by a motor-driven fan at the top of the switchboard room. The design of the substation and switchboard enables the company to secure a high degree of efficiency in the charging of its vehicle batteries.

A separate room about the size of the switchboard room is set apart for battery maintenance. A concrete bench large enough to carry twelve vehicle batteries is installed along one wall. At one end of the room is a

so-called "hospital board" carrying a recording volt meter and ammeter, rheostats and switches, with a watt-hour meter for testing defective batteries and securing complete records of performance during charge and discharge. Two circuits are connected to the main garage switchboard, and if desired any battery can be discharged through the rheostats controlling the charging circuits throughout the garage. A gas-fired steam boiler is located in the battery room, steam at 90 lb pressure being used in connection with a  $\frac{1}{8}$ -in. hose nozzle in cleaning Edison cells. A gas-heated distiller is also in service, its total capacity being 250 gal. per day.

The garage equipment includes a special portable lamp resistor, consisting of 112 32-cp incandescent lamps mounted in rows of eight, on a frame of triangular section 3 ft. high and 3 ft. wide at the bottom. The frame in turn is carried on a hand truck 2 ft. above the floor level. The frame carries a volt-ammeter, and a Weston ammeter is mounted on an intermediate shelf. By adjusting individual lamps in their sockets and by tightening up and loosening fuses in each row the resistance of the outfit can be varied as needed. The apparatus is useful in discharging vehicle batteries either on the car or on the bench, when batteries are under special observation. The length of the lamp bank is only 4 ft.

In the concluding instalment of this article the standardizing laboratory will be described. This building contains elaborate equipment for standardizing and testing work, high-tension investigations, photometering chemical analysis, photographic work, etc.

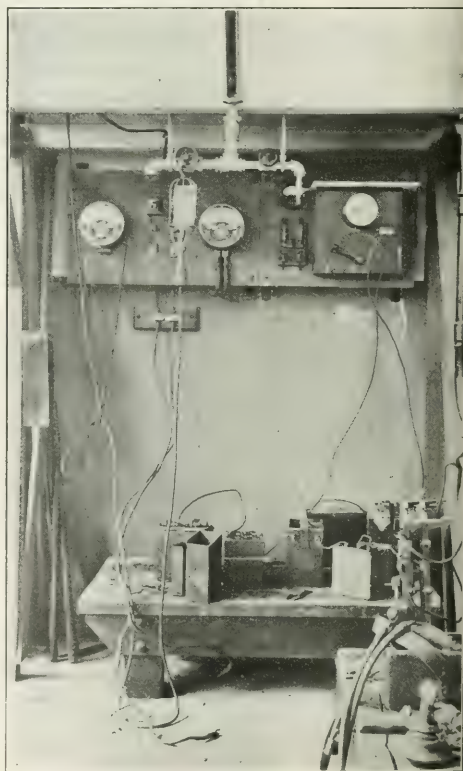


FIG. 37—BOARD FOR SINGLE-CELL TESTS, BATTERY ROOM

# The High-Efficiency Tungsten Lamp in Photography

An investigation of the actinic value of the radiation from the gas-filled tungsten-filament lamp. By M. Luckiesh

THE recent great increase in the efficiency of tungsten lamps of large size has opened new fields for the incandescent lamp, one of which is photography. Owing to the higher operating temperature of the filament, the actinic value of the radiation is considerably greater than that of the older types of tungsten lamps. Therefore the new lamps are interesting from the viewpoint of photography.

In a great amount of photographic procedure only the rays of wave-length from  $0.30 \mu$  to  $0.50 \mu$  are of importance. In fact, the ultra-violet radiation in daylight ends at approximately  $0.30 \mu$  (about  $0.295 \mu$ ), the rays of shorter wave-length being absorbed before reaching the earth. Glass begins to absorb ultra-violet

and  $0.50 \mu$  the 0.5 watt per horizontal candle lamp is far richer than the old tungsten lamp operating at 1.25 watt per horizontal candle. The distributions of energy in average daylight and blue sky are shown for purposes of comparison. These curves are the means of the observations of various investigators as collected by Ives.<sup>1</sup> Daylight varies so with time and place that only the most general conclusions can be drawn from the "average" curves. It is exceedingly interesting to compare the spectral distribution of energy in the old direct-current carbon arc with that of the "half-watt" lamp. The circles in Fig. 1 indicate the relative energy values in the direct-current arc as found by Ives. These curves have been plotted with equal energy values of the radiation of wave-length  $0.59 \mu$ . By doing this the energy values of the various curves at any wave-length can be compared upon the basis of approximately equal luminous intensities. When it is remembered that the relative amounts of energy of any wave-length determine the relative actinities of the sources at that wave-length the curves in Fig. 1 will be found useful in selecting illuminants for photographic purposes or in roughly estimating exposures.

There is no standard unit of actinicity, and hence the actinic value of the radiation from an illuminant cannot be measured in standard absolute units. Moreover, the actinic value of radiation depends upon the kind of plate or sensitive paper used, and in actual practice of course depends upon the character and quantity of rays reflected from the object which is illuminated.

For these reasons a few experiments have been chosen which would represent the general field of photography. Daylight being so variable, it was decided to compare the tungsten lamps with the glass-tube mercury-arc lamp which is extensively used for photographic purposes. First a very common plate (Seed 26) was chosen. This plate was placed behind a sector disk with ten openings varying in size from 10 deg. to 180 deg. The plate and disk were inclosed in a velvet-lined box with a small aperture in one end covered with ground opal glass which was chosen after finding that it transmitted practically the same rays that clear glass transmits and in the same relative proportions. This ground-glass aperture was necessary in order to obtain well-defined circular strips on the photographic plate and also to cut down the light so that a reasonably long exposure could be given. The exposure time was constant, and the illumination on the ground opal glass was kept constant for the various illuminants, the photometric measurements being made with a direct comparison photometer. Several plates were exposed for each illuminant with the usual unexposed "fog strip" on each. These were developed under the same conditions and finally measured for transparency by means of a Martens polarization photometer. In order to interpret the data the following definitions are presented:

<sup>1</sup>"Color Measurements of Illuminants," Herbert E. Ives, *Trans.*, I. E. S., March, 1910.

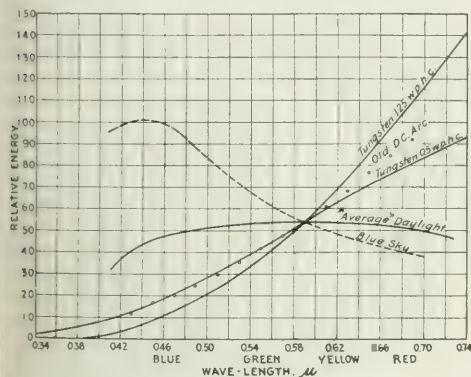


FIG. 1—SPECTRAL DISTRIBUTION OF ENERGY IN THE RADIATION FROM VARIOUS SOURCES

rays at  $0.35 \mu$  and completely absorbs all rays shorter than about  $0.30 \mu$  in wave-length, so that among the available artificial light sources for photographic purposes only the bare arc lamp and the quartz mercury arc supply radiation of extremely short wave-length. The "visible" spectrum, or the range of rays to which the retina responds, can be taken for practical purposes to be between  $0.39 \mu$  and  $0.76 \mu$ . In orthochromatic photography where it is desirable to render the photograph in true relations of values, or light and shade as seen in the subject, only rays in the visible spectrum should act upon the photographic plate and these should act in proper proportions. This is also true in color photography. In other words, to render true values the plate must "see" light just as the eye sees it. Of course, the spectral sensibility of photographic plates can be altered in several ways, a convenient one being found in the use of filters.

Owing to its continuous spectrum the tungsten lamp radiates all the rays desired in photography. However, the spectral distribution of these rays is of importance. In Fig. 1 are shown the relative distributions of energy as found in the spectra of several illuminants. It is seen that in the region between  $0.35 \mu$



$$\text{Transparency} = T = \frac{\text{light transmitted}}{\text{light incident}}$$

$$\text{Opacity} = O = \frac{1}{T}$$

$$\text{Density} = D = \log O$$

In Fig. 2 are plotted the results obtained with the mercury vapor tube and 0.5 and 0.75 w.p.h.c. tungsten

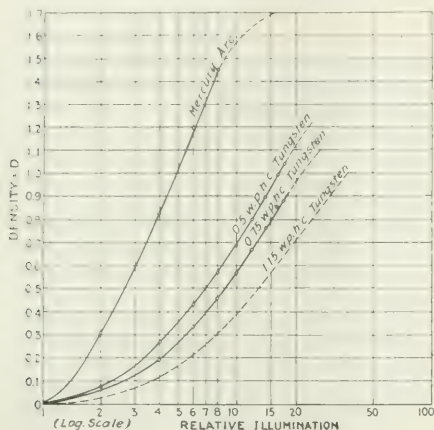


FIG. 2—RELATIVE ILLUMINATION

lamps. The dotted curve represents the comparative results with a 1.15 w.p.h.c. tungsten lamp. These data were not obtained in the same manner as the data represented in the other curves. They have been reduced to be quite comparable with those of the other curves. The relative photographic values of these illuminants, of course, depend upon the point where comparison is made. It is recognized that in general the region of correct exposure is the approximate straight-line portion of the density curve, the relative illumination values being plotted on a logarithmic scale. In the region of correct exposure it is seen that the photographic value of the 0.5 w.p.h.c. tungsten lamp is from about one-half to one-third that of the mercury vapor tube (for this very commonly used plate) on the basis of equal illumination as measured with a direct-comparison photometer. This relative value ranges from one-third to one-fourth for the 0.75 w.p.h.c. tungsten lamp. Of course, these figures depend somewhat upon time of exposure and development. In fact, it is very difficult to arrive at an absolute comparison, but the foregoing is sufficient for practical photography. It is thus seen that for equal densities two or three times the illumination is required of the "half-watt" lamp for equal exposure times, or for equal illuminations (visually measured) equal densities will result from practically two and one-half to three and one-half times the exposure to 0.5 w.p.h.c. tungsten light. Here it should be noted that the law relating intensity of illumination and time of exposure with photographic action is  $IT^p = \text{constant density}$  for the region of correct exposure; that is, the photographic action increases more rapidly with increasing illumination than with increasing time of exposure. This is evident from the fact that  $p$  is usually less than unity, ranging from 0.7 to 1.

Various other tests were made with a 500-watt tungsten lamp burning at 0.5 w.p.h.c. (22 lumens per watt). It was found that instantaneous photographs could be obtained with the source at a distance of 6 ft. The

lamp was used without a reflector. If an ordinary reflector had been used, the intensity of illumination would have been approximately doubled, thus decreasing the time of exposure. With subjects of high reflecting power, such as white and gray objects, satisfactory photographs were obtained with exposures as short as one-tenth of a second with the lens diaphragm at F 4.5. Satisfactory photographs could be obtained with any ordinary subject in less than one second with the bare lamp 6 ft. from the subject. The mercury-vapor lamp used in this work was a studio lamp with reflector and containing one mercury tube. This was rated at 3.5 amp, 110 volts, and was operated normally. With bromide paper it was found that from three to four times as long an exposure was required with the 0.5 w.p.h.c. tungsten lamp as with the mercury-vapor lamp.

As a possibility in orthochromatic photography the new lamp is worthy of consideration. For spectrographic work the Cramer spectrum plate is quite satisfactory. Its sensibility to rays throughout the spectrum as determined by the writer is shown in curve A of Fig. 3. This curve represents the relative opacities of the plate resulting from equal exposure to equal amounts of energy of the various wave-lengths. For purposes of photographic photometry a filter has been made which alters this sensibility curve to that for the average eye as shown in Fig. 4. The circles show the approximation of this visual color filter to the ideal curve represented in the full line. With this filter applied to the aforementioned "spectrum" plates the true relations of values or light and shade are reproduced upon the plate as opacities. However, in order to render these values as usually seen in daylight use must be made of either the latter illuminant or another source with a continuous spectrum properly corrected by means of a color filter. The new lamp apparently can compete with carbon-arc lamps for this purpose. The mercury-arc lamps cannot be used for this purpose ow-

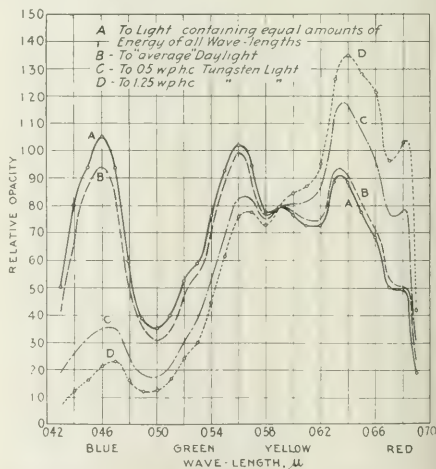


FIG. 3—SENSIBILITY OF CRAMER SPECTRUM PLATE

ing to the discontinuous nature of their spectra. Curve B is the computed opacity curve resulting from the incidence of the average daylight spectrum upon the plate, and curves C and D are the respective opacity curves for the spectra of the 0.5 w.p.h.c. and 1.25

w.p.h.c. tungsten lamps. These are the results when the energy at  $0.59 \mu$  is of the same value in the three illuminants. This means roughly the same total illumination of the integral visible light. In the extreme blue region it is seen that the effectiveness of the light from the high-efficiency tungsten lamp is twice that of 1.25 w.p.h.c. tungsten lamp for this "spectrum" plate.

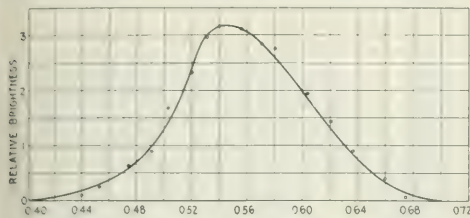


FIG. 4—SENSIBILITY OF EYE AND COLOR FILTER FOR ORTHOCROMATIC PHOTOGRAPHY

In the extreme red region the difference between the effectiveness of the latter light and daylight is about halved by the high-efficiency tungsten lamp. These curves show that the new high-efficiency tungsten lamps are to be considered as factors in photography requiring true reproduction of values.

In color photography there is also noted the superiority in the color value of the new lamp compared with the older incandescent lamp. Color photography is now being used by lighting specialists in recording the illumination resulting from various systems and for other commercial purposes. Perhaps the most commonly used plate is the Lumière plate, consisting of a layer of transparent colored starch granules which are sensitized. These plates cannot render absolutely correct color values but are found to be satisfactory for many practical purposes. With daylight a yellow filter is necessary while with artificial light sometimes a blue-green filter is necessary. With the high-efficiency lamp some operators claim it is necessary to use a light yellow screen. However, satisfactory pictures can be obtained without a filter.

It is thus found that the high-efficiency tungsten lamp operating at 22 lumens per watt is a valuable source of light for photographic purposes, it being from one-half to one-third as effective with ordinary plates as the mercury-vapor lamp for equal times of exposure and from one-third to one-fourth as fast as the latter lamp with bromide paper. Its speed for the ordinary plate would be about the same as for bromide paper. For blueprinting the new lamp shows promise, although means must be developed for decreasing the exposure time, which for practical reasons cannot be lengthened materially. In spectral distribution of energy it corresponds closely to the old direct-current open-arc lamp. In orthochromatic photography the new lamp can be used very advantageously owing to the continuity of its spectrum, its steadiness of operation and its color value. In color photography where a steady artificial light is required it should also prove satisfactory. It has been shown that from the standpoint of actinic value the new high-efficiency tungsten lamp is an important factor in photography. Although some artificial sources emit relatively more actinic rays per watt than the new lamp, the latter will find favor owing to its steadiness of operation, constant actinic and color value, the continuity of its spectrum, and its ready adaptability to any position or to use in portable outfits.

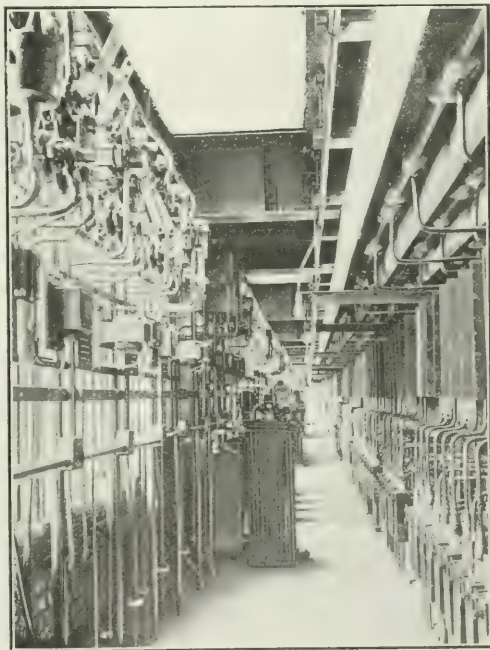
Moreover, the ease with which light from the high-efficiency tungsten lamp can be concentrated upon the

object to be photographed overcomes the handicap due to the lower actinic value of its light. In fact, the incandescent lamp can be placed in a parabolic reflector, thus obtaining a very high utilization efficiency, making this lamp a worthy competitor of any illuminant used in ordinary photography. The writer has developed a glass which reduces the luminous rays without affecting the actinic value of the light for ordinary plates. This glass can be used to avoid glare when it is necessary to illuminate highly a subject for comparatively short exposures.

The writer is indebted to Mr. F. E. Cady for the data regarding the distribution of energy in the radiation from the high-efficiency lamp, and to Mr. Harold McMullen for assistance in the work, which was carried on in the Nela research laboratory, Cleveland, Ohio.

### Arrangement of Low-Tension Equipment

The relative arrangement of the 4000-volt buses and switches employed in the Commerce Street station of the Milwaukee (Wis.) Electric Railway & Light Company combines safety, accessibility and economy in copper. The buses, which are in duplicate, are arranged horizontally just below the ceiling of the low-tension gallery directly over the low-tension disconnecting and oil switches. Vertical concrete barriers separate the



OVERHEAD BUS STRUCTURE, OIL SWITCHES AND FEEDER REGULATORS AT COMMERCE STREET STATION, MILWAUKEE

bus conductors, which are supported on porcelain insulators fastened to horizontal angle-irons hung from the ceiling girders. Short jumpers connect the buses, disconnecting and oil switches. The accompanying illustration gives an idea of the small amount of connecting cable which had to be used and the simplicity of the installation.



# Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods and Current Practice Among Successful Utilities

## Ten Million Breakfasts Daily Made by Central-Station Energy

To the Iowa Railway & Light Company belongs the distinction of operating from its electric-service mains what is said to be the largest cereal mill in the world, the Quaker Oats factory at Cedar Rapids, Ia. From this one concern the genial advertising man says that enough cereal products are produced in one day to provide breakfasts for 10,000,000 people. The mammoth size of the cylindrical elevators and grain-storage bins leads the casual observer to believe that this statement may be correct.

Prior to April 20, the mill was operated by energy generated in an isolated plant in which there was one 625-kva turbo-generator, one 1023-amp rotating-field alternator directly connected to a cross-compound engine, and one 1920-amp rotating-field alternator connected to a larger engine of the same type. All of the generators were of the three-phase type producing energy at 240 volts, sixty cycles. Steam for operating these units was supplied from a bank of water-tube boilers aggregating 1600 hp in rating. All of this equipment will now be removed from the factory as the Quaker Oats Company, in addition to purchasing electrical energy from the central station, is also being supplied with 25,000 lb. of live steam at 225 lb. pressure and 100 deg. superheat at the central-station end of the main. This steam is used for cooking.

On account of several peculiar engineering features involved the electrical equipment, replacing the steam station, is of particular interest. Since all generators in the main power house of the Iowa Railway & Light Company are of the two-phase type, energy is transmitted from the central station to the cereal mill over 5400 ft. of 750,000-circ. mil two-phase concentric cable. The energized conductors, together with a spare cable,

are laid in clay conduit at a depth varying from 2 ft. to 10 ft. Arriving at the mill, the conductors pass through potheads and an oil switch and enter a pair of 1500-kva transformers. These 1500-kva, sixty-cycle two-phase, 2300-volt, three-phase, 240-volt units have been T-connected to give the same low voltage on the secondary which was generated by the machines of the steam station. All 2300-volt wiring outside the potheads is done with conductors insulated with varnished cambric and asbestos flame-proof covering.

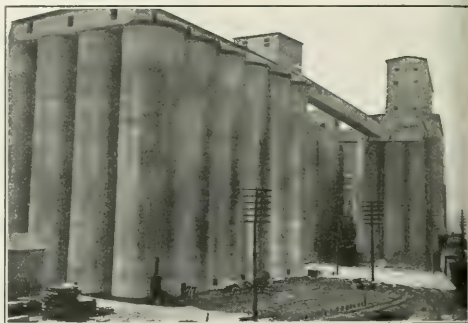


FIG. 3.—A PORTION OF THE ELEVATORS OF THE QUAKER OATS COMPANY

To transmit the output of these two 1500-kva units at 240 volts to the distributing switchboard 9 tons of 10-in. by 0.25-in. copper was required, although the distance traversed was short. A rack of seasoned timber was erected on 5-ft. centers along one wall of the former engine room to carry this unusual bus structure

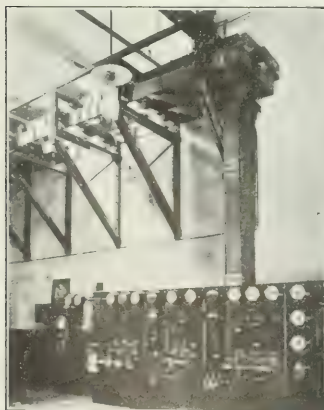


FIG. 1.—HEAVY COPPER BUS STRUCTURE AND THE SWITCHBOARD FORMERLY USED



FIG. 2.—METER AND CONTROL PANEL CONSTRUCTED FOR CENTRAL-STATION SERVICE

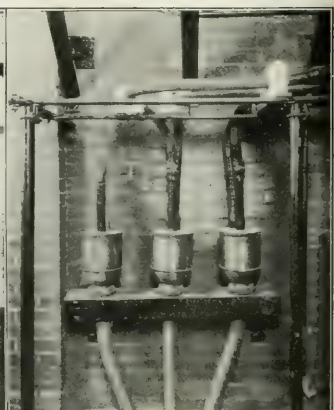


FIG. 4.—CABLE ENTRANCE, POTHEADS AND LEADS TO 1500-KVA TRANSFORMERS

the copper being set on edge in this framework and insulated from it by pieces of Alberene stone. Between the supports the copper is separated by means of spacer blocks and retained in position with clamps at 5-ft. intervals. The six disconnect switches in this heavy copper lead are of the 6000-amp multiple-blade, lever type with spade handles and are arranged two in paral-

It is also pointed out as further argument for this system that the men who have come to the new-business department from the meter department have without exception "made good," while the men who have been tried in the new-business department without the previous experience in the meter department have not come up to the standards of the company.

### New Business in Minneapolis

During the first six months of the year 1914 the Minneapolis General Electric Company secured an average of twenty-one contracts a week for wiring already-built residences. These additions were obtained without special effort being made by the company to get this class of business. During the week ended June 19 the sales department of the company closed 148 lighting contracts, requiring 123 kw, and fourteen "power" contracts, covering 563 hp in motors. For the period from Jan. 1 to June 19 the company's output of electricity showed an increase of 18.8 per cent over the corresponding period of 1913.

### A Smokeless Donkey Engine

Val. Jobst & Sons, building contractors at Peoria, Ill., are using a 20-hp, 500-volt direct-current motor for hoisting brick and building material for the two-story addition to the Jefferson Hotel in that city. In consequence the hotel guests can, if so inclined, enjoy sleep in the morning hours after the contractor's force of men has gone to work. The usual intermittent chug-

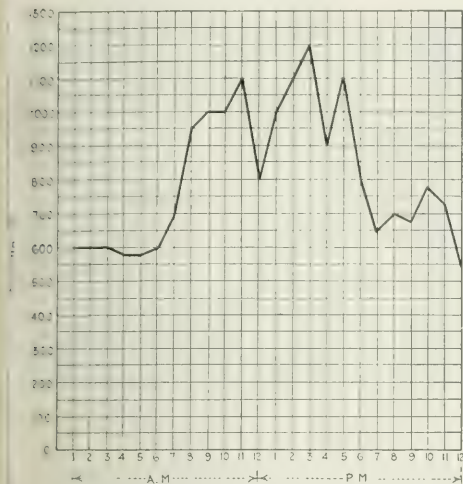


FIG. 5—LOAD CURVE FOR TWENTY-FOUR HOURS' OPERATION, QUAKER OATS COMPANY

el. The total connected load of the mill is about 4000 hp, the motor sizes ranging from 300 hp to fractional horse-powers.

The contract for this notable twenty-four-hour load or the Iowa Railway & Light Company was secured by Mr. William G. Dows, president and general manager of the company. The engineering features were worked out under the direction of Mr. John M. Drabelle, electrical engineer of the company. All apparatus was supplied by the General Electric Company.

### Organization of Meter Department at Kokomo, Ind.

The opinions of various central-station managers as to the relations which should exist between the meter readers of the company and the customers have served to provide an interesting discussion at many of the conventions where meter reading has been talked of. Not a few of the men who are in charge of the smaller stations throughout the country are of the opinion that the meter reader ought to have instructions not to converse with a customer on the subject of bills or of tests which have been made on the meter.

At Kokomo, Ind., it has been the aim of the management to organize the meter department and the complaint department of the company as a unit. The instructions to the meter-men are to the effect that they shall talk with the customers of the company and obtain the viewpoint of the public. The men are selected with the idea that they shall later become solicitors. Mr. P. H. Palmer, who is assistant general manager and superintendent of the lighting department of the Indiana Railways & Light Company at Kokomo, says that after a short experience in the meter department the men are able to smooth over most of the difficulties that arise between the customers and the company.



HOISTING ENGINE AND HOUSING FOR MOTOR

ging exhausts of the hoisting engine, as well as its soft coal smoke, is lacking.

When the same building contractor was at work on the Block & Kuhl Building in Peoria a strike of the hoisting engineers forced idleness upon all of the workmen. Appealing to the Central Illinois Light Company, however, the contractor learned that by belting a motor



to the flywheel of his engine, already in place, the hoist could be operated without a licensed engineer. Allowing the motor to operate continuously, the travel of the elevator was controlled by means of the levers and a clutch on the smokeless hoisting engine, a task for which little skill was required. Since this experience with hoisting engineers Mr. Jobst is fully convinced of the reliability of central-station service and employs electricity in place of steam whenever the lines of the electric-service company can be conveniently brought to his jobs.

### Selling Twenty-five Vacuum Cleaners a Month in a Town of 75,000

Since the spring of 1913 the new-business department of the East St. Louis (Ill.) Light & Power Company has sold on an average twenty-five electrically operated vacuum cleaners a month. To accomplish such results Mr. F. C. Pullen, sales manager for the company, keeps one man continually engaged at the work of selling appliances by house-to-house canvassing. This salesman has a rather unusual scheme for gaining admission to the homes of patrons who he thinks may be prospective appliance customers. When leaving the house of one "prospect" the salesman inquires concerning the friends of the housewife just visited, asking the names of those she thinks would be interested in some particular appliance. If possible, he gets her to write introductory notes to some of her friends on his business cards. Women are generally willing to write such notes, and sometimes as many as six introductions have been obtained from one visit. Each of these new prospective customers is in turn visited and a similar request after either a sale or a failure generally gives the salesman a complete list of women buyers in the neighborhood together with introductory cards to the majority. Such cards when indexed make valuable aids to the solicitor. However, the true secret of the campaign, says Mr. Pullen, lies in selecting a solicitor who is a "stayer" and whose personality appeals to womenfolk, so that permanent benefits can be obtained.

For a city of 75,000 the record of 900 old houses wired in East St. Louis since May, 1913, is also enviable. A simple wiring schedule and the co-operative efforts of contractors are said to be responsible for the success of the wiring campaign.



FIG. 1—COLONIAL "HOUSE OF EDISON LIGHT," ARLINGTON, MASS.

### A Colonial House with Electrical Equipment at Arlington, Mass.

The Edison Electric Illuminating Company of Boston, Mass., recently leased a typical Colonial homestead at Arlington, one of its suburban districts, and thoroughly equipped it with electrical household devices, which will be exhibited for some months in accord-



FIG. 2—DINING ROOM, SHOWING ELECTRIC COOKING UTENSILS, "HOUSE OF EDISON LIGHT"

ance with a plan developed about three years ago and since carried out at various important centers in the company's territory.

At this "House of Edison Light," as it is called, the company maintains a district office for handling receipts, lamp renewals and supplying information to the public, and the various chambers are provided with full line of portable heating devices, lighting fixture and other apparatus illustrating the convenience of electrical service in a mansion of the Colonial type. Special pains were taken to secure wallpaper and other furnishings accurate in every historical detail, and, as described in a recent issue of *Edison Life*, the house is much as Benjamin Franklin's home might have been had that distinguished philosopher pursued his studies as far as Thomas A. Edison. The house is under the control and management of the appliance-development department of the company.



FIG. 3—BEDROOM, SHOWING VARIOUS ELECTRICAL APPLIANCES, "HOUSE OF EDISON LIGHT"

# Illumination and Wiring

## Reduced Wattage with Overhead Lighting of a Tennis Court

BY S. L. E. ROSE AND C. S. VAN DYKE

The advent of the high-wattage tungsten lamp has made possible the successful lighting of outdoor tennis courts by units suspended overhead. Heretofore the general practice has been to place a large number of small units along each side of the court, although this arrangement involves putting more or less of the light sources in the field of vision at all times. About a year ago the writers of the present article lighted a tennis court by means of eight units placed four along each side. It was felt, however, even at that time, that if the units could be placed overhead the glare would be most entirely eliminated unless the player should look directly up into the units, which he need not do.

Almost any kind of lighting system is satisfactory for slow playing, but for fast play there are certain factors which must have consideration. Almost without exception after the ball has come over the net it is low the eyes of the player receiving it, and consequently the light on its top and front faces is of great importance. Usually the player returns the ball by striking it as it passes his side, so that with the side lighting system the units on one side of the court only are effective at any one time. It would, therefore, appear that equal visibility of the ball could be obtained from the overhead system with a lower energy consumption than with the side system.

Other advantages of overhead lighting would be the use of fewer units with a consequent lower first cost and lower energy consumption. The one disadvantage seemed to be that in lobbing the ball it might strike the pits or supports, but after talking this over with a number of tennis players it appeared that lobs formed a small percentage of the play and the chances of the ball hitting the units or supports were so small that they could be neglected. With these points in mind the illuminating-engineering laboratory of the General Electric Company, with the assistance of the Schenec-

tady Illuminating Company, started experimenting on lighting tennis court at the Mohawk Golf Club, Schenectady, N. Y.

Two adjacent courts were selected. One of these was lighted from the side and the other from overhead in order that a direct comparison of the two systems could be made. The side-lighted court had eight 400-watt tungsten lamps, in angle reflectors, placed four down each side, equally spaced in a row 6 ft. back of the side lines, and with the end units opposite the end lines of the court. The lamps were 20 ft. above the ground.

The other court was lighted by means of specially designed rectangular trough reflectors lined with mirror glass. Each reflector contained four 250-watt lamps, and a trial was made with three of these units suspended 30 ft. above the ground along the center line of the court. While the distribution of illumination was fair, it was not entirely satisfactory and the intensity was too low for fast playing, consequently the side-lighted court seemed to have the preference.

There were two ways of correcting these faults. First, by increasing the number of units, with a consequent increase in wattage, and, second, by suspending the units lower. Neither of these methods seemed desirable, however, from a practical standpoint. The perfecting of the high-wattage tungsten lamp solved the problem, and the Mohawk Golf Club now has one of the best lighted courts in the country, with a minimum number of units and considerably lower wattage than has been heretofore used.

The installation consists of four 1000-watt tungsten lamps each equipped with a BEE-1000 Holophane reflector and special skirt. The lamp filaments are 30 ft. above the ground and the units are spaced 28 ft. apart along the center line of the court, as shown in Fig. 3. The skirts are so designed that not only are the lamp filaments shielded from the eyes of the player, but the white porcelain-enamel reflecting surfaces are also shielded from view at all normal positions of play, unless one looks almost directly up into the unit.

In the daylight view herewith some of the construction work used when this court was lighted from the side can be seen, as well as part of the court which is still lighted from the side.



FIG. 1—LAMPS ARRANGED FOR OVERHEAD LIGHTING



FIG. 2—COURT LIGHTED FROM FOUR 1000-WATT LAMPS



The simplest construction for the overhead lighting system would be to set posts at each end opposite the center line of the court, suspending the units from wires stretched between the two poles. For convenience in replacing lamps provision might be made for lowering the units, but in the installation just described the units are rigidly suspended and replacements are made by using an extension ladder. Some slight changes are contemplated which it is thought will further improve the lighting of this court.

The surface of the court is very light in color so that it almost matches the color of the cover of a tennis ball when new. Experiments were made with tennis balls artificially colored to increase the contrast. Six colors were selected—purple, light blue, yellow, orange, pink and gray. From the few tests made to date, light pink or light blue give the best results of the colors tested. It is possible that for some other court where the color of the surface is different another color for the ball would give the best results. Some players, on the other hand, seemed to feel that the difference between the white balls and colored balls is not sufficient to warrant the trouble and expense of coloring the balls.

In the writer's opinion the overhead lighting is superior to side lighting, but in order to give the two

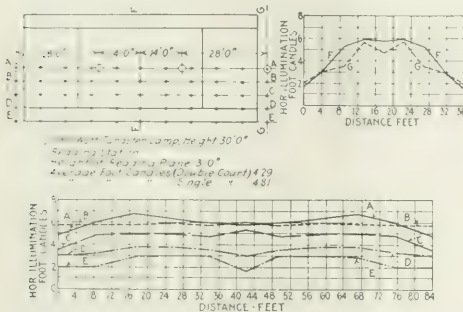


FIG. 3—RESULTS OF ILLUMINATION TESTS ON TENNIS COURT

systems a thorough and impartial comparison the eight outlets on the side-lighted court are to be equipped with 500-watt lamps. This will give equal wattage on the two courts, and after several months' play it is intended to get the opinions of expert tennis players who have used both courts.

#### Boardwalk Lighting at North Wildwood, N. J.

The accompanying illustration shows the new ornamental iron poles with inverted arc lamps for lighting the boardwalk at North Wildwood, N. J. The poles are placed in the center of the walk, and, aside from throwing most of the light on the boardwalk serve to separate the moving crowds into two groups, each keeping to the right of the walk in the direction of travel. The lamps are the General Electric Company's inverted magnetite 6.6 amp series type, and are placed 67½ ft. apart. The width of the boardwalk is 30 ft. The standards weigh 560 lb. each and are painted an old copper finish. They were furnished by the Elmer P. Morris Iron Works, Inc., of New York. Sherardized conduit and fittings were supplied by Messrs. Machold & Riddell, engineers, of Philadelphia, and the Standard Underground Cable Company furnished the lead-covered wire, which is No. 6 solid and insulated with oiled linen tested for 10,000 volts. The conduit and poles are connected together and grounded every fifth pole.

This method of lighting the boardwalk was recommended by Mr. J. Fithian Tatem, treasurer and manager of the West Jersey Electric Company at Wildwood, and



BOARDWALK, NORTH WILDWOOD, N. J.

the system was adopted after the Mayor and Council men, with Mr. Tatem, had inspected similar standards at New Haven, Conn.

#### Rehabilitating Service Centers in Chicago

As typifying the condition brought about at service centers by the gradual growth of customers' loads the accompanying photographic reproductions, Figs. 1 and 3, are interesting. These pictures were taken some time ago in the Art Institute on Michigan Avenue Chicago, and in the six-story office and warehouse building of the American Radiator Company in the same city. Since that time practically all service centers of the lines of the Commonwealth Edison Company have been receiving attention, with the encouraging result shown in Figs. 2 and 4.

At the old installation for the Art Institute (Fig. 1



FIG. 1—FORMER SERVICE CENTER AT ART INSTITUTE

the service wires entered the building by means of "Edison tubes," which, as older wiremen will remember consisted of three insulated solid-copper bars placed in an iron tube and surrounded by a sort of pitch compound. This service entry may be seen emerging from

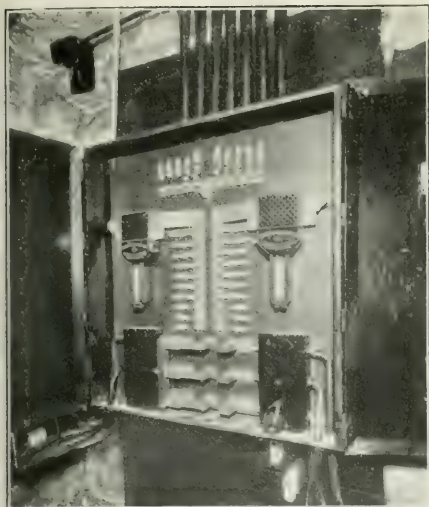


FIG. 2—NEW SERVICE CENTER AT ART INSTITUTE

a wooden box in the wall at the lower right-hand corner of the picture. The "Edison tube" service and another emergency service were connected through two maximum-demand indicators and distributed on branch circuits to the meters registering the energy consumption for the different departments of the Institute. Had the meters also been installed at the service center it is difficult to imagine just what sort of picture would have resulted.

Replacing this troubleman's nightmare, however, is

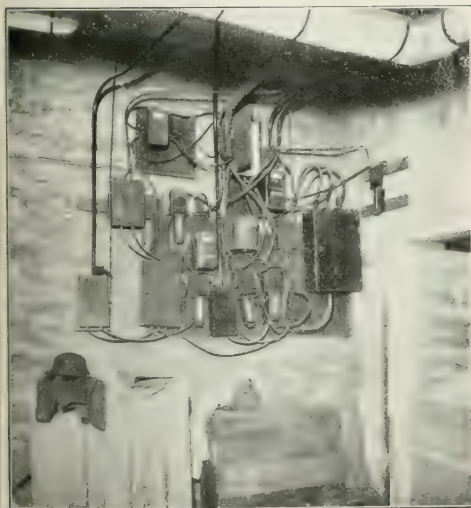


FIG. 3—FORMER SERVICE CENTER, AMERICAN RADIATOR COMPANY'S BUILDING

the installation seen in Fig. 2, which shows conditions remarkably improved. The "Edison tubes" and emergency entrance were taken out and two sets of lead-covered 1,000,000-circ. mil cables were laid in the tile conduit to bring energy to the Joleen service center.

Two new 1000-amp maximum-demand indicators were also installed. A feature of the new service center lies in the fact that the top and sides of the box consist of small plates which may be removed and drilled to allow the entrance of additional conduit of any size. As a labor-saver this idea will recommend itself to wiremen who have tried to drill conduit entrance holes in close quarters. The circuits leaving the service center feed the department meters as before.

At the building of the American Radiator Company (Fig. 3) the conditions existing were different and really somewhat worse. Although the service center distributed energy for but one customer, four meters and five maximum-demand indicators were in use as energy was being delivered for lighting, general motor-service, elevators and special motor applications under about four different rate schedules. The installation showed, however, what may happen as an electric-service customer gradually extends his business and increases his load.

In Fig. 4 again the Joleen service center was employed in effecting a reconstruction of the three-wire

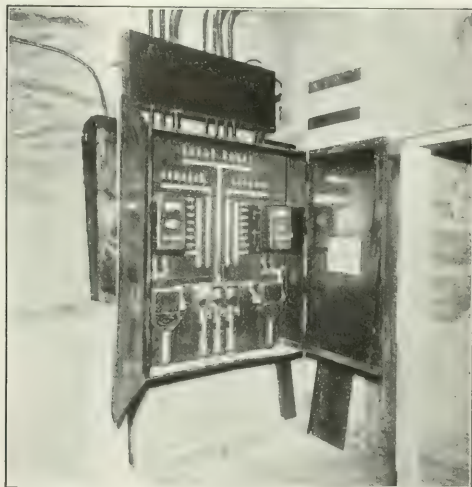


FIG. 4—SERVICE CENTER REPLACING THAT SHOWN IN FIG. 3

service. Reducing the number of meters and maximum-demand indicators to two each and inclosing all instruments and switches in the wall cabinet, a neat and reliable installation was made. This installation is also so equipped that future services can be added without trouble and without impairing what has been done. A desire for economy directed that as much as possible of the existing conduit and wire be used. To accomplish this saving a connection box was placed above the service center and the old wires brought into this box were spliced and the added pieces run through short conduits to the buses in the service cabinet.

### Arrangement of Pole-Top Equipment

With a view to providing greater safety to men working on its poles the Wichita Falls (Tex.) Electric Company arranges all junction boxes, oil switches and fuse boxes on the lower arms. In case of trouble, especially on rainy or windy nights, the lineman will therefore not be required to crawl through a network of wires to operate a switch or replace a fuse.



## RECENT TELEPHONE PATENTS

### Party-Line Call Bell

A patent recently issued to Mr. H. G. Webster, of Chicago, Ill., covers broad claims on a call bell designed to supplant the older type of harmonic polarized bell now in general use on four-party lines. As is quite well known, the older type of harmonic bell possesses several inherent faults, the best known among these being the cross-ringing. That is, when current applied was delivered at a frequency which was an even sub-multiple of the frequency for which the bell was tuned operation would result; for example, a 33.33-cycle bell will at times operate in response to a ringing current supplied at 16.66 cycles. Another fault perhaps not so generally known was the failure of the bell to ring when the ringing current was applied at a time when the reed was vibrating slightly. Under these conditions the reed would continue to vibrate at reduced amplitude, failing to ring the bell. These faults, the patent claims, have been eliminated in the new call bell.

By replacing the two electromagnets in the former polarized bell by a single electromagnet and a permanent magnet it is claimed that additional efficiency has been obtained. The magnetic pull on the armature of prior polarized bells has always been the result of differential magnetic fields. On account of the low efficiency of these ringers mean potentials as high as 175 volts have been required in telephone operation, at times causing considerable trouble owing to breakdowns in cable insulation. It is claimed that the new ringer will allow a reduction in the operating voltage, eliminating these troubles.

### Telephone Instruments and Attachments

The joint invention of Messrs. H. von Hoenberg and R. W. Pope, New York City, consists of a device for preventing the unauthorized use of transmitters. Over the mouthpiece is a plate which is locked by a set of concealed annular rings mounted concentrically with the mouthpiece and operating like a combination lock.

Mr. J. Frith, Bridgeport, Conn., has patented a hook switch which is manually controlled from an auxiliary latch independent of the receiver holder arm.

Contrary to the usual practice, Mr. E. Gransaul, New York City, has provided for mounting a telephone receiver in a stationary clamp and extending a sound tube and amplifier to the proximity of the user's ear, thus eliminating the necessity of holding the receiver while using the telephone.

## Letters to the Editors

### Transformers for Changing the Frequency

*To the Editors of the Electrical World:*

SIRS:—I am pleased to learn from the editorial in your issue dated May 30 that you believe there are possibilities for the application of the method of changing the frequency proposed by me, but I think it is a little unfair to characterize the efficiency of the arrangement as applied to lighting work as "low," and to suggest that it is doubtful "whether the efficiency can be raised to make the method practically serviceable on three-phase transmission systems." Surely, if I can obtain, as I hope to do, efficiencies of the order of 95 per cent on units of 500 kw, and 88 per cent on units as small as 30 kw, this method will compare at least quite favorably with existing methods of changing the frequency, in which the efficiency of the rotative apparatus is, I presume, distinctly lower than the above, and

which would no doubt require greater floor area and would, moreover—and this is very important—require the attention which all rotating machinery involves.

I am free to admit that the power-factor represents a considerable difficulty, but, fortunately for the scheme, methods for improving the power-factor by means of phase advancers applied to induction motors are now available at a cost which is really extremely low. As I have shown in the addendum to my paper, the cost is of the order of 0.12 cent per kw-hr. on a 7 per cent lighting load-factor, and about 0.04 cent per kw-hr. on a 25 per cent load-factor.

The idea would be that the company wishing to install the frequency changers would debit the frequency changer with the small charge representing the above, on account of phase compensation, and with the money so levied would introduce on the premises of the motive power users, free of cost to them, phase advancers arranged to give a small over-compensation.

I have shown, in my reply to the (British) discussion on the frequency changer, that where the motor load is in the same direction from the generating station as the lighting load, and on the further side of it, the poor power-factor of the lighting load can easily be compensated for, and even where it is on the other side of the town it is possible, by the introduction of phase advancers on the motor load, so to reduce the cost of the feeders for the motor load on that side of the town as to assist in paying for any extra cost of the feeders on the lighting-load side, which latter is, of course, only a small proportion of the total load.

Apart from this, I have, however, hopes of being able to improve the power-factor of the apparatus itself considerably, and there is always the alternative of being able to turn the current into triple-frequency extra high-tension current at the sending end and to step down the tension through single-phase transformers at the receiving end. These latter transformers would be very cheap owing to the high frequency.

Where, therefore, there is a large existing motor load, and the lighting load is only a small proportion of the total load, it should be quite practicable to install static frequency changers sufficient to deal with the lighting load without pulling down the power-factor of the system in the least.

*Birmingham, England.*

A. M. TAYLOR.

### Electricity and the Lightning Sign

*To the Editors of the Electrical World:*

SIRS:—Permit me to protest against the type of electrical advertising exemplified by the large sign exhibited on Broadway, New York, in which lightning is represented as dashing down the entire length of the sign and striking at the bottom of it with a tremendous crash, as described on page 1500 of your issue dated June 27, 1914. It undoubtedly does attract attention, but it leaves the impression in the minds of the public that electricity and lightning are closely allied, and such belief in the minds of the layman and laywoman has been largely responsible for the reluctance with which they have installed electrical devices in their homes.

Why add to this terror by showing them artificial lightning crashing earthward obviously produced by electric current, which they are asked to introduce into their houses.

Personally, I think the effect of the sign in question upon the public would be to deter it from using electricity. I sincerely trust that such signs will not come into general use.

*New York, N. Y.*

J. M. WAKEMAN.

# Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

## Ash-Disposal System at Milwaukee

At the Commerce Street station of the Milwaukee (Wis.) Electric Railway & Light Company a 2-ton storage-battery locomotive is being used to haul cars for collecting ashes from beneath the furnace grates. When the ash cars are loaded they are conveyed to and lumped into a hopper feeding a bucket elevator which hoists the ashes to an overhead hopper. From this hopper the ashes are discharged by gravity into scows stationed in the river outside the plant. The scows when filled are towed out into Lake Michigan and dumped.

## Electrical Ringer for Bells or Chimes

At St. Luke's German Lutheran Church, 1502 Belmont Avenue, Chicago, an electrically operated ringer for chimes has recently been installed. Formerly six men were required to ring the three bells in this set of chimes, and the expenditure for their salaries amounted to \$400 a year. Now, however, by a device worked out by Mr. Nels Joleen, of the Commonwealth Edison Company, Chicago, this operation is accomplished by a 0.5-hp, 220-volt, single-phase motor.

As will be seen from the accompanying diagram, a

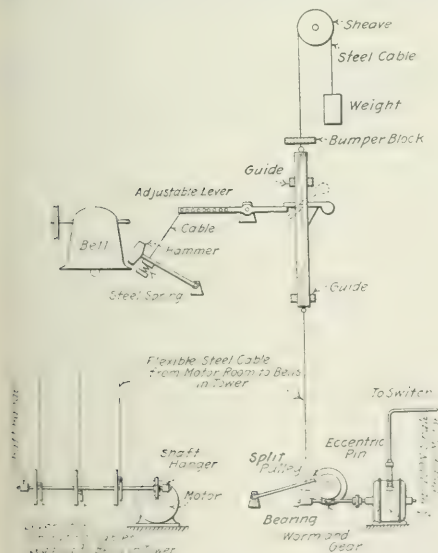
device and an adjustable lever to the bell hammer. A part of the sheaves have been omitted in the diagrammatic representation herewith for the sake of clearness.

On May 6 this set of chimes was operated from the motor for the first time. On that occasion, at a convention of officers of German Lutheran churches, the precision with which the heavy chimes were rung excited the admiration of the visitors.

## Limiting and Warning Device for Preventing High Maximum Demand

Frequently the motor-service users operating industrial plants from central-station service contract bills larger than necessary because careless machine operators or shop foremen increase the monthly maximum demand. In many of these cases a little judicious management of machines and men will keep the demand of the industrial plant within a reasonable limit and the company will enjoy electric service at a fair cost. To aid factory foremen in accomplishing this result, Mr. Nels Joleen, Commonwealth Edison Company, Chicago, has recently worked out an ingenious wiring scheme. The diagrammatic representation of the apparatus and the circuits is shown in the accompanying sketch.

In one phase of the customer's main leads is installed



ELECTRICALLY OPERATED CHIME RINGER

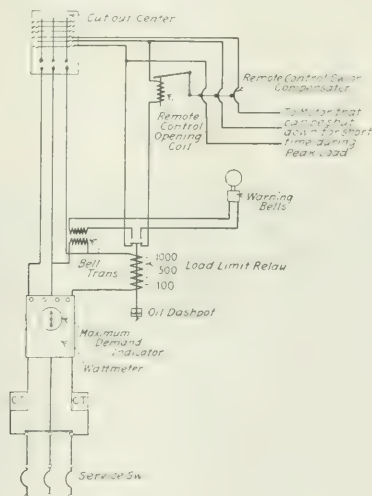


DIAGRAM OF MAXIMUM-DEMAND LIMITING DEVICE

worm pinion attached to the motor shaft drives a gear to which in turn is connected a set of adjustable steel split pulleys with eccentric pins and levers. Leading from these levers, flexible steel cables are attached to a tripping device in the belfry. The horizontal movement of the cables is transmitted through this tripping

device and an adjustable lever to the bell hammer. A part of the sheaves have been omitted in the diagrammatic representation herewith for the sake of clearness. On May 6 this set of chimes was operated from the motor for the first time. On that occasion, at a convention of officers of German Lutheran churches, the precision with which the heavy chimes were rung excited the admiration of the visitors.

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In one phase of the customer's main leads is installed



controlled opening coil of an oil switch or compensator in the circuit of some motor which can be conveniently kept off the line during peak loads. At the same time the plunger of the load-limit relay completes an electrical circuit to a warning bell, notifying the man in charge that the estimated maximum demand has been exceeded. By placing this bell on the desk of the shop foreman and giving him instructions to keep it from ringing the owner of an electrically operated industrial plant can fix the peak to which his daily connected load shall rise, enabling him to tell in advance very accurately what his bills for motor service will be.

### Cornice Lighting with Straight-Filament Lamps

A departure from the ordinary practice of illuminating building cornices has been made in equipping the Baird Building, Omaha, Neb., with straight-filament lamps instead of bulb-type units. Continuous reflectors 306 ft. long were installed along the cornices and equipped with straight-filament lamps arranged end to end to form a continuous "line of light." To protect the lamps and the interior of the reflectors from the weather and dust, glass cover shields were employed. The effect secured is that of a brilliant white band encircling the top of the building. No shadows or lamp filaments are visible and the architectural details are brought out with remarkable clearness.

### Home-Made Arrangement for Testing Service Meters

The accompanying illustrations show meter-testing apparatus in service at Walton, N. Y., which did not cost over \$10 and has been found to be very satisfactory. The upper twenty lamps are 54-volt units formerly used on the street-lighting circuit in Walton. They are arranged to burn two in series and are controlled by two separate switches. Each lamp consumes approximately 1 amp, so that the two series circuits make a load of 10 amp. The lower twenty lamps are handled separately as indicated in the diagram, making it easy to connect from one lamp to twenty lamps on the meter. The lower ten lamps are also in series with a rheostat. By inserting 32-cp lamps in the lower sec-

ond of fixture tubing. A four-way snap switch is installed just below the fused knife switch so as to reverse the connections of the potential coil of the standard meter in order to cause it to run in either direction. In case the operator does not stop the counter hand on zero, it

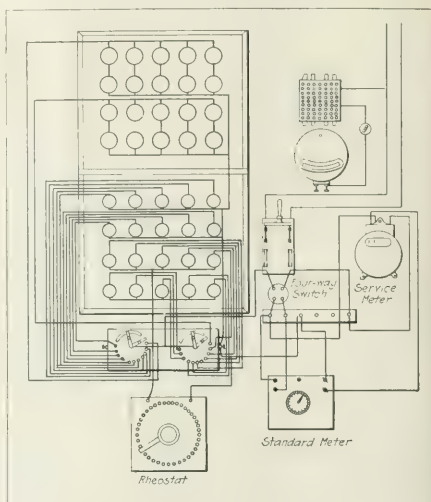


FIG. 2—CONNECTIONS OF METER-TESTING BOARD

can easily be run backward to that point by this means. The object of the rheostat is to enable the operator to maintain any desired voltage on a 5-amp meter, which is the size mostly used on the Walton lines.

### Frequency and Emf Relations in Induction Motors

What relations exist between the frequencies and emfs in the primary and secondary windings of an induction motor?

A. H. P.

If the rotor of an induction motor is kept from revolving when the primary winding is energized, the frequency in the secondary will be the same as that in the primary circuit. By allowing the rotor to turn of its own accord the secondary frequency gradually decreases as the motor speeds up. At synchronous speed the frequency would be zero. If the rotor is rotated by some external means in the opposite direction from that in which it would run if left free, the frequency will increase above that of the supply source in proportion to the relative speed of the rotating field and rotor. The magnitude of the emf in the secondary is proportional to the flux cut and to the relative speed of the conductors. When the rotor is turning at synchronous speed no flux is cut, hence no emf will be induced in the secondary coils. An induction motor, therefore, cannot run at absolutely synchronous speed unless assisted by some outside means, as no torque would be exerted between the rotor and stator. With the rotor held stationary and the primary energized the maximum flux is cut (as a motor), hence the maximum emf is induced in the secondary. If operated as a generator—that is, with the rotor turning opposite to the rotating field—the rate of cutting flux is still further increased and the secondary emf increased in proportion. This principle is utilized to boost the voltage of alternating-current systems, the motor being driven as a generator by another motor in series with the supply circuit.

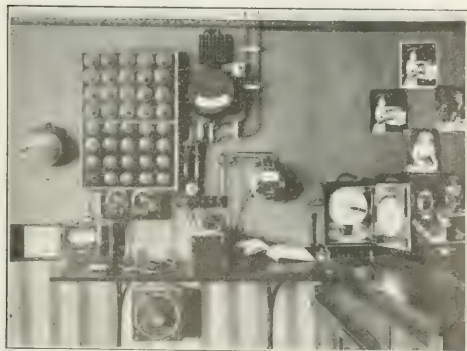


FIG. 1—METER-TESTING BOARD AT WALTON, N. Y.

tion the arrangement is suitable for currents as high as 40 amp. The sockets are covered by a piano panel-board arranged so as just to slip over the neck of the wall sockets used to support the lamps. The edges of this panel are held straight by means of a frame made

# Digest of Current Electrical Literature

## Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

### Generators, Motors and Transformers

**Three-Phase Repulsion Motor with Unity Power-Factor.**—ALEXANDER HEYLAND.—The author reports an interesting and theoretically unexpected result obtained in practice with his three-phase repulsion motor. If the distance between the short-circuited brushes is

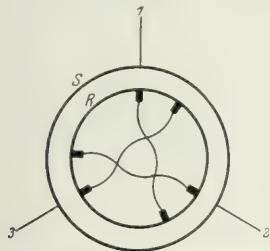


FIG. 1—ARRANGEMENT OF SHORT-CIRCUITED BRUSHES

made greater than the angle between the stator phases, an automatic compensation of the phase difference between current and emf is obtained. This result was found in tests made by J. Rezelman in Charleroy with the first motors of this type. The author calls the phenomenon "internal compensation." Only the three-phase repulsion motor, and not the single-phase repulsion motor, has this property. The effect is most pronounced near synchronism. Fig. 1 is a diagram of a

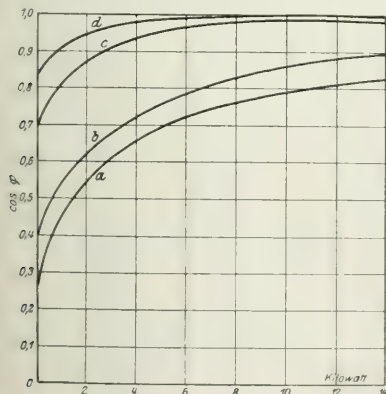


FIG. 2—POWER-FACTORS FOR VARIOUS BRUSH SETTINGS

two-pole, three-phase motor of this type. *S* is the stator. 1, 2 and 3 are the three connections to the network. *R* is the rotor with three pairs of brushes, arranged here with an angle of 160 deg. Fig. 2 shows power-factor curves of an 8.84-kw motor. The curve *a* refers to the motor with simple short-circuited armature. In this case the commutator was simply short-circuited by direct connection of the segments. The curve *b* refers to a distance of 120 deg. between the

brushes, that is, there is coincidence between the brushes of two adjoining sets in the same way as if the commutator was short-circuited through three brushes. The curve *c* relates to a distance of 160 deg. between the brushes—that is, the case of Fig. 1. In this case the power-factor becomes unity for normal power and above it. The curve *d* also relates to a distance of 160 deg. between the brushes, but in this case a further improvement is obtained by also displacing the stationary brushes by about 40 deg. from their normal position. In this case the power-factor becomes unity at loads below the normal.—*Elek. Zeit.*, June 25, 1914.

### Generators, Motors and Transformers

**Effect of Titanium on the Magnetic Properties of Iron.**—KENNETH P. APLEGATE.—An account is here given of an experimental investigation made to discover whether the hysteresis loss in iron can be reduced by the addition of titanium. To reduce the hysteresis loss the iron is made magnetically softer by annealing or by the addition of foreign material. For the latter purpose the addition of elements of low atomic weight has been found to be particularly advantageous. The present low-hysteresis irons are chiefly silicon and aluminum steels. The material used by the General Electric Company is a silicon steel containing from 3.5 per cent to 4.5 per cent of silicon and known by the trade name X1 steel. Titanium was experimented with on account of its relatively low atomic weight. The chief results obtained are given in the following lines. Small amounts of pure titanium (less than 1 per cent) decrease to a slight extent the hysteresis loss in pure Swedish charcoal iron. An increase in the percentage of titanium causes an increase in the hysteresis loss. Alloys of titanium and iron are not rendered appreciably softer by prolonged annealing at 760 deg. C. The commercial titanium alloys when dissolved in iron yielded a metal much poorer in magnetic quality than the alloys containing pure titanium. Titanium steels are not so good as the present standard silicon steels. Small amounts of pure titanium increase the permeability of pure Swedish charcoal iron. The maximum induction of alloys containing titanium was considerably higher than that of the X1 steel or pure-iron samples. The permeability of the titanium specimens was higher, for the same value of *H*, than that of the X1 steel or pure iron. The small percentage of pure titanium gave the lowest values for the hysteretic constant when the titanium alloys were considered. The values were, however, not as low as the hysteretic constant for the X1 steel.—*Rensselaer Polytechnic Institute, Engineering and Science Series*, No. 5, 1914.

**Magnetic Properties of Chrome Steels.**—MARGARET B. MOIR.—An account of an experimental investigation of the magnetic properties of a graded series of chrome steels at ordinary and low temperatures. The effect of lowering the temperature of a chrome steel is to diminish its susceptibility for low fields and to increase it for high fields. Immersion in liquid air produces a permanent effect on the annealed specimen, which does not disappear when the temperature is allowed to rise to room temperature again. Immersion in liquid air has no permanent effect on quenched specimens, and



in both the annealed and quenched conditions the residual magnetism and the coercive force are greater at —190 deg. C. than at 15 deg. C.—*Philos. Mag.*, May, 1914.

#### Lamps and Lighting

**Half-Watt Lamps for Small Candle-Powers.**—A Berlin daily newspaper published an interview with Rathenau (the head of the A. E. G.) to the effect that the Allgemeine Elektrizitäts Gesellschaft has succeeded in making half-watt lamps for small candle-powers. This has led to a misunderstanding, since this statement referred not to half-watt lamps for 110 volts or 220 volts but to half-watt lamps for 6 volts to 15 volts and relatively high currents. They may be used suitably with storage batteries and in connection with transformers in alternating-current systems.—*Zeit. f. Beleucht.*, May 20, 1914.

**Modern Theater Lighting.**—H. LUX.—The first parts of a detailed illustrated description of recent progress in theater lighting, especially stage lighting, the reproduction of the sky, etc. The serial is to be continued.—*Zeit. f. Beleucht.*, May 10, 20 and 30, 1914.

#### Installations, Systems and Appliances

**Nationalization of British Electricity Supply.**—R. A. CHATTOCK.—His presidential address delivered at the Birmingham convention of the (British) Municipal Electrical Association. After dealing with some legal problems the author emphasizes the great progress which has been made during the past few months in developing the use of the electric automobile in England. He then discusses the presidential address of J. J. Newbigging before the British gas engineers, in which combined control for municipal gas and electrical plants was advocated. The present author thinks this would be disadvantageous as it would mean the total suppression of competition and would create collusion which would be fatal to the interests of the consumer. Moreover, another obstacle would be the proposed centralization of local supply stations in England so that the electricity supply would be of a national scope while the gas supply must always remain more or less local. The author insists that central control of the electricity supply stations must come. "The larger British municipalities, such as Glasgow, Manchester, Birmingham, Liverpool, Leeds, etc., have pointed the way. Now it remains for Parliament to tackle the question of nationalization—whether by means of a government department or public board of management, such as the Port of London Authority, or by means of a private company, subject to limitations as to dividends and prices to be charged for energy supplied, is yet to be seen. . . . Large bulk-supply power stations should be installed in various parts of the country having regard to the three following chief requirements: proximity of an ample quantity of coal, proximity of an unlimited supply of water for condensing purposes, and proximity of the various large centers of industry where the major portion of the energy is likely to be required. Railways, of course, cover practically the whole of the country, so that these can be fed economically at any point or points throughout their length. As soon as these bulk supply stations are available and the distributing trunk cables installed, the majority of the small generating stations in the country should be at once shut down and utilized as substations." There would be no necessity of dispensing with the services of a single central-station engineer since the very object of the scheme is enormously to increase the business to be handled in all these centers by offering the energy at a much more attractive price. The men on the spot have the best knowledge obtainable for pushing the business and developing the distribution of

the bulk supply that they would receive, and the chief engineers in charge would be especially valuable in this direction. "We electrical engineers have to be managers of our business as well as engineers in charge, and the business control is every bit as important as is the engineering control."—*London Electrician*, June 19, 1914.

**Electricity Supply in Towns of Moderate Size.**—W. A. VIGNOLES.—A paper read before the (British) Municipal Electrical Association. In discussing the problems met with in the supply of electricity in towns of about 100,000 inhabitants the author deals first with the commercial side of the undertaking, considering particularly advertising, canvassing, wages and wiring, and then goes on to deal with the questions of financial control, rate contribution and other financial data, such as depreciation, reserve and renewal funds. Finally the cost of supply is gone into in detail.—*London Electrician*, June 19, 1914.

**The Wolverhampton System.**—An illustrated article on the development of electric-energy supply at Wolverhampton. The original plant was a direct-current station, but turbo-alternators were installed for the generation of high-tension three-phase current in 1908, and at present 4000 kw of plant is to be added. Notes are given on various industrial plants located in Wolverhampton.—*London Electrician*, June 12, 1914.

**Municipal Wiring and Leasing.**—E. H. FREEMAN.—An article on municipal wiring and leasing from a contractor's point of view. The subject is reviewed in the light of the Municipal Electric Association bill, and reasons are first suggested why such a bill is desirable in view of the fact that no station engineer would be anxious to add to his duties the cares attached to a wiring department. It is then pointed out that the results so far obtained by municipalities which have taken up wiring are not encouraging. Finally, the position is considered as it affects the contractor.—*London Electrician*, June 12, 1914.

#### Units, Measurements and Instruments

**Localization of Faults.**—K. SIMONS.—The author describes briefly several methods which he has employed for the localization of faults. In the first case the resistance was very high. In the second case the insulation of the three conductors of the three-phase cable had broken down, but the insulation against earth was intact. In the third case the insulation against earth had also broken down. In the fourth case the fault was on a separate feeder of a railway. The article is illustrated by diagrams.—*Elek. Zeit.* June 18, 1914.

**Pyrometer.**—An illustrated article on thermoelectric pyrometers of English make. To avoid the necessity of correcting the readings for the temperature of the cold end of the couple the indicator is fitted with a Darling compensator, as shown in Fig. 3, which consists of a spiral *B* of two different strips of metal welded together. The compensator automatically adjusts the pointer *P* of the indicator by rotating the control spring *S* of the coil *C*. This correction becomes important in the measurement of low temperatures. For temperatures up to 1200 deg. Fahr. the thermo-couple consists of an Eureka rod welded into a cap of nickel alloy. The cap is welded to a nicfer tube and efficiently protects the junction. Iridium-platinum and rhodium-platinum couples are used for the temperature range up to 2400 deg. Fahr. and 2900 deg. Fahr. respectively; with these, in order to allow of the use of shorter and less expensive couple, an electric automatic compensating system is employed, as shown in Fig. 4. The arms of the Wheatstone bridge *C*, *C*, are of copper *M*, *M*, of manganin. The current through the latter

from the battery is limited by the resistance  $A$  to 0.1 amp. The galvanometer circuit includes the couple  $E$  and is joined across the points  $KL$ . All the resistances are compactly fitted in the thermo-couple connector. When the connector is at the standard cold-union temperature (20 deg. C.) no battery current flows through the galvanometer, and the error is ex-

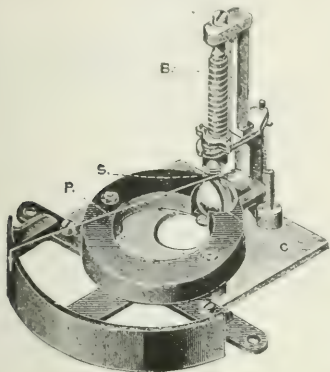


FIG. 3—WORKING PARTS OF COMPENSATED INDICATOR

actly compensated for.—London *Elec. Review*, June 19, 1914.

**Units.**—K. STRECKER.—A discussion of the list of units and notations for many physical quantities pre-

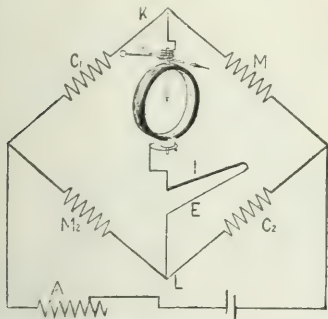


FIG. 4—CONNECTIONS OF ELECTRICAL COMPENSATOR

pared by the German Association of Electrical Engineers. They mostly agree with those recommended by the International Electrochemical Commission.—*Elek. Zeit.*, June 11, 1914.

#### Electrochemistry and Batteries

**The Application of Physical Chemistry to Industrial Processes.**—WALTER F. RITTMAN.—A paper read before the American Institute of Chemical Engineers showing how the principles of physical chemistry can be applied in the solution of problems in the fixation of atmospheric nitrogen, the contact process of making sulphuric acid, the synthesis of ammonia, etc., with special reference to equilibrium relations.—*Met. and Chem. Eng'ing*, July, 1914.

**Electrolytic Refining of Gold and Silver.**—H. LAZARUS.—An illustrated article on the plant of the Geneva refinery, with a description of the methods employed for refining gold and silver alloys, refining silver, and refining gold.—*Met. and Chem. Eng'ing*, July, 1914.

**Electric Iron Smelting.**—JOHN HÄRDÉN.—A third article on the electric iron smelting experiments at Hardanger in Norway, on the basis of a report by Oedquist.—*Met. and Chem. Eng'ing*, July, 1914.

**Annealing Furnace.**—An illustrated description of an electric annealing furnace for brass and German silverware.—*Met. and Chem. Eng'ing*, July, 1914.

#### Telegraphy, Telephony and Signals

**Telephone Cable.**—A. EBELING.—With reference to the recent article of Breisig on the Berlin and Magdeburg telephone cable which is loaded with induction coils, the author gives an account of the practical results obtained in the manufacture and the laying of this cable. New problems were to be solved in this case since this was the first long Pupin cable with 3-mm diameter conductors. Extensive tests were made on the inductance and leakage. Special, and on first sight apparently expensive, means were developed for laying the cable, but these have proved very successful and have resulted in the end in savings.—*Elek. Zeit.*, June 18, 1914.

## Book Reviews

**INCANDESCENT ELECTRIC LAMPS AND THEIR APPLICATION.** By Daniel H. Ogley. New York: Longmans, Green & Company. 108 pages, 59 illus. Price, 80 cents.

This book treats in a simple and practical manner of illumination problems, with special reference to incandescent electric lamps. The student will find in it a great deal of valuable information, and even the general reader who would reap little benefit from the more scientific literature on this subject will find here much that will be useful to him in deciding upon the proper candle-power and disposition of lamps to give the best results under various conditions. The subjects covered include: Illumination and standard sources of light; photometry; distribution of light; the manufacture of incandescent lamps, and their characteristics; direct and indirect systems of lighting, with good photographic illustrations showing results obtained, and the methods of calculation for solving illumination problems. The book is clearly written and is a valuable addition to the literature which is already available on this subject.

**HANDBUCH DER ELEKTRIZITÄT UND DES MAGNETISMUS.** Vol. I. Edited by Prof. Dr. L. Graetz. Leipzig, Germany: Johann Ambrosius Barth. 420 pages, 49 illus. Price, 10 marks.

An excellent treatise on certain portions of electrical theory, especially on the theory of dielectrics under various conditions, each section of the work having been prepared by a specialist. The first section is on dielectrics, by Schrödinger. The second is on certain anomalous dielectric phenomena, by von Schweidler. The third is a brief discussion on electrostriction and magnetostriction, by von Hirsch. The fourth is devoted to electro-optics, by Voigt. The fifth and last treats of pyroelectricity and piezo-electricity, by Edward Riecke. The book is intended especially for the mathematical physicist or the advanced student of electrical theory. The treatment is very condensed but not highly mathematical. It is essentially a physical analysis of the various phenomena considered. The work is thorough, masterly and carried well up to date. There are few treatises in any language which deal so fully with some of these less well known electrical phenomena.



# New Apparatus and Appliances

## An Illustrated Descriptive Record of Recently Developed Manufactured Products of Interest to Electrical Readers

### Conduit Fastener

The fastener shown herewith is made in two sizes, for 0.25-in. and 0.3745-in. flexible conduit. After inserting the conduit through the outlet in the wall case,

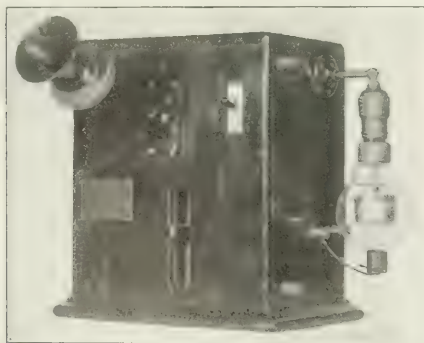


FASTENER FOR FLEXIBLE CONDUIT

the fastener is forced over the end of the conduit, as shown in the cut, and the teeth of the fastener then engage the fabric. This fastener is being made by the Hart & Hegeman Manufacturing Company, Hartford, Conn.

### High-Frequency Oscillating Transmitter for Wireless Telephony

Apparatus for generating in an incandescent lamp from direct-current energy continuous high-frequency oscillations to be used for wireless telephony and telegraphy, as well as for numerous laboratory applications, is being made by the Radio Telephone & Telegraph Company, 309 Broadway, New York. This equipment is called an oscillating "audion" transmitter and can be connected to either a 110-volt or a 250-volt lighting circuit. By means of the small 3.5-volt amplifier bulb



TRANSMITTING APPARATUS FOR RADIO TELEPHONE

used with this apparatus direct current can be transformed to alternating current at frequencies of from sixty cycles per second to 1,000,000 cycles per second. With this form of transmitter it is possible to telephone one to three miles, and the device is well adapted for use on small yachts, tugs, ferryboats, etc.

When a storage-battery supply is available this oscil-

ating transmitter can serve as a receiver also, both the functions of transmitting and receiving being performed by means of the same bulb with the aid of a telephone receiver connected to the wing-filament circuit.

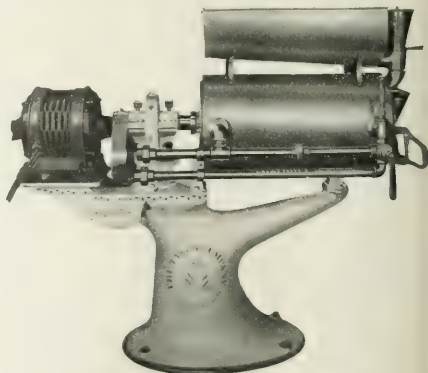
### Portable Meter Board for Unwired Houses

A portable meter board with five outlets, which can be installed for \$5, is being used to good advantage by Louisville (Ky.) representatives of the Federal Sign System (Electric), in reaching new customers for the Interstate Public Service Company.

The portable meter board enables the tenant in an unwired house to secure electric service at a net outlay of \$6, which is later returned if the house is wired for electricity. The offer interests a great many people who do not own their own homes. The campaign of the company was preceded by extensive advertising in which sixteen-sheet posters, portable signs, imprinted pamphlets, bulletins and newspaper space were used.

### Motor-Driven Ice Cream Freezer

The ice-cream freezer shown in the annexed illustration is directly connected to a 2-hp alternating current motor. The apparatus is designed to freeze 40 pt. of ice-cream at one time. Freezing is accomplished by means of brine which flows around the freezing cylinder and is circulated by a small pump. All parts touched by the cream are of non-corrosive metal and can be easily cleaned. The rear end is insulated by a dead-air space. In front a funnel-shaped de-

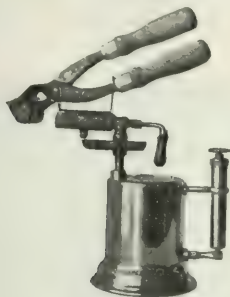


MOTOR-DRIVEN ICE-CREAM FREEZER

vice is employed to show the consistency and "expansion" of the cream; a small quantity of cream constantly flows through this device. The operator, therefore, can always determine the condition of the cream and can stop the freezing at the proper time. This ice cream freezer, which is operated by a Westinghouse motor, is made by the Tyson Company, Canton, Ohio.

### Soldering Tool for Interior Wiring

The soldering tool for interior wiring shown herewith is made of malleable iron. It is designed so that it can be used with any gasoline torch. The manufac-



SOLDERING TOOL

urer claims that ten joints can be soldered by this tool with one heating. This soldering tool is being made by Mr. P. A. Cassidy, 1254 Curtis Street, Denver, Col.

### Electric Searchlamps for Warships

A 36-in. marine searchlamp designed for use on warships is shown herewith. It is equipped with a 30-in. parabolic glass mirror and takes 80 amp at the arc. This searchlamp has all the accessories and fittings usually required by the United States Navy Department, together with the signaling shutter shown on the front. One of the features of the lamp is the auto-

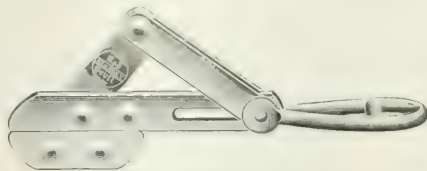


36-IN. SEARCHLAMP FOR NAVAL SERVICE

matic feeding device for the carbons. This feed mechanism, the manufacturers claim, is accurate and positive, and it is impossible for the arc to break or the carbons to stick except through actual breakage of some of the parts. This searchlamp is being manufactured by the Carlisle & Finch Company, 228 East Clifton Avenue, Cincinnati, Ohio.

### Tool for Gripping and Stretching Wires

A set of grips for stretching wire is being placed on the market by the Smith & Hemenway Company, 150 Chambers Street, New York. This set includes grips



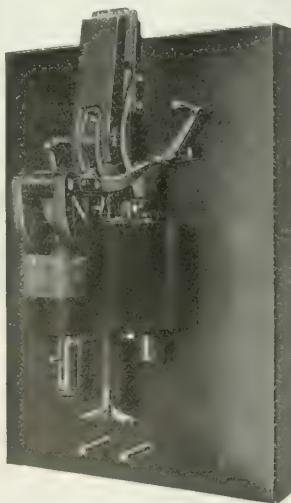
TOOL FOR GRIPPING AND STRETCHING WIRE

for stretching both smooth and barbed wire, whether of copper or steel. The grips are strong and compactly made. In the illustration is shown a grip designed to stretch wires ranging in size from the No. 6 to No. 0.

### Automatic Re-closing Circuit-Breaker

The circuit-controller shown herewith consists of an electromagnetically operated circuit-breaker so designed that in case of overload or short-circuit the breaker not only opens the line but also automatically recloses the circuit as soon as the overload condition or short-circuit is removed. This breaker is especially adapted for use in small substations for mines or electric railways, since by its use no attendant is required at the station except to start and stop the generator or rotary converter or for occasional inspection, the breaker taking care of overload and short-circuits automatically.

The main contact arm of this breaker is normally



RECLOSING CIRCUIT-BREAKER

held in the closed position by means of an electromagnet. When an overload occurs the energy in the series coil raises a plunger which opens a contact in the circuit of the operation magnet, thus cutting off the current and allowing the main contact to open the load circuit. A high resistance is connected in shunt to the main contact and a small amount of energy will then

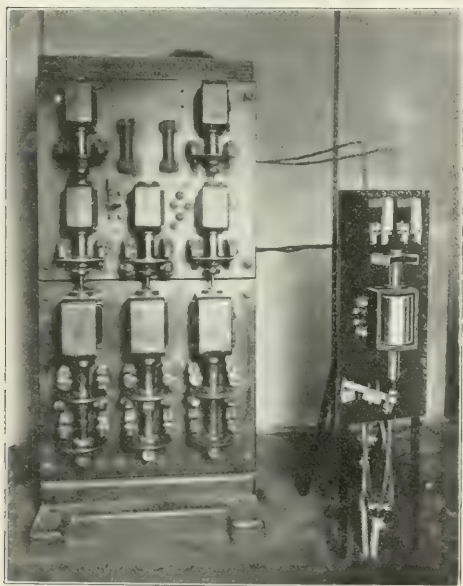


flow through this resistance to act as an index to the condition of the line. After the opening of the main breaker a dash-pot allows a contact to close a circuit connecting a low-resistance trip coil in parallel with the load circuit and in series with the high resistance. The index energy which flows through the high resistance now has two paths; it can flow through the short-circuit or through the trip coil. The index energy will flow through the short-circuit as long as that exists, but after it is removed this energy will then be forced through the trip coil, which trips a latch and allows the main magnet to be energized again and close the circuit.

This re-closing circuit-breaker is made by the Automatic Reclosing Circuit-Breaker Company, Columbus, Ohio.

### Safety Control Apparatus for Elevators

Safety apparatus to prevent elevators being moved except from the car controller, and then only when the doors opening into the shaft are latched, is being



ELEVATOR CONTROL AND SAFETY-DEVICE CONTACTOR

marketed by the Safety Appliance Company, St. Louis. The apparatus consists of gate contacts wired in series with a solenoid-operated safety contactor which de-energizes all of the electrical equipment, including the reversing switches, except when the gates are latched. When the safety contactor is open a green lamp is lighted in the car, and when conditions are proper for car operation a red lamp is lighted and the green one extinguished. If a car is standing at a floor with the gate open and the safety contactor is closed by hand, the green light goes out and the red one appears. With this equipment it is impossible for any one to move a car by manually closing the elevator control switches, as the safety contactor which is inclosed in a sealed steel case has to be closed first. An emergency switch can be installed in the car to cut out the safety contactor when it is desirable to do so.

### Electric Clock Signs

To provide means for attracting more attention to electric signs, the Betts & Betts Corporation, 256 West Fifty-fifth Street, New York, is furnishing electric clocks which may be installed on the sign and controlled from a master clock inside the owner's place of business. The master clocks, which are self-winding, oper-



FIG. 1—LARGE CLOCK SIGN

ate on energy from four dry cells and are guaranteed to keep within one minute of correct time for periods of one month. The clock will operate from fourteen to eighteen months without renewing the primary cells. Inside the master clock is a relay which closes every minute, thereby operating the secondary clock installed on the sign.

The secondary clocks are operated by motor-driver mechanisms set in motion periodically by the master-clock relay. The motor is belt-connected to a countershaft, which in turn is geared to the shafts, or quills carrying the clock hands. On one end of the countershaft is a four-arm star wheel which engages with a stop operated by a solenoid in the relay circuit. When the relay closes the solenoid momentarily draws in its plunger, releasing the star wheel and at the same time closing the motor circuit. When the countershaft has turned through 90 deg. (corresponding to a one-minute interval on the clock dial) it is brought to a rest by the stop. Any shock which might result from the abrupt

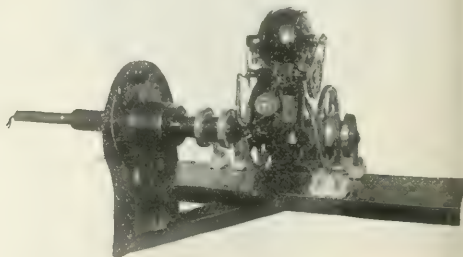
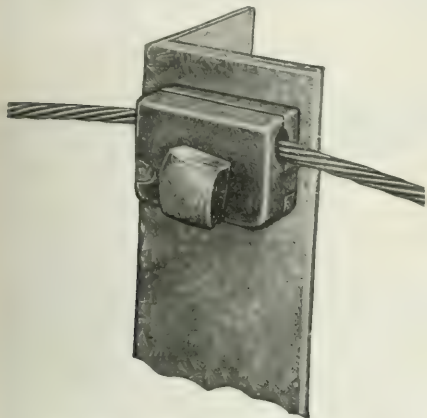


FIG. 2—SECONDARY-CLOCK OPERATING MECHANISM

stop is prevented by slippage of the motor belt. When the clock hands are to be outlined with lamps energy is conducted thereto through contact fingers, slip-ring and wires threaded through the hollow main shafts. The master clocks may also be equipped to operate time stamps and signal bells for calling and dismissing employees.

### Ground-Wire Clamp

A ground-wire clamp consisting of two identical malleable-iron castings which when fitted together form a clamping jaw for use with either 0.25-in. or 0.3125-in. strands is being made by the Electric Service Supplies Company, Seventeenth and Cambria Streets,

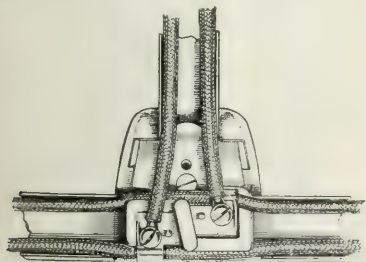


MALLEABLE-IRON GROUND-WIRE CLAMP

Philadelphia, Pa. This clamp can be fastened to bayonets or other ground-wire supports used in high-tension transmission line construction by a 0.625-in. bolt, as shown in the illustration. The clamp may also be secured directly to wooden or iron poles by means of a through-bolt when angle-iron supports are not used. This clamp is so designed that it can be secured to the bayonet or pole before the ground wire is placed in it. The part of the clamp in contact with the wire is corrugated and the ends of the hole are flared. The full width of the clamp is 2.25 in., leaving 0.75 in. for clamping to the wire. A clamp similar to the one depicted above but having the surface in contact with the wire smooth instead of corrugated is also made by the same manufacturer.

### Metal-Molding Branch Fitting

A branch connection for metal-molding installations is shown herewith. This fitting consists of a metal



BRANCH CONNECTION FOR METAL MOLDINGS

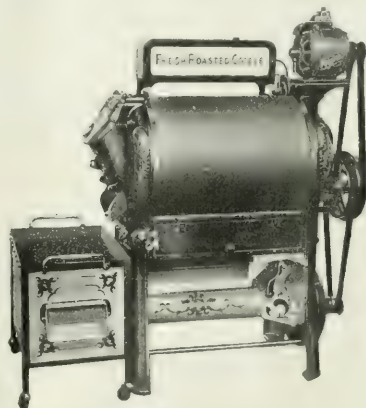
to be inserted under the main-line metal molding, a metal top to which to fasten the branch line to this metal, a porcelain connector and a porcelain cover. The fitting is installed as follows: (1) The metal back is slipped under the main-line metal molding and the molding for the branch is laid down against the main line; (2) the branch line is fastened to the metal

back by a screw; (3) the main-line wires are skinned and placed under the lug of the porcelain connector; (4) the wires for the branch line are fastened under the heads of the screws as shown in the accompanying illustration; (5) the metal-molding capping is put in place and the porcelain cover placed over it.

S. Robert Schwartz & Company, 624 Broadway, New York, are the general sales agents for this branch fitting, which is called the "Ememtap."

### Coffee and Peanut Roaster

A compact machine for roasting coffee in small quantities is shown herewith. The coffee is placed in the cylinder which is surrounded by a jacket and revolved by a Westinghouse motor. In this cylinder the coffee is subjected to the heat of a gas or gasoline flame, and when roasted is dropped into a movable car where it is quickly cooled by means of an air blast. The machine illustrated has a capacity of 25 lb. and it will roast 100 lb. of coffee at a cost of approximately 18 cents, which covers the cost of electric energy for the



COFFEE-ROASTING MACHINE

motor and that for the gas. This Royal roaster, as it is called, is also suitable for roasting peanuts. The A. J. Deer Company, Hornell, N. Y., manufactures this coffee-roasting machine.

### Automatic Time-Limit Cutout

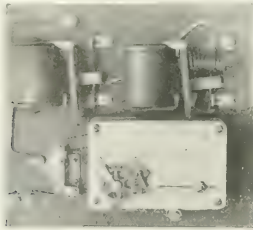
An automatic time-limit cutout recently developed by the Independent Electric Manufacturing Company, Milwaukee, Wis., is, according to statements made by its manufacturers, adapted to many and varied uses. Chief among these are its application as an overload relay in connection with a remotely controlled switch or circuit-breaker; its use for the intermittent control of hall lamps and the like; automatically switching off lamps left burning by the householder returning late at night; its application to control blueprinting and photographic lamps; and its use for controlling electric cooking operations. The device may also be used where it is desired to open a circuit if the energy supply is continuous, but it is unaffected if the supply is intermittent.

As shown in the illustration, the device consists of a train of gears provided with an escapement mechanism, two electromagnets and a small toggle switch or circuit-



breaker. One of the electromagnets drives the gear chain indirectly through the medium of a spring, which is wound by the magnet when it has uncoiled a certain predetermined amount.

The upper magnet governs the tripping device for the circuit-breaker and controls the circuit to the lower



TIME-LIMIT CUTOUT

magnet coil. When this magnet is energized it causes the pawl to open the circuit-breaker after a definite interval of time has elapsed. Thus it is seen that if the upper magnet coil remains energized continuously for a predetermined length of time the tripping pawl will open the circuit-breaker, but if the current is interrupted before this period is ended the circuit-breaker will not be opened and the apparatus will automatically reset itself. An intermittent current, or a current not sufficiently strong to operate the magnet armature, will, therefore, never open the small circuit-breaker. The device measures approximately 10 in. by 11 in. by 4 in. and can be adjusted for any time interval from 0.5 minute to 14 minutes in duration. Platinum contact points are used throughout the device.

#### Pilot Lamp and Receptacle

In the accompanying illustration is shown a pilot lamp inclosed in a receptacle which is designed for use on heater circuits, remote-control lines, vacuum-cleaner systems, etc., to indicate when energy is being used. A

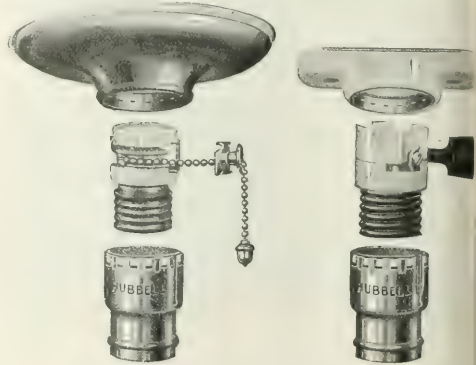


FIGS. 1 AND 2—PLATE COVER AND PILOT LAMP

candelabra lamp is mounted in the porcelain base as shown in Fig. 2 and glows through a ruby-glass bull's-eye (Fig. 1), when the circuit is closed. This pilot lamp and receptacle are being placed on the market by the Hart & Hegeman Manufacturing Company, Hartford, Conn.

#### Socket Shells

In the exploded views of sockets shown herewith are illustrated the so-called "Presturn" socket shells. These shells are being made by Harvey Hubbell, Inc., Bridgeport, Conn., and are similar in design to a quick-catch shell placed on the market by the above manufacture except that nineteen slots are cut around the fluting. These slots engage and interlock with a like number of projecting catches in the socket cap or retaining ring.

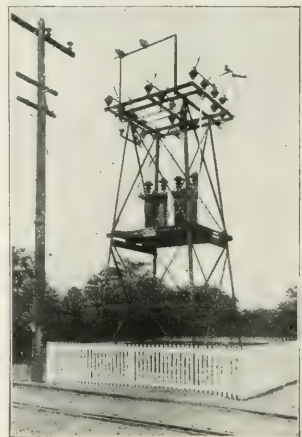


FIGS. 1 AND 2—SNAP SHELLS WITH CHAIN AND KEY SOCKETS

thus distributing the strain around the shell. By actual test these shells have withstood a pulling strain of more than 700 lb. The shells can be interchanged with various pendant, wall and ceiling sockets made by the same manufacturer.

#### Outdoor Substations

The demand for lighting and motor service along the lines of the Terre Haute, Indianapolis & Eastern Tr



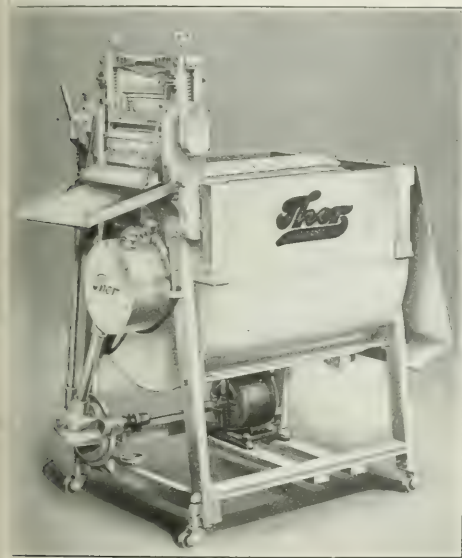
OUTDOOR SUBSTATION IN INDIANA

tion Company is being met by the installation of outdoor high-tension substations of the type shown herewith. The initial installations usually consist of a single transformer, but as the load increases two transformers are connected in open delta, and a third unit may be added to develop the full rating of the station.

The installation shown was designed by and installed under the supervision of Mr. J. A. Norman, chief electrician of the traction company, which is installing a number of high-tension extensions from its transmission systems. The switching, fusing and protective equipment was manufactured by the Delta-Star Electric Company, Chicago, the transformers being of the Westinghouse outdoor type.

### Electric Washer with Shaft Drive

Improvements have recently been made in the "Thor" electric washing machine, manufactured by the Purley Machine Company, Chicago, Ill., which it is stated will render it practically accident-proof and increase its simplicity of operation. As shown in the illustration herewith, the interior reversing cylinder and the wringer are both driven by means of inclosed shafts and spiral bevel gears. The motor is started and



ELECTRIC WASHER WITH SHAFT DRIVE

stopped by a push-button switch conveniently placed on one side of the wringer. For starting and stopping the reversing cylinder and wringer, control levers are placed near the heads of the shafts driving the respective mechanisms.

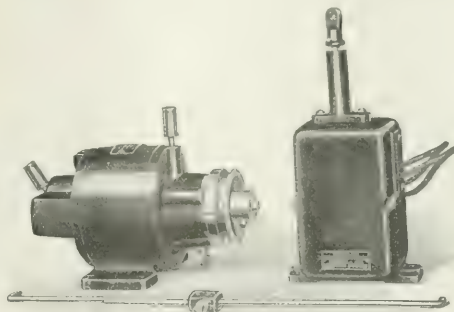
Nickeled guards are placed on both sides of the wringer and are so arranged that either may be lifted near of the rollers when clothes are issuing from that side of the machine.

### Sewing-Machine Motor

A direct-current series motor designed for driving sewing machines used in tent and awning factories, mattress factories, department repair shops, etc., is being manufactured by the Robbins & Myers Company, Springfield, Ohio. A six-point controller is connected in series with the armature and has its arm attached to the pedal of the sewing machine by an adjustable rod. The controller is normally held in the "off" position by a spring which acts on a plunger

connected to the arm. By varying the pressure on the treadle the operator shifts the arm from one contact point to another and can get any desired speed from a few turns per minute up to 3000 r.p.m. This latter speed gives about 2400 stitches per minute.

The head on the pulley end is solid, completely in-



DIRECT-CURRENT MOTOR FOR SEWING MACHINES

closing the motor at this end. This head also carries a magnetic clutch brake, the winding of which is in series with the armature winding of the motor. When the circuit is closed the clutch releases the brake; when the circuit is opened the brake acts, bringing the motor to an immediate stop. The V-groove pulley is an integral part of the clutch and has a pitch of diameter of 3 in. for a  $\frac{3}{8}$ -in. round belt.

### Lighting of Stock-Quotation Boards

One of the first requirements to be met in the lighting of a bulletin board is that of even distribution of light over the surface of the board. It is very desirable also so to arrange the lighting system that no lamp or reflecting equipment is visible.

The question of concealing the lamps in the installation shown in the accompanying illustration was simplified by the fact that a beamed ceiling was used in the room, and it was only necessary to build in an additional or false beam near the board and parallel to it. This beam, which is in reality only an apron, is about 3 ft. from the wall and drops down in front



BULLETIN BOARD LIGHTED FROM CONCEALED LAMPS

of the conduit and reflectors which direct the light upon the board. The beam is finished in mahogany to conform with the woodwork. Sixty-watt tungsten lamps and so-called "scoop" reflectors, manufactured by the National X-Ray Reflector Company, Chicago, Ill., are used in this installation.



## Jobber, Dealer and Contractor

### Results Obtained from Appliance-Sales Campaign

Practically every dealer in electric appliances will remember that during the week of May 11 to 19 the Hot Point Electric Heating Company authorized the sale of a new electric table stove at half its regular price. Through extensive advertising and co-operation with local dealers this sale obtained considerable publicity. By the triple co-operation of manufacturers, dealers and central stations in twenty-four cities where the electric-service companies are operated by H. M. Bylesby & Company the results attained have been tabulated. The data show that electric household heating and cooking devices equivalent to 1499 kw of connected load were placed among the companies' patrons during this week. Although the half-price feature was centered on the table stoves, many other appliances were also disposed of, the totals being: Table stoves, 1984; other appliances, 867. The total appliance sales in the twenty-four cities in which the census was taken are given in the accompanying table:

San Diego, Cal.	638	Mobile, Ala.	64
Minneapolis, Minn.	542	Eugene, Ore.	60
Pueblo, Col.	391	Mankato, Minn.	51
Stockton, Cal.	153	Muskogee, Okla.	41
Grand Forks, N. D.	151	Louisville, Ky.	37
El Reno, Okla.	122	Enid, Okla.	35
Oklahoma City, Okla.	117	Richmond, Cal.	34
Minot, N. D.	93	Eureka, Cal.	29
Kalspell, Mont.	95	Dallas, Ore.	13
Fargo, N. D.	89	Ottumwa, Ia.	8
Faribault, Minn.	82	Sandpoint, Idaho	7
Sioux Falls, S. D.	81	Galena, Ill.	6

### Wiring of Table for Demonstrating Appliances in Dealer's Store

After the appliance salesman in an electrical sales-room has found out what device interests a prospective customer, his first step is generally to connect that piece of apparatus to a source of energy and to turn on the electricity. Convenience in performing this operation saves the time of both customer and salesman, and a quick connection often has great bearing upon the customer's opinion. Hardly anyone wants to buy a device which even an experienced demonstrator finds trouble in putting into service; hence if the circuits are handily

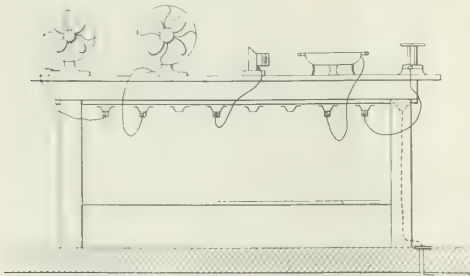


TABLE FOR DEMONSTRATING APPLIANCES IN ELECTRICAL DEALER'S STORE

arranged in the dealers' shops, devices can be ready for exhibition at a second's notice.

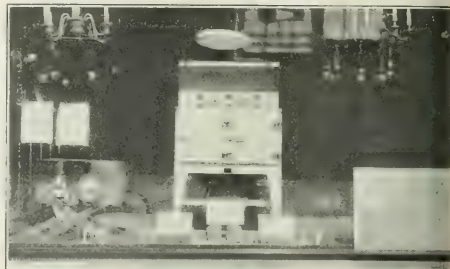
One arrangement used in the shop of the Central Electric Company, Peoria, Ill., as shown in the drawing herewith, presents an effective and slightly method of bringing energy to electrical appliances on display. The circuit enters the display room through a flush receptacle in the floor and is conducted to the table through

a flexible cord. Along the under side of the table the circuit continues in conduit carrying closely spaced sockets. The entire circuit is provided with a switch at the end of the table, while each appliance is control from its own switch or socket.

### Economical Range Operation in Contractor's Window

In the accompanying illustration is shown an electric range display in the window of the Salt Lake Electric Supply Company, Salt Lake City, Utah, from June 1 to 19. The electric stove is controlled by a thermostat, which the picture shows. The stove was run twenty-four hours a day during the entire week, the meter reading taken every day and printed on the card, as shown.

In order to forestall any skeptical opinions which the public might have, the city electrician was called upon to inspect the connections on this stove, and one of the letters in the window is a statement over his signature that the energy used in the operation of the



A SALT LAKE CITY WINDOW DISPLAY, SHOWING THE ECONOMY OF THE ELECTRIC RANGE

stove passes through the meter. Hundreds of people inspected this meter every day as every housewife is interested in electric ranges.

The Salt Lake Electric Supply Company is the oldest and largest contracting company in Salt Lake City, having furnished the electrical equipment in the largest

TABULATION OF ENERGY CONSUMED AND COST OF OPERATION BASED ON 4-CENT ENERGY WITH 10 PER CENT DISCOUNT

	Kilowatt-hours	Net Cost for Twenty-four Hour Operation, Cent
June 13, 1 P.M.	0.0	00
June 14, 1 P.M.	6.0	21.6
June 15, 1 P.M.	6.0	21.6
June 16, 1 P.M.	5.5	19.8
June 17, 1 P.M.	4.5	16.2
June 18, 1 P.M.	6.0	21.6
June 19, 1 P.M.	5.0	18.0
Total cost of operating stove continuously for six days		\$1.188

buildings in the city, including the Walker Bank and the Utah State Capitol. The president of the company is Mr. R. W. Nichol and the manager is Mr. Z. S. Gwaltney.

# Industrial and Financial News

## Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

**Electrical Equipment of Lincoln Street Substation, Chicago.**—The W. A. Jackson Company, of Chicago, has received from the Sanitary District of Chicago the contract for furnishing and installing electrical equipment in the street-lighting substation at Rice and Lincoln Streets. The contract includes the making of necessary alterations and additions in the substation for the purpose of installing electrical equipment. The price named is \$26,800.

**Electric Sign Company Makes Improvements.**—The Brilliant Sign Company, St. Louis, is increasing its floor space by approximately 5000 sq. ft., bringing the total space occupied to about 25,000 sq. ft. With this addition the company will occupy both the first and second floors of its former building at 420 North Eighth Street. In the main room Mr. Frederic A. Kehl, manager, expects to install one of the most modern electric-sign displays in the western states.

**Generators for Tanneries.**—The James J. Clark Company, Louisville, Ky., has just closed contracts to supply L. J. Over & Sons, owners of tanneries at Elkton, Va., and Augusta Springs, Va., with two generators, together rated at 250 hp, and a total of 500 to 600 hp of motors with which the firm will electrify its two Virginia tanneries, abandoning its steam plants. Other tanneries in the same section have also been recently supplied with electrical equipment by the above company.

**Sanitary District Orders Impedance Coils.**—Following the recommendation of its committee on engineering, the Board of Trustees of the Sanitary District of Chicago has ordered that the contract for furnishing and delivering manhole-type impedance coils, to be used in connection with the electric street-lighting system of the city of Chicago, be awarded to the Westinghouse Electric & Manufacturing Company. The impedance coils are specified as of the 4.1-amp, 60-cycle, oil-immersed type and the contract price is \$65.85 each.

**Order for 110,000-Volt Switches from Chile.**—The Clark Electric & Manufacturing Company, Singer Building, New York, has received an order from the Chile Exploration Company for a number of 110,000-volt sectionalizing switches, together with the necessary poles for operating these switches. Although this company finds very little new construction work being done, its factory has been kept busy supplying overhead protective clamping sets for line crossings over railroad rights-of-way, telephone lines, telegraph lines, etc.

**A Campaign on "Four Household Necessities."**—The Federal Sign System (Electric) has invaded Indiana to good purpose from its Louisville (Ky.) office, of which Mr. R. E. Brian is manager. There have just been shipped from Louisville to points in Indiana in which the Interstate Public Service Company operates twenty suction cleaners, 200 electric irons and twelve electric washing machines. The advertising and soliciting campaign was based on the slogan "Four household necessities." These are enumerated were the electric fan, the electric iron, the electric washer and the electric vacuum cleaner.

**Record Sales of Commercial Trucks.**—According to a bulletin sent out by Mr. W. K. Chilcott, sales manager of the General Motors Truck Company, makers of electric and gasoline commercial vehicles, more trucks were shipped and more trucks were sold in April, 1914, than in any previous month. Again, in May, 11 per cent more trucks were shipped and 17 per cent more trucks were sold than in April, while in June 5 per cent more trucks were shipped and 9 per cent more trucks sold than in May. The amount of sales in April, 1914, exceeded that for April of the previous year by 20 per cent; the amount of sales in May, 1914, exceeded that of May, 1913, by 36 per cent, and the amount

of sales in June, 1914, exceeded that in June, 1913, by 17 per cent. Up to April, 1914, June, 1913, was the record month for amount of sales. The amount of unfilled orders on hand for July, 1914, delivery is 34 per cent greater than the total amount of sales in July, 1913.

**Large Order for Electric Irons.**—An order for 10,500 electric flatirons has been received by the General Electric Company from the United Gas & Electric Corporation, 40 Wall Street, New York City, for distribution among its various properties. This is said to be one of the largest orders of the kind ever placed, aggregating four carloads of irons. When it is considered that the average income from an electric flatiron is approximately 70 cents a month, the value of this class of business is self-evident. The 10,500 electric flatirons referred to above will thus furnish an estimated income of approximately \$88,200 per year.

**Electric Company Moving to Newark, N. J.**—The Apple Electric Company will move its plant about Sept. 1, it is reported, from Dayton, Ohio, to Newark, N. J., where it will be amalgamated with the Splittorf Electrical Company. Part of the Apple Electric Company's plant at Dayton was destroyed recently by fire, and property valued at \$90,000 was lost. Before the fire about 150 men were employed, but since then the force has been reduced to some 100 men. The company is capitalized at \$300,000 and the officers are as follows: President, Mr. V. G. Apple; vice-president, Mr. T. A. MacKenzie; secretary and treasurer, Mr. E. V. Martin; and manager, Mr. F. A. Cornell. The company was organized five years ago.

**Bids for Synchronous Condensers.**—On June 11 last bids were opened by the clerk of the Board of Trustees of the Sanitary District of Chicago for furnishing and delivering alternating-current synchronous condensers to be used in connection with the street-lighting system of the city of Chicago. They were referred to the committee on engineering for report. A tabulation shows prices for each horizontal-type alternating-current synchronous condenser set as follows: Allis-Chalmers Manufacturing Company, \$10,091; General Electric Company, \$8,725; Westinghouse Electric & Manufacturing Company, \$9,000. The price for each starting equipment is given as follows: Allis-Chalmers, \$1,090; General Electric, \$1,060; Westinghouse, \$1,340. The Allis-Chalmers and Westinghouse companies specified the autotransformer and switch type of starting equipment, while the General Electric bid on the compensator type. The Allis-Chalmers set is to be operated at 360 r.p.m. and the other two at 600 r.p.m. All the companies guarantee delivery in ninety days.

**Electric Car in Road Race.**—A 100-mile Fritchle electric car was recently entered in a road contest over a course 280 miles long, extending from Denver through Colorado Springs and Canon City to Pueblo and returning to Denver via Colorado Springs. The race was divided into five legs. The electric car was equipped with a thirty-two-cell Fritchle battery weighing 900 lb. with a rating of 180 amp-hours. The total weight of the car was 2400 lb. The car competed with nine high-power gasoline automobiles. The electric car negotiated the distance in 16.34 hours driving time, an average of over 17.25 miles per hour in spite of showers and heavy roads. The electric car made no stops for repairs, and recharging was done during the prearranged stop-overs. The best time made by the gas cars was 12 hours, 27 minutes and 35 seconds. On the run from Colorado Springs to Canon City, a distance of 54 miles, the cost of operating the electric was 36 cents, figuring the energy cost at 2 cents per kw-hr. On the same stretch with the gasoline car which used the least amount of gasoline, the cost of fuel was \$1.20.



**Jovian Roster for 1913.**—"The Jovian Roster," containing names of 12,282 members of the Jovian Order, has just been received from the press. This collection of names of representative men of the electrical industry has been divided into three lists, arranged alphabetically, numerically as to potential, and geographically. In addition to the list of names the book also gives the personnel of the Past Jupiters' Association, plan of the Jovian Order, constitution, by-laws, honorary members, and deceased members. The Roster is copyrighted by Mr. Ell C. Bennett for the Jovian Order, Syndicate Trust Building, St. Louis, Mo., and is for sale at \$2 a copy.

**Central Station Returns for March, April and May.**—The *Electrical World* has received comparable returns for the months of March, April and May from the central station companies operating in a majority of the fifty largest cities in the country. The results are given in the accompanying tables, and it will be seen that the rate of increase of this year over last year shows a fairly wide range of variation from month to month. In table I are given the combined data from fifteen of the twenty-five cities, and it may be mentioned that these companies between them make up no inconsiderable proportion of the entire electric service industry. In an average month these companies handle something like six and one half million dollars of gross sales, and the total gross income of all the central stations of the country from the sale of electric energy is a little more than thirty million dollars in a month. The total for the companies operating in every one of the twenty-five cities is known to be over thirteen million dollars, or over forty per cent of the entire industry, but it is impossible here to present comparable returns from all these companies for each of the three months. The rate of increase of 1914 over 1913, as shown by the May returns (the first yet published for that month), is not quite so high as that given by the April figures, although the percentage increase is considerably higher than that for March. It will be seen from table III that the reports from the companies operating in twenty-eight of the first fifty cities show combined gross income from the sale of energy of \$7,671,838 for May, 1914, against \$6,993,648 for May, 1913, an increase of 9.8 per cent; while the combined energy output of all the stations

TABLE I—COMPARATIVE DATA ON INCOME AND OUTPUT FOR MARCH, APRIL AND MAY, 1913 AND 1914, FOR COMPANIES OPERATING IN 15 OF THE FIRST 25 CITIES

	GROSS INCOME FROM THE SALE OF ENERGY			TOTAL OUTPUT IN KW-HRS.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
March	\$7,022,345	\$6,551,519	7.2	305,806,561	269,278,908	13.6
April	6,884,407	6,247,882	10.2	278,970,074	240,975,565	15.8
May	6,482,681	5,904,204	9.8	272,785,980	240,975,653	13.3

operated by these companies is 329,069,269, against 291,600,632 kilowatt-hours, an increase of 13 per cent. The rates of increase over 1913 were 10.8 and 15.5 per cent for April, and 7.8 and 13.4 per cent for March. It may be stated that the average figures as given by these tables are probably fairly true for the operating companies scattered through the country. That is to say, the figures which the *Electrical World* has collected include hardly a single instance of a decrease, which would tend to pull the average down, nor any instances of excessively heavy local increases which would have the effect of raising the average value to a misleading extent. On the other hand, it cannot be denied that the gratifying showing which is at present being made by the electric service utilities is due very largely to the healthy condition of the companies operating in a great majority of the large cities. The large cities, say the first one hundred, make up a very large proportion of the total for the entire country; and if the companies in these cities can make a satisfactory showing on monthly income and output, then the statistics of the whole industry will indicate a condition of stability and good health, even though the companies in cities of, say, 50,000 population and less

were in a condition of stagnation. The business of the smaller companies to-day is not by any means stationary, although the rates of increase over last year are not as high as are being shown by the larger companies. The *Electrical World* returns from cities of 50,000 and less include

TABLE II—COMPARATIVE DATA ON INCOME AND OUTPUT FOR MARCH, APRIL AND MAY, 1913 AND 1914, FOR COMPANIES OPERATING IN 13 OF THE SECOND 25 CITIES

	GROSS INCOME FROM THE SALE OF ENERGY			TOTAL OUTPUT IN KW-HRS.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
March	\$1,253,189	\$1,133,049	10.5	53,582,712	47,741,076	12.2
April	1,273,482	1,117,593	14.1	56,845,282	49,665,912	14.4
May	1,189,157	1,059,444	9.2	56,283,280	50,624,979	11.2

more than one instance of decreasing gross income, and it is indeed likely that the business depression is capable of influencing the business of the smaller companies to a greater extent than in the case of the larger utilities. The returns show that, whatever the size of the community served, the local system which is under syndicate control and operation seems to maintain its gross income through a period of slow general business with a greater measure of

TABLE III—COMPARATIVE DATA ON INCOME AND OUTPUT FOR MARCH, APRIL AND MAY, 1913 AND 1914, FOR COMPANIES OPERATING IN 28 OF THE FIRST 50 CITIES (COMBINED FIGURES OF TABLES I AND II)

	GROSS INCOME FROM THE SALE OF ENERGY			TOTAL OUTPUT IN KW-HRS.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
March	\$8,275,534	\$7,684,568	7.8	359,389,273	317,019,984	13.4
April	8,157,889	7,365,475	10.8	335,815,356	290,641,477	15.5
May	7,671,838	6,993,648	9.8	329,069,269	291,600,632	13.0

success than does the independent company. The theoretical reasons which would bring about such a result have been frequently formulated and expressed in the past, so that there is no need to recount them here. It is interesting to note, however, that the arguments in favor of syndicate control and operation of the smaller utilities seem to be fairly well substantiated by actual operating experience.

#### NEW YORK METAL MARKET PRICES

	July 7		July 14	
	Bid	Asked	Bid	Asked
Copper Standard spot*	13.45	13.85	13.35	13.75
	Selling Prices		Selling Prices	
	¢	¢	¢	¢
London, standard spot*	62	5 0	61	0
Prime Lake	14.90	to 14.25	13.70	to 13.80
Electrolytic	13.70	to 13.85	13.50	to 13.70
Casting	13.55	to 13.65	13.50	to 13.55
Copper wire base	14.87 1/2	to 15.12 1/2	15.00	to 15.12 1/2
Lead	.....	3.90	.....	3.90
Nickel	40.00	to 45.00	40.00	to 45.00
Sheet zinc, f.o.b. smelter	.....	7.00	.....	7.00
Spelter, spot	5.00	to 5.10	4.95	to 5.05
Tin, spot*	31.95	to 32.20	31.50	to 32.00
Aluminum:				
Prompt delivery	17.50	to 17.75	17.50	to 17.75
Future	17.50	to 17.75	17.50	to 17.75

#### \*OLD METALS

Heavy copper and wire	12.00	12.25
Brass, heavy	8.25	8.50
Brass, light	7.00	7.25
Lead, heavy	3.60	3.75
Zinc, scrap	3.75	3.85

#### \*COPPER EXPORTS

Total tons to July 14.....14,731

\*From daily transactions on the New York Metal Exchange.

## Corporate and Financial

**American Light & Traction Company.**—Mr. T. R. Fell has been elected a director of the American Light & Traction Company to succeed the late James Campbell.

**Columbus Electric Company Notes Sold.**—Messrs. Curtis & Sanger and Eastabrook & Company have sold at 99 and interest \$1,750,000 three-year 6 per cent gold notes dated July 1, 1914, of the Columbus (Ga.) Electric Company.

**Westinghouse Electric & Manufacturing Company.**—Holders of the two-year 6 per cent collateral notes of 1913 of the Westinghouse Electric & Manufacturing Company have been notified of the company's election to redeem on Aug. 1 all notes now outstanding at 102 and interest.

**Merchants' Light & Heat Company.**—The Merchants' Light & Heat Company of Indianapolis, a subsidiary of the American Public Utilities Company, has sold to the Harris Trust & Savings Bank of Chicago and Lee, Higginson & Company \$308,000 refunding mortgage 5 per cent bonds, due Oct. 1, 1922. Most of the issue has been sold and the remainder is being offered at 96½ and interest.

**Union Electric Light & Power Company.**—The election of Mr. W. J. Kinsella, a director of the Mercantile Trust Company, to fill the vacancy in the board of directors of the Union Electric Light & Power Company, St. Louis, Mo., caused by the death of James Campbell has been announced by Mr. A. C. Einstein, vice-president and general manager of the company. The company is a subsidiary of the North American Company, of which Mr. Campbell was president at the time of his death.

**American Telephone & Telegraph Company Shareholders.**—It is reported that on April 1 the directors of the American Telephone & Telegraph Company owned personally 47,299 shares of the stock. The trustee holdings and firm stock represented by several of the directors, including the above, reach 148,590 shares, somewhat more than 4 per cent of the total share capital. Among the large holdings were the following: Messrs. C. F. Adams, 503; G. F. Baker, 6,760; U. N. Bethell, 1800; A. Cochran, 1500; W. M. Crane, 3,000; F. P. Davidson, 132; R. Ellis, 240; G. P. Gardner, 360; N. W. Harris, 463; H. L. Higginson, 200; H. S. Howe, 422; C. E. Hubbard, 867; L. C. Ledyard, 120; J. J. Mitchell, 20; R. Olney, 300; W. L. Putnam, 268; S. L. Schoonmaker, 78; E. V. R. Thayer, 207; T. N. Vail, 4000; J. I. Waterbury, 914, and M. Williams, 550.

**Short Stories of Public Utilities.**—Messrs. Williams, Dunbar & Coleman, New York, have issued the first of a series of short stories of public utilities. The present issue traces the growth of the public utility from its birth in the wax-handle trade and ox-cart transportation, through the early 0's when gas was sold at \$10 a thousand cubic feet, to the Philadelphia exposition in 1876. It was then that the Edison incandescent lamp and the Brush arc lamp for streets attracted so much attention. The booklet contains also a brief description of the history and commercial position of the American Light & Traction Company and of the Cities Service Company. At the end of the pamphlet are described the bond and note issues, offered by the company, of the Denver Gas & Electric Company, Utah Securities Corporation, Tennessee Power Company and the Denver Gas & Electric Light Company.

**Report of J. G. White & Company, Ltd.**—Mr. E. A. Borel, secretary, in presenting the fourteenth director's report of the J. G. White Company, Ltd., of London, stated that in view of the depressed financial conditions which have hampered the development of new construction enterprises, the results of the business have been fairly satisfactory and how a net profit on the year's trading of £70,387. The general reserve now amounts to £135,000, £15,000 having been allotted to it out of the profits. The directors recommend again a dividend of 12 per cent on both classes of shares, and, in addition, an extra dividend of 10 shillings on the ordinary shares. The balance carried to profit and loss was £73,786, which the directors recommend shall be dealt with as follows: In payment of the 6 per cent half-year dividend, £12,000; in payment of the extra dividend of 10 shillings for the full year on the ordinary shares, £25,000; to general reserve, £15,000; the balance of £21,786 to be carried to next year's accounts.

**American Gas & Electric Company Bonds.**—The Electric Bond & Share Company of New York is offering \$1,000,000 of 6 per cent gold debenture bonds of the American Gas & Electric Company. These are one-hundred-year bonds dated May 1, 1914, and redeemable as a whole on any interest day at 110 per cent and interest. No additional debenture bonds can be issued unless the net income of the company applicable to payment of interest on the debenture bonds for twelve months is at least three times the annual interest on all outstanding debenture bonds, together with those to be issued. The earnings of the company and of its subsidiaries applicable to it for the year ended April 30, 1914, after deducting expenses and prior interest charges, were more than twelve times the annual interest on the present issue. The proceeds from the sale of this issue will be used to liquidate floating debt resulting from the financing of subsidiary companies, for the purchase of additional properties and for other corporate purposes. In 1913 the company served 52,873 customers with a total of 142,254,960 kw-hr.

**Pacific Gas & Electric Company.**—President F. G. Drum has sent to stockholders a letter supplemental to his communication of June 3 in which it is stated that stockholders representing more than two-thirds of the outstanding capital had voted for the new plan of permanent financing, and that in an order dated July 1, the Railroad Commission of California has authorized the financial plan in every particular. The commission's order, granting authority to the company to reimburse its treasury for \$11,568,161 expended for plant additions and not heretofore capitalized, makes it possible to utilize the proceeds of subscriptions to the first preferred stock to free the company from all floating debt and to give it a net working capital, which, with accretions from surplus earnings, should exceed \$5,000,000 prior to the resumption of the dividends on the common stock, to which the board of directors pledged itself in the letter of June 3. President Drum further states that subscriptions to the first preferred stock are being received at a satisfactory rate and that of the total number of stockholders who have forwarded their subscription about 40 per cent have subscribed for more than their allotment. This the directors regard as a substantial endorsement of the opinion that subscriptions to this stock are merited solely from an investment standpoint entirely aside from the collateral benefits which stockholders will derive from the consummation of the plan.

**Annual Report of the Middle West Utilities Company.**—The annual report of the properties of the Middle West Utilities Company for the year ended April 30, 1914, shows that the gross earnings were \$7,345,351. This, less \$5,036,696 for operation, leaves \$2,308,655 as net earnings from operation. Fixed charges were \$908,033, and interest and dividends amounted to \$474,817. This left \$925,805 as the earnings accruing to securities owned by the company. Of these earnings \$336,127 represented interest on bonds and debentures and \$442,261 dividends on stock owned, leaving a balance of \$147,417, being the company's portion of the surplus carried in the aggregate surplus accounts of the subsidiary companies on their own books. The company's own report showed a total income of \$1,466,761, which, less expenditures for depreciation, taxes, dividends and discount appropriation, left a balance carried to surplus of \$432,261. To this was added the company's share of the aggregate surplus of \$147,417, making a total surplus of \$579,678. President Samuel Insull said that the company is trying, as far as possible, to keep all the junior securities in its treasury. The \$3,500,000 of three-year 6 per cent collateral gold notes of the company, issued June 1, 1913, have all been sold and the proceeds used for corporate purposes. During the past year the subsidiary operating companies have been engaged, in addition to the regular operation of their properties, in making such physical improvements as will enable them to operate more efficiently. President Insull further remarked that while they are already enjoying some advantages from these improvements, they have not yet received the full benefit therefrom. The subsidiary companies are at present serving, with one or more classes of public utility service, an aggregate estimated total population of between 900,000 and 950,000 people in 333 communities embraced in ten states.



## Business Notes

The Mueller Electric Company has moved its office from 1211 Cherry Street to 222 North Eleventh Street, Philadelphia. This company is engaged in the business of selling and repairing electrical apparatus.

**Blaw Steel Construction Company, Pittsburgh, Pa.**—Mr. Alan P. Wilson has been appointed Western sales manager of the Blaw Steel Construction Company, with headquarters in the People's Gas Building, Chicago, Ill.

**Hughes Universal Arc Lamp Company.**—Mr. L. L. Leber, formerly consulting and constructing engineer for railroads and electric plants in the West, is now employed by the Hughes Universal Arc Lamp Company, 628 Race St., Philadelphia, Pa.

**Holophane Works of the General Electric Company.**—Mr. Arthur B. Wilson, for the past five years assistant sales manager of the Tungstolier Works of the General Electric Company, has become identified with the jobbing division of the Holophane Works of the above company at Cleveland, Ohio.

**Ball & Ball.**—Mr. Frederick O. Ball has resigned as general manager of the American Engine & Electric Company (formerly the American Engine Company) of Bound Brook, N. J., to engage with his father, Mr. Frank H. Ball, in the manufacture and sale of carburetors under the firm name of Ball & Ball with headquarters in Detroit, Mich.

**The H. A. Strauss Data-Card Service**, with offices in the Harris Trust Building, Chicago, makes announcement of a technical data-card service for engineers and all others interested in technical data. The plan is to mail at least four cards every fortnight to subscribers. These cards are to contain data taken from actual practice and to cover the entire field of engineering.

**Kandem Electric Company.**—Owing to the fact that the name of the Koerting & Mathieson Company has been found difficult to write and to remember and does not indicate the nature of the company's business, this firm will hereafter be known as the Kandem Electric Company, Inc. There will be no change in policy or organization and the office will be continued at 49 East Twenty-first Street, New York, as heretofore.

**The Electric Emblem Company, Louisville, Ky.**, is introducing a new "emblem of the electrical profession" in the form of an enamel-inlaid gold-filled button bearing the Greek letter "E" followed by a numeral indicating the year in which the wearer entered the electrical field. Thus a button with the inscription "E 96" would signify that the wearer had been engaged in electrical work since 1896. The emblem has been copyrighted, but all persons are encouraged to use the design for show-window advertising, cards, stationery, and all purposes except as a design for emblem buttons or jewelry.

**Detroit Insulated Wire Company.**—In accordance with a reorganization which took place on June 25, 1914, the following are now officers of the Detroit Insulated Wire Company, Detroit, Mich. Mr. Joseph H. Hunter, president; Mr. J. G. Spilane, vice-president; Mr. James Inglis, chairman of the board of directors; Mr. C. C. Gray, secretary and treasurer, and Mr. W. G. Dalglish, assistant secretary and treasurer. Mr. Hunter, one of the original incorporators, served as vice-president and general manager and succeeded to the presidency on Feb. 20, 1914. He was formerly vice-president and general manager of the National Cable & Wire Company. Mr. Spilane is a graduate of the University of Pittsburgh. He held a responsible position with the Standard Oil interests from 1887 to 1903. On May 18, 1903, he was elected president of the Pittsburgh & Allegheny Telephone Company. Mr. Inglis has been connected with the company as a stockholder since its inception. His business career practically originated with the American Blower Company, of which he served as president for a long time. He is a director of the National Bank of Commerce and the Michigan Savings Bank and was one of the organizers of the Detroit Board of Commerce and its president from April 1, 1906, to April 1, 1907. Mr. Gray has had charge of the company's activities since September, 1912, and formerly held a similar position with the National Cable & Wire Company.

## Trade Publications

**Wire.**—A folder issued by the Western Electric Company, New York, describes the relative characteristics of copper and copper-clad wire.

**Electric Hoists.**—Bulletin 301A of the Pawling & Harnischfeger Company, Milwaukee, Wis., deals with applications of the electric hoist.

**Curve-Drawing Instruments.**—Curve-drawing instruments are described in Catalog No. 321, published by the Esterline Company, Indianapolis, Ind.

**Corliss Engines.**—The Murray Iron Works Company, Burlington, Ia., has issued a pamphlet on Corliss engine-driven alternating-current generators.

**Belt Drive.**—A short treatise on belt drive, referring especially to Lenix belts, has been published by F. L. Smith & Company, 50 Church Street, New York.

**Washing Machines.**—The Western Electric Company, Chicago, has printed a folder in English and Chinese describing its electric washing and wringing machine.

**Speed Regulators.**—The Allen-Bradley Company, Milwaukee, Wis., has issued bulletin B-571 on the subject of its speed regulators for slip-ring induction motors.

**Elevator Safeguards.**—An illustrated catalog on safety devices for elevator installations has been issued by the Burdett-Rowntree Manufacturing Company, New York.

**Ventilating Equipment.**—Multiblade blower fans and ventilating equipment are described in a booklet prepared by the Typhoon Fan Company, 1544 Broadway, New York.

**Automatic Circuit Controllers.**—A booklet on automatically reclosing circuit-breakers has been issued by the Automatic Reclosing Circuit Breaker Company, Columbus, Ohio.

**Switchboard Instruments.**—The Kermel Apparatus Company, 145 Main Street, Cambridge, Mass., has issued a catalog descriptive of its new line of switchboard instruments.

**Switches and Accessories.**—Rotary and push-button type snap switches are described in Catalog K, published by the Hart & Hegeman Manufacturing Company, Hartford, Conn.

**Solderless Connectors.**—Various types of Dossert solderless connectors are described in a catalog distributed by Dossert & Company, 242 West Forty-first Street, New York.

**Electric Power Table.**—A table equipped with a motor for driving kitchen utensils is described in Bulletin No. 192 issued by the Federal Sign System (Electrical), Chicago, Ill.

**Vacuum Cleaner.**—A house-type suction cleaner supported on three wheels is described in a leaflet distributed by the Birtman Electric Company, 12 South Clinton Street, Chicago.

**Cascade Induction Motors.**—The firm of Sandycroft, Ltd., Sandycroft, near Chester, England, has published an illustrated catalog describing single-speed cascade induction motors.

**Automatic Sprinklers.**—The General Fire Extinguisher Company, Providence, R. I., has issued Bulletin No. 77, describing installations of the Grinnell automatic sprinkler system.

**Motor-Driven Sewing Machine.**—A foot-controlled motor-driven sewing machine is described in Bulletin No. 117 issued by the Robbins & Myers Company, 145 Chambers Street, New York.

**Vehicle-Type Searchlamp.**—An adjustable vehicle-type searchlamp with the switch integral with the handle is described in the leaflet issued by the Wood Manufacturing Company, Fairfield, Conn.

**Storage Batteries for Boats.**—Bulletin No. 147, containing information on Ironclad-Exide storage batteries for yacht and motor boats, has been issued by the Electric Storage Battery Company, Philadelphia, Pa.

**Portable and Semi-portable Locomobiles.**—The April number of the periodical published by Heinrich Lanz, Mannheim Germany, manufacturer of locomobiles, describes installations of this equipment at Lisbon, Portugal, and in France, Italy, Asia and Brazil. The Wiener Machinery Company, 5 Church Street, New York, is the United States agent for the Lanz company.

**Paper-Lift.**—A motor operated paper lift is described in the booklet issued by H. R. Rouse & Company, 2214 Ward Street, Chicago, Ill.

**Vehicle-Loading Machinery.**—Illustrated Booklet No. 190, sent out by the Link-Belt Company, Chicago, Ill., describes vehicle-loading apparatus.

**Glass Insulators.**—Bulletins No. 1B and 55 of the Brookfield Glass Company, 2 Rector Street, New York, present data on its glass insulators.

**Time Switch.**—Bulletin C, issued by the Kennedy-Webster Company, 536 South Clark Street, Chicago, Ill., refers to several types of time switches.

**Pressure-Recording Gages.**—Differential pressure-recording gages are described in Bulletins 188 and 189 of the Bristol Company, Waterbury, Conn.

**Conduit.**—Card No. 9 issued by the Safety-Armorite Conduit Company, Pittsburgh, Pa., lists discounts on and prices of conduit, couplings and elbows.

**Insulators.**—Porcelain and glass insulators are described in Catalog DS-845 of the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.

**Electric Trucks.**—Bulletin No. 108, issued by the General Motors Truck Company, Pontiac, Mich., contains information and data regarding its electric trucks.

**Axle-Lighting System.**—Principles of its axle-lighting system are brought out in a bulletin issued by the Electric Storage Battery Company, Philadelphia, Pa.

**Traveler's Iron.**—The Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., has issued a pamphlet (Form 4281) describing a traveler's electric iron.

**Electricity in Leather Industry.**—Motor drive in the shoe and leather industry is discussed in Bulletin No. 48,010 of the General Electric Company, Schenectady, N. Y.

**Portable Rectifier.**—A portable rectifier for charging storage batteries is described in a folder sent out by the Wagner Electric Manufacturing Company, St. Louis, Mo.

**Telephone Testing Sets.**—Breast-plate type telephone-testing sets are described in Circular No. 20,400, sent out by the Holtzer-Cabot Electric Company, Brookline, Mass.

**Central-Station Specialties.**—A loose-leaf catalog listing central-station specialties has been issued by the Electrical Development and Machine Company, Philadelphia, Pa.

**Transformers.**—Information regarding central-station transformers is contained in Bulletin No. 105, issued by the Wagner Electric Manufacturing Company, St. Louis, Mo.

**Index to G.E. Descriptive Bulletins.**—The General Electric Company, Schenectady, N. Y., has issued an index covering all current descriptive bulletins published before April, 1914.

**Testing Manual.**—Information on electrical testing is contained in the forty-seven-page Bulletin No. 104, issued by the Wagner Electric Manufacturing Company, St. Louis, Mo.

**Oil Filters.**—Bulletins No. 87 and 89 of the Elliott Company, Pittsburgh, Pa., describe applications of filters to purifying insulating oils and separating oil from boiler-feed water.

**High-Voltage Direct-Current Equipment.**—In Bulletin No. 4,010 of the General Electric Company, Schenectady, N. Y., high-voltage, direct-current railway installation is described.

**Outdoor-Type Oil-Break Switches.**—Information on high-voltage outdoor-type oil-break switches is contained in Bulletin No. 47,401 of the General Electric Company, Schenectady, N. Y.

**Meters.**—Single-phase watt-hour meters and portable test meters are described respectively in Bulletins No. 6,201 and 46,291 of the General Electric Company, Schenectady, N. Y.

**Street-Lighting Fixtures.**—Street-lighting fixtures for new sizes of series tungsten lamps are illustrated in Folder 423, issued by the General Electric Company, Schenectady, N. Y.

**Combustion Engines.**—Dimensions of air compressors and gasoline and fuel-oil engines are given in Bulletin No. 34-C of the Chicago Pneumatic Tool Company, Fisher Building, Chicago, Ill.

**Storage-Battery Plants.**—Thirty-two-volt, 60-volt and 110-volt storage-battery plants are described in Catalog A of the Petschel Storage Battery Company, 3051 West Lake Street, Chicago, Ill.

**Polyphase Induction Motors.**—The General Electric Company, Schenectady, N. Y., has prepared Bulletin No. 41,302, containing information on its complete line of polyphase induction motors.

**Bracket Arms.**—Catalog Section DS-842 of the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., contains information on bracket arms for direct and catenary suspension.

**Insulated Wire.**—A loose-leaf filler containing the prices of "Safety" rubber-covered wire is being sent out by M. B. Austin & Company, Chicago, Ill., as a supplement to Bulletins No. 1, 2, 2A and 2B.

**High-Rated Tungsten Lamps.**—Information regarding 750-watt and 1000-watt tungsten lamps for interior illumination is contained in Bulletin No. 43,600 of the General Electric Company, Schenectady, N. Y.

**Battery and Switchboard Units.**—In Hand Book HX and Bulletin SL, issued by the Electric Storage Battery Company, Philadelphia, Pa., are described storage-battery installations for automobile service and isolated plants.

**Industrial Illumination.**—Bulletins No. 43,400, 43,401 and 43,402 issued by the General Electric Company, Schenectady, N. Y., contain information on the illumination of wood-working plants, clothing factories, machine shops and metal-working plants.

**Switchboards and Equipment.**—The Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., has issued Leaflets No. 3719 and 3745, and loose-leaf filler Section DS-1410 for Catalog 3001, describing its two-wire battery-charging panels, two-wire direct-current panels, and hand-operated oil-switches.

## New Industrial Companies

**Lunt & Heath**, of Augusta, Maine, has been chartered with a capital stock of \$50,000 to manufacture and deal in all kinds of electrical supplies, etc. E. M. Leavitt, of Augusta, Maine, is president and treasurer.

**The Winona Electric Construction Company**, of Chicago, Ill., has been chartered with a capital stock of \$2,500 to do a general contracting business by John F. Rosen, John P. O'Shaughnessy and Joseph L. Toohey.

**Joseph Dixon Crucible Company.**—Dudley A. Johnson has been appointed Chicago branch manager of the Joseph Dixon Crucible Company, manufacturer of brushes and other graphite products, to succeed the late Sam Mayer.

**The Lektric Sales Company**, of Louisville, Ky., has been incorporated by Thomas J. Comer, Charles L. Stephens, Frank G. Clark and others. The company is capitalized at \$175,000 and proposes to manufacture and sell electrical supplies.

**The Rutland Foundry & Machine Company**, of Biddeford, Maine, has been incorporated with a capital stock of \$50,000 to manufacture, repair and deal in machinery of all kinds, including electrical specialties. J. A. Snow, of Scarborough, is president, and F. B. Ross, of Biddeford, treasurer.

**The Stromberg-Carlson Telephone Company**, of Rochester, N. Y., has been incorporated with a capital stock of \$450,000 to manufacture electrical apparatus, etc., and will take over the property of the old company. The incorporators are W. M. Angle, W. R. McCanne and F. C. Goodwin, of Rochester.

**The Chicago Electric Lamp Company**, of Chicago, Ill., has been incorporated with a capital stock of \$2,500 to manufacture and deal in lamps, fixtures, electrical and other novelties. The incorporators are Samuel H. Gilbert, Oliver J. Chambers and Lewis Drucker.

**The Silent Salesman Company**, of New York, N. Y., has been incorporated with a capital stock of \$100,000 by P. M. Millsbaugh, W. E. A. Wheeler and H. A. Hall, 1624 University Avenue, the Bronx. The company proposes to manufacture and deal in machinery, electrical appliances, etc.



## Personal Mention

Mr. Frank Gier, Jr., has succeeded Mr. J. V. Harding as manager of the municipal electric-light plant at State Center, Ia.

Mr. Philip D. Laird has tendered his resignation as chairman of the Maryland Public Service Commission to take effect August 1.

Mr. William J. Kinsella has been appointed a director of the Union Electric Light & Power Company, St. Louis, Mo., to fill the vacancy caused by the death of the late James Campbell.

Mr. E. F. Stone, superintendent of the Arkansas Valley Railway, Light & Power Company, has been elected president of the Manufacturers' Bureau of the Pueblo (Col.) Commercial Club.

Mr. F. M. Sheperd, Philadelphia, Pa., has been elected president of the Electrical Contractors' Association of the State of Pennsylvania and the Philadelphia Electrical Contractors' Association.

Mr. Fred O. Plymale has resigned as manager of the Gallipolis (Ohio) Electric Light Company and has been succeeded by Mr. G. T. Bogard of Richmond, Ky., who has acquired a large interest in the property.

Mr. C. G. Bowen has been appointed superintendent of the Seven Cities Company, Russellville, Ark., which recently purchased the entire assets of the Russellville Water & Light Company formerly operating in that city.

Mr. B. C. Edgar, who was recently appointed general superintendent of the Nashville (Tenn.) Railway & Light Company, was formerly assistant general superintendent of the Columbus (Ohio) Railway, Power & Light Company.

Prof. D. W. Mead, of the University of Wisconsin, Madison, Wis., has been appointed a member of the board of engineers which will supervise the work on a twenty-million-dollar project for the prevention of floods in eastern China.

Mr. J. F. C. Snell, president-elect of the Institution of Electrical Engineers of Great Britain, was recently knighted by King George in recognition of the services which he rendered the government in its purchase of the national telephone system.

Prof. Alexander G. Christie, who is associate professor of steam engineering at the University of Wisconsin, Madison, Wis., has been appointed associate professor of mechanical engineering in the college of engineering now being organized by Johns Hopkins University.

Mr. Edward Schildhauer, who has had supervision of the design and construction of the entire electrical generating, distributing and lock-control system for the Panama Canal, has returned to the Canal Zone after a leave-of-absence. Mr. Schildhauer was accompanied by his family on his trip north.

Prof. A. A. Potter has been appointed dean of the engineering division of the Kansas State Agricultural College, Manhattan, Kan., and director of the engineering experiment station of the same institution. Professor Potter has heretofore been in charge of the department of steam and gas engineering.

Mr. William P. Bear, of Chicago, has been appointed electrical engineer for the Public Utilities Commission of Illinois, with office at the headquarters of the commission in Springfield, Ill. Mr. Bear has been connected with the Sprague Electric Works of the General Electric Company and with other companies, and he is a member of the Jovian Order.

Prof. Samuel Sheldon, of the Polytechnic Institute, Brooklyn, N. Y., past-president of the American Institute of Electrical Engineers, is receiving the sympathy of friends because of the death of his wife, Mrs. Frances Warner Putnam Sheldon, who died at the family residence in Brooklyn, July 9. Mrs. Sheldon was well known in Brooklyn and Polytechnic Institute circles.

Prof. James Graves Scrugham has been appointed dean of the newly created department of engineering at the University of Nevada and has also been named as commissioner to take charge of the Nevada exhibits at the San Francisco

and San Diego expositions. Mr. Scrugham was graduated from the State University of Kentucky, Lexington, in 1900. Upon graduation he entered engineering work and later took up testing work for several railroads. Prior to his appointment as dean Professor Scrugham was professor of mechanical and electrical engineering at the University of Nevada.

Prof. Gustav W. Meyer of the Engineering School of Zwickau, Germany, has been awarded the honorary medal of the Industrial Society of Mülhausen, Alsace, for his paper on "The Comparative Efficiency of Electric and Mechanical Drives in the Textile Industry." The medal and the diploma will be presented to Prof. Meyer at a special meeting of the Society on Sept. 30th. Prof. Meyer is well known in this country, having been formerly connected with the Crocker-Wheeler Company, New Jersey, the Westinghouse Electric & Manufacturing Company, the Interboro Rapid Transit Company, the De la Vergne Machine Company, and the Morgan Engineering Works.

Dr. Francis B. Crocker, Ampere, N. J., who has been re-elected president of the Electric Power Club, as noted in our issue of last week, is well known as a manufacturer, engineer, author and educator. He was born in New York



PROF. F. B. CROCKER

in 1861 and at the age of seventeen entered Columbia University, where he studied mining engineering. After being graduated he formed a partnership with Mr. Charles G. Curtis, establishing the firm of Curtis & Crocker, patent attorneys. Later these two men organized the C & C Electric Motor Company, which was a pioneer in the electrical manufacturing business. In 1888 Messrs. Crocker and S. S. Wheeler formed the Crocker-Wheeler Company. One year after launching the enterprise Mr. Crocker was appointed to take charge of the electrical engineering department of Columbia University, which had just been established. While holding this supervisory position he still retained his connection with the firm of which he was joint organizer. At the World's Columbian Exposition in 1893 Professor Crocker was made permanent secretary of the International Electrical Congress. It was just before this event that he proposed the name of "henry," which was adopted by the Congress as the unit of inductance. Besides being a life member of the American Institute of Electrical Engineers Professor Crocker has served it as president and manager as well as vice-president for two terms. He was chairman of the A. I. E. E. committee which drew up the original standardization rules and also of the committee which revised these rules. He was also chairman of the conference of insurance and engineering representatives which formulated the National Electrical Code adopted by the Board of Fire Underwriters. Professor Crocker has contributed many articles to the electrical press and is also author of a two-volume treatise on "Electric Lighting" and a book on "Electric Motors." He has received the degrees of mining engineer, master of science and doctor of philosophy from his alma mater, Columbia University.

## Obituary

William Edward Flaherty, Ballston Spa, N. Y., at one time local manager of the Adirondack Electric Power Corporation, died at his home June 30 after a short illness.

Melville E. Ingalls, formerly president of the National Civic Federation and chairman of the Federation's Committee of Fifteen which investigated municipal-ownership methods in Europe, died at Hot Springs, Va., July 11, at the age of seventy-two years. Mr. Ingalls organized the B Four Railroad in 1880 and was afterward its president at chairman. From 1888 until 1900 he was president of the Chesapeake & Ohio Railroad.

MILAN, OHIO.—The Village Council has accepted the offer of the Lake Shore El. Ry. Co., of Cleveland, to furnish energy to operate the municipal electric-lighting



system. Under the new arrangement a 24-hour service will be established.

**OSBORN, OHIO.**—The Dayton Ltg. & Pwr. Co., of Dayton, has purchased the municipal electric light plant in Osborn.

**URBANA, OHIO.**—Under the new contract authorized by the City Council with the Urbana Lt. Co., covering a period of ten years, the company is to furnish not less than 100 incandescent lamps at \$57.50 each per year; as many 100-cp. incandescent lamps as may be needed at \$25 each per year and as many three-lamp clusters as may be required at \$57.50 per standard per year.

**OLIVE HILL, KY.**—Steps have been taken toward the organization of a company, to be known as the Tygart El. Co., to establish an electric-lighting system in Olive Hill. Equipment and machinery will be purchased about Aug. 1. J. A. Maddox and others are interested.

**PARIS, KY.**—The capital stock of the Paris Gas & El. Co. has been increased from \$75,000 to \$150,000.

**WINGO, KY.**—The proposal to issue \$10,000 in bonds for the installation of a municipal electric-light plant and water works system was defeated at an election held recently. Plans are being considered, it is reported, to organize a company to install and operate electric and water plants in Wingo.

**GARY, IND.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Aug. 6, for construction complete (including mechanical equipment, interior lighting fixtures and approach) of the United States post office at Gary. Drawings and specifications may be obtained from the above office or from the custodian of site at Gary. O. Wenderoth is supervising architect.

**CHICAGO, ILL.**—The Lincoln Park Commissioners expect to purchase within the next two months 3000 200-watt (400 cp) compensator type, incandescent incandescent lamps and 750 power transformers.

**CHICAGO, ILL.**—The Public Service Co. of Northern Illinois, of Chicago, it is reported, contemplates the construction of a hydro-electric power plant at Dresden Heights, to cost about \$1,000,000 in the near future. Samuel Insull is president.

**CHICAGO, ILL.**—Complying with an order of the City Council the Board of Trustees of the Sanitary District of Chicago has appropriated \$70,000 for the purpose of removing and placing in underground conduits all of its overhead wires in Western Avenue, between West Thirty-first Street and the south line of Gage Park, a distance of 2.5 miles.

**GREENUP, ILL.**—The village of Greenup will receive bids until July 20 for a new electric-light plant with a generating capacity of 75 kw. Specifications call for a high-speed engine, for direct connection to generator. Bids will also be received for Corliss type engine and belted generator. Bids will also be received for a 250-gal. per minute, motor-driven triple pump for pumping plant water. Plans may be seen in the office of the village clerk, Greenup, and in the office of Fuller-Coulton Co., engineer, Chemical Building, St. Louis, Mo.

**PANA, ILL.**—The City Council has voted to enter into a contract with the Central Illinois Pub. Ser. Co., of Mattoon, for a period of two years. Under the terms of the agreement the company is to supply gas against the company restraining it from entering the city with its high-tension wire from Kinkaid. When the transmission line is extended to Pana, the local power plants have not been in service since Nov. 1, 1913.

**PEORIA, ILL.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Aug. 3, for an electric signal system in the United States post office in Peoria, Ill. For details see proposal columns.

**DELAVER, WIS.**—At an election held recently the proposal to purchase the pole line, wiring and equipment (transformer, engine and generator) of the United Hl. Lt. & Pwr. Co., of Delavan, was carried, the price to be fixed by appraisers. The village is to purchase an engine and generator (directly connected), transformer, switchboard, etc.

**LA CROSSE, WIS.**—The Wisconsin-Minnesota Lt. & Pwr. Co., which recently acquired the La Crosse plant of the Gas & El. Co., is reported to be planning to transmit electricity from its Cedar Falls and Chippewa Falls plants to La Crosse, to operate a municipal system. The plan provides for the installation of a 3500-hp water wheel at Cedar Falls plant and two 1600-hp water wheels in the Chippewa Falls station. The highest-tension line will be erected to La Crosse, via Winona.

**PRESCOTT, WIS.**—The Wisconsin Rail-

road Commission has authorized the River Falls Pwr. Co., of Prescott, to issue \$20,000 in bonds, the proceeds to be used to erect a transmission line from Hastings, Minn., to Pine Bend, Minn., and substation and to purchase equipment.

**STEVENS POINT, WIS.**—Bids will be received by the Board of Regents of Normal Schools at the office of board, Madison, Wis., until July 24, or at the Club Room in Plankinton House, Milwaukee, until July 25, for construction and completion, including plumbing, sewerage, heating and ventilating and electrical work, for a two-story and basement and attic addition to the Stevens Point Normal School building. Plans are on file in the office of the board at Madison, at the office of Van Ryn & Geleke, architects, 726 Casswell Block, Milwaukee, and at the office of the school, Stevens Point.

**WORTHINGTON, MINN.**—Bids will be received by W. H. Buchan, city clerk, Worthington, until July 22 for construction of an electric transmission line and substation, to be taken over by the city, from Round Lake, Bigelow and Rushmore, Minn., according to plans and specifications which are on file in the respective offices of the village and the county. The above-mentioned villages, and also in the office of Earle D. Jackson, consulting engineer, Capital Bank Building, St. Paul. The sum of \$2, to cover cost of printing and mailing, and company applications for plans and specifications.

**CLARINDA, IA.**—The city of Clarinda has entered into a contract with the Lee Lt. & Pwr. Co. for lighting the streets of the city for a period of 10 years. Under the terms of the new contract the company is to furnish 267 lamps, an increase of 78 lamps over the old contract, at cost \$1,072 less a year than the city is now paying. Material, it is understood, will be ordered at once for the new system.

**DENISON, IA.**—Preparations are being made for improvements to the electric-lighting system taken over by the city, work on which will begin about Aug. 15. The plans provide for the installation of two 150-kva generators directly connected to the city. Contractors for the work have not yet been awarded. J. B. Hill, of Iowa City, will have charge of the work. W. P. Hoover is superintendent of the plant.

**LYONS, IA.**—At an election held recently the proposal to issue bonds for the installation of a municipal electric-light plant in Lyons was carried.

**DREXEL, MO.**—Application has been made to the Town Council by A. Steele, owner of the Adrian electric-light plant, for a franchise to furnish electricity here. Mr. Steele proposes to extend his transmission lines to Drexel.

**KIRKWOOD, MO.**—Within the next four months the city of Kirkwood expects to purchase a 150-hp boiler and smokestack, two generators, one 100-kva and one 200-kva generators and engines, directly connected to the city, and extend his transmission panels. W. A. Trussell is superintendent.

**PALMYRA, MO.**—Bonds to the amount of \$26,000 have been voted for extensions to the municipal light and water plant. The cost of the work is estimated at about \$32,000. The plans provide for a day service. For further information address Howard Smith, of Palmyra.

**PILOT GROVE, MO.**—A franchise has been granted by the city of Pilot Grove to the Commercial Club to install an electric-lighting system here.

**DICKINSON, N. D.**—Hughes & Deiters, owners of the local electric-light plant, have recently installed two 72-in. by 18-ft. horizontal tubular boilers. A. H. Deiters is manager.

**CRAWFORD, NEB.**—The local electric-light plant, owned by S. A. Oliver, has been purchased by the Intercontinental Ry. Lt. & Pwr. Co., of Colorado Springs. G. F. Warnock will continue as manager.

**ATCHISON, KAN.**—The City Council is considering the question of installing an electric-light plant to furnish electricity to maintain the ornamental lighting system on Commercial Street. F. B. Stanley is a member of the light committee of the Council.

**ENTERPRISE, KAN.**—At an election held recently the proposal to issue \$3,000 in bonds for improvements to the municipal electric-light plant was carried.

**EUDORA, KAN.**—Steps have been taken by the Commercial Club to secure the installation of an electric-light plant in Eudora.

**HANOVER, KAN.**—The city of Hanover has entered into an agreement with Fred Meyn, of the Hanover Roller Mills, whereby the latter will furnish electricity to the city for a period of ten years, the contract to be for \$131.80 per year. The city will take over the municipal system. It is un-

derstood that many new street lamps will be installed.

**HORTON, KAN.**—Bids will be received by the city of Horton until July 28 for one 250-kva generating unit, consisting of generator and engine, directly connected. Specifications are on file in the office of the city clerk, Horton.

## Southern States

**CHARLESTON, S. C.**—The Santee-Cooper Development Co., recently organized, contemplates the construction of a navigable canal between the Santee and Cooper Rivers, and building a large hydro-electric power plant at the intersection of the proposed waterway with the aimed stream. The company has applied to the War Department for permission to divert one-half of the waters of the Santee River into the canal and construct a dam at the junction across the stream, for the purpose of diverting the water. The plans provide for the construction of a canal about 24 miles long, extending from the mouth of the Savannah, on Santee River, to the mouth of Biggin swamp, on the west branch of Cooper River. J. L. David is interested in the company.

**ATLANTA, GA.**—Plans are being prepared for the installation of a new electric power plant at the Georgia School of Technology, to cost about \$100,000.

**CANTON, GA.**—Bonds to the amount of \$5,000 have been voted for the installation of a municipal electric-light plant in Canton.

**DETROIT, FLA.**—Steps have been taken to organize a company to establish an electric light plant and ice factory, steam laundry and cannery. The proposed company will be capitalized at \$25,000. J. Youso, J. M. Powers, B. F. Forrest and others are interested in the project.

**JACKSONVILLE, FLA.**—The Jacksonville Ry. & Ltg. Co. has applied to the City Council for a heating franchise. The company proposes to install a steam heating system, to cost approximately \$100,000, plans for which have been prepared by D. L. Hayward, of the Atlantic Steam Co., of North Tonawanda, N. Y.

**CLARKESVILLE, TENN.**—The lighting committee of the City Council has recommended that the Council accept the proposal of the Kentucky Fuel Co. to amend the street-lighting contract between the city and the company (which has six years to run), which provides for the installation of the new type of lamps. Under the new contract the company agrees to install 14 lamps of 600 cp, 40, 400-cp, and 92 of 100 cp.

**BIRMINGHAM, ALA.**—Improvements and additions to several plants in the Tennessee coal, iron and steel fields in this district, involving an expenditure of about \$55,000 will be made, which will include equipping the Bessemer rolling mills with electrically driven machinery.

**HUNTSVILLE, ALA.**—Application has been made to the City Commissioners by E. C. Dillon and others for a 30-year franchise to furnish electricity and natural and manufactured gas in Huntsville. Electricity is to be transmitted from the hydro-electric development of the Chattanooga-Tennessee River Pwr. Co. at the Hales Bar development.

**WAYNESBORO, MISS.**—The Fagan-Pee Co. of Waynesboro, it is reported, would like to receive prices on electrical equipment and fixtures for a building, costing about \$10,000.

**BLYTHEVILLE, ARK.**—Bids will be received by the Board of Commissioners of Sewer District No. 1, Blytheville, until July 30 for construction of a complete sanitary sewer system, including sewage treatment plant, from the Big 6000 g.p.d. in 3500 ft. of 12 in., 3000 ft. of 10 in. and 52,000 ft. of 8-in. sewer, 70 manholes, 60 flush tanks, pumping pit and electrically driven pumping outfall. Plans and specifications may be secured at the office of A. C. Lange, secretary and board of commissioners, Blytheville and at the office of the Exchange Building, Memphis, Tenn.

**HARRISON, ARK.**—The Harrison El. Lt. & Ice Co. has changed its name to the Harrison Gas & El. Co. and increased the capital stock from \$45,000 to \$100,000.

**MEMPHIS, TENN.**—Bids will be received at the office of the Young Men's Hebrew Association, addressed to Samuel Kaplan, chairman building committee, Monroe, until Aug. 6, for erection and construction of a new temple for the congregation B'Nai Israel of Monroe. Separate proposals are requested for the general contract, exclusive of trim and decorative work, and for lighting. Plans and specifications may be

obtained upon application to Samuel Kaplan, chairman building committee, Monroe, or to Stevens & Nelson Co., Liverpool & London Globe Building, New Orleans, architects.

**NEW ORLEANS, LA.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Aug. 3 for an electric signal system in the United States mint in New Orleans, La. For details see proposal columns.

**WINNSBORO, LA.**—Carl Shipp is installing an electric-light plant in Winnsboro, La. to be equipped with a 25-hp oil engine and a 15-kw generator. Soon after the plant is put in operation Mr. Shipp expects to purchase another engine and generator.

**OKEMAH, OKLA.**—The Canadian Pwr. & Lt. Co., recently organized, proposes to build a hydroelectric plant on the North Canadian River, about 7 miles from Okemah. The cost of the plant is estimated at about \$500,000 and will develop about 2000 hp. W. Hill is manager.

**CISCO, TEX.**—The Cisco Gas & El. Co., recently organized with a capital stock of \$50,000, is contemplating the construction of an electric-light plant in Cisco. The incorporators are W. S. Michael, W. H. Tebbis and G. G. Ward.

**CLEBURNE, TEX.**—Plans have been prepared for the installation of an ornamental lighting system in Cleburne which provide for the installation of 15 lamp standards, each mounted with four 100-watt Mazda lamps, to be maintained by underground wires, at a cost of about \$1,200. Contracts will be awarded Aug. 1. Hugh Wallace is chairman of lighting committee.

**FORT WORTH, TEX.**—Steps have been taken to install an ornamental lighting system on North Main Street from the new bridge to Exchange Avenue, at a cost of about \$30,000.

**MARBLE FALLS, TEX.**—The city of Marble Falls is contemplating the installation of a water power, water works and electric-light systems, the power to be derived from the Colorado River. The plan will include the erection of small power house, construction of dam and the purchase of equipment for electric plant and gasoline engine to drive the water pumps in case of emergency, material for electric distribution system and water works system. The city of Marble Falls is not prepared to issue bonds for the entire sum necessary to install the plants, but could issue bonds for a first payment of \$10,000, and would like to correspond with parties interested. For further information address R. E. Johnson, Mayor.

**ORANGE, TEX.**—A franchise has been granted to C. G. Smythe and associates for the construction of an electric street railway in Orange. The plans, it is understood, provide for the construction of a power plant.

**TEMPLE, TEX.**—Extensive improvements are to be made to the local plant of the Texas Pwr. & Lt. Co. Electricity for operating the Keokuk power plant will be supplied from the Temple power system when improvements are completed.

## Pacific States

**KALAMA, WASH.**—The City Council is considering the installation of an electrical distributing system and substation to furnish electrical service in the city. It is proposed to purchase electricity from a private company.

**SEATTLE, WASH.**—Bids will be received by the city of Seattle, until July 20 for supplying the city lighting department with 115,000 incandescent lamps during the year. H. W. Carroll is city clerk.

**BAKER, ORE.**—The Eastern Oregon Lt. & Pwr. Co., of Baker, may possibly build during the next three or four months a 300-kw steam power plant to take the place of that destroyed by fire last April. If the plan is carried out the purchase of material and equipment for same (excepting boilers and engines) will be necessary. F. A. Harmon is general manager.

**MEDFORD, ORE.**—Within the next three months the California-Oregon Pwr. Co., of Medford, expects to purchase 100 3-kw, 110/220-volt air heaters. H. C. Stoddard is superintendent.

**PORTLAND, ORE.**—The Portland Ry. & Lt. Pwr. Co. has been granted permission by the State Engineer to construct two reservoirs on the headwaters of the Clackamas River. It is understood that two reservoirs will be built, one 30 ft high with a storage capacity of 17,900 acre ft, the other 90 ft high to store 40,000 acre ft.

**SHERIDAN, ORE.**—Within the next 30 days the Sheridan Lt. & Pwr. Co. expects to purchase 15 miles of No. 4 bare copper wire. J. F. Thompson is general manager.

**TILLAMOOK, ORE.**—The Coast Pwr. Co., recently organized, has taken over the property of the Tillamook El. Lt. & Fuel Co., and will make improvements and extensions to same. Within the next two months the company will install a 500-kw Curtis turbine with condensing outfit and a 300-hp Lyons boiler, switchboard equipment, consisting of one double-exciter panel, generator panels, one double panel, generator regulator and synchronizing outfit, switchboard and meters, furnished by the General Electric Co. Equipment for above has been purchased. During the summer and fall the company will rebuild a large part of the distributing system and make some improvements to the lighting system. Within the next year the company expects to erect a transmission line along the beach for a distance of 20 miles to provide electrical service to the summer resorts along the shore. C. J. Edward is president and manager.

**LOS ANGELES, CAL.**—The Board of Public Works has awarded the contract for street-lighting to the Los Angeles Gas & Elec. Corp. and the Pacific Lt. & Pwr. Co. for 15 months, during which time 500 new arc lamps are to be placed.

**NORDHOFF, CAL.**—The State Railroad Commission has granted the Ojai Pwr. Co. permission to issue \$19,200 in capital stock, the proceeds to be used for the purchase of new equipment and improvements to its system.

**SAN FRANCISCO, CAL.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Aug. 3, for an electric signal system in the United States post office (old) building, San Francisco, Cal. For details see proposal columns.

**THOMPSON FALLS, MONT.**—The Interstate Pwr. Co., of Thompson Falls, recently incorporated with a capital stock of \$50,000, proposes to generate and distribute electricity in the State of Montana. The company, it is reported, is to acquire various water power sites between this city and the Montana-Idaho inter State line on the Clarks Fork of the Columbia River. One dam, it is understood will be built at Belknap, one near the town of Trout Creek and a third in or near the town of Heron and the Idaho State line.

**TACOMA, WASH.**—C. M. Fassett, commissioner of public utilities, has completed the street-lighting budget for 1915, asking various water power sites between this city and the Montana-Idaho inter State line on the Clarks Fork of the Columbia River. One dam, it is understood will be built at Belknap, one near the town of Trout Creek and a third in or near the town of Heron and the Idaho State line.

**LORDSBURG, N. M.**—The Eighty-five Mining Co. is building a new power plant at its mine near Lordsburg.

## Canada

**LACOMBE, ALTA.**—The Town Council is contemplating the purchase of a 60-hp turbine to be connected to one of the spare generators.

**MONCTON, N. B.**—The special committee appointed by the City Council to consider the street-lighting problem, it is reported, favors the installation of a municipal electric-light plant.

**LONDON, ONT.**—The Hydro-Electric Commission of the city of London is contemplating the purchase of new equipment for the new power house, including generators, transformers, etc. H. J. Glaubitz is general manager.

**ORILLIA, ONT.**—Tenders will be received by the secretary of the Orillia Water, Light & Power Commission until Aug. 3 for furnishing the following apparatus: Contract (E) furnishing and erection of motor-driven turbine pumps and equipment; (F) furnishing and erection of Diesel oil engine and appurtenances; (G) furnishing and erection of mechanical pressure type filtration plant. Plans and specifications may be seen at the office of the commission, at Orillia, W. Greenwood is engineer and E. Long chairman of commission. Through error the date of receiving bids was given as July 27 instead of Aug. 3, in the issue of July 4.

**OTTAWA, ONT.**—Tenders will be received by R. C. Desrochers, secretary, department of public works, Ottawa, Ont., until July 27, for furnishing 270,000 lb. galvanized iron telegraph wire, to be delivered at Montreal, Que.; also 320,000 lb. of same to be delivered at Vancouver, B. C. Specifications and form of tender may be obtained on application to the office of the general superintendent of the Government Telegraph Service at the Department of Public Works, Ottawa.

**OTTAWA, ONT.**—Tenders will be received by R. C. Desrochers, secretary, department of public works, Ottawa, until July 27 for furnishing 23 knots of single conductor submarine telegraph cable (107 lb. copper and 150 lb. gutta-percha per knot) with sheathing of 12 No. 8 Starrett wire gage, iron wires to be delivered at Halifax, N. S., within eight weeks after order is given. Also for 14 knots same as above on several reels for distribution to be delivered at Vancouver, B. C. Specifications and form of tender can be obtained on application to the general superintendent of Government Telegraph Service, Department of Public Works, Ottawa.

## New Incorporations

**MUNFORDVILLE, KY.**—The New Munfordville El. Lt. & Pwr. Co. has been incorporated with a capital stock of \$2,800 by F. W. Wheeler, J. W. Fayton and others.

**SHEPHERDVILLE, KY.**—The Shepherdville El. Lt. Ice & Wtr. Co. has been incorporated with a capital stock of \$10,000 by S. W. Bates, Conrad Maraman, W. E. Ashby and W. T. Lee.

**MCALLESTER, OKLA.**—The McAlester Lt. & Pwr. Co. has been chartered with a capital stock of \$10,000 by J. B. McAlester, W. B. McAlester and E. A. Daniels.

**NAPLES, TEX.**—The Northwestern El. Co. of Texas has been incorporated by J. C. Martin, M. Galloway and J. D. Bedell. The company is capitalized at \$15,000.

# Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED  
JULY 7, 1914.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York, N. Y.]

1,102,274. ELECTROMAGNETIC TELEGRAPH. D. M. Bliss, Stamford, Conn. App. filed July 2, 1909. Designed especially for use on shipboard.

1,102,245. ELECTRIC RESISTANCE UNIT. H. W. Denhard, San Francisco, Cal. App. filed Oct. 31, 1911. "Radiant heater" type.

1,102,252. ELECTRICAL INSULATOR; J. H.

Ellis, Prescott, England. App. filed Mar. 30, 1912. "Double strain" insulator for overhead conductors.

1,102,300. ELECTRIC FLAT-IRON; P. E. Shailor, Pittsfield, Mass. App. filed Apr. 19, 1913. Has pivoted switching plug.

1,102,308. VAPOR ELECTRIC DEVICE; E. Weintraub, Lynn, Mass. App. filed Feb. 21, 1914. "High pressure" vapor lamp.

1,102,315. MOTOR-CONTROLLER; P. H. Zimmer, Milwaukee, Wis. App. filed Mar. 19, 1913. Compound starter insuring full field strength on starting.

1,102,318. INTERLOCK; C. B. Callow, London, Eng. App. filed Sept. 29, 1911. Particularly for operating printing presses in synchronism.

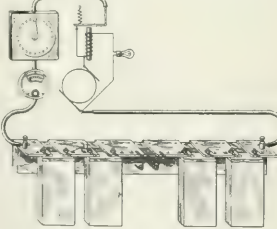
1,102,336. FROST REMOVER; J. J. Heim & W. Notberg, Kansas City, Mo. App. filed Dec. 12, 1912. Conveys electrically heated air from the brake system to the car window.

1,102,337. MOTOR CONTROLLER; C. E. Hyatt, East Orange, N. J. App. filed Apr. 12, 1910. For slowing down motors prior to stopping.



- 1,102,355. CONNECTOR FOR BATTERIES; G. I. Rawson & L. B. Shultz, St. Louis, Mo. App. filed May 23, 1911. Battery cell placed in charging circuit by simply engaging the cell terminals with adjacent contact members on a binding rack.
- 1,102,369. WINDING MACHINE; B. R. Varley, Jersey City, N. J. App. filed Oct. 8, 1912. Special means for laying the tying bands between the layers of the coil while the same is being wound.
- 1,102,382. ADVANCES FOR MANUFACTURE; N. Y. App. filed Jan. 4, 1913. Electric furnace treatment with provision for removing phosphorous and other bodies.
- 1,102,392. HEATING DEVICE; H. W. Denhard, San Francisco, Cal. App. filed Oct. 31, 1911. Electrical heater disk can be moved toward and away from the utensil supporting ring.
- 1,102,393. ELECTRIC RESISTANCE UNIT; H. W. Denhard, San Francisco, Cal. App. filed Oct. 31, 1911. Electric resistance frame which can be snapped into place in holder.
- 1,102,399. MILLINER'S IRON; A. J. Eilau, Chicago, Ill. App. filed Nov. 29, 1913. Bull-shaped body with electric heater inclosed therein.
- 1,102,415. BIASED POLARIZED RINGER; W. Kauling, Chicago, Ill. App. filed May 31, 1912. A single permanent magnet effects the biasing operation.
- 1,102,421. TELEPHONE SIGNAL AND RECORDER; F. J. McGowen, Los Angeles, Cal. App. filed June 9, 1913. Phonograph automatically records a message received.
- 1,102,424. ELECTRIC FUMIGATOR; W. F. McNabb, Pittsburgh, Pa. App. filed Apr. 3, 1914. Heater immersed in volatile fumigating material and formed of fusible material which, when exposed, fuses and breaks circuit.
- 1,102,442. APPARATUS FOR SELECTIVE WIRELESS TELEGRAPHING; F. G. Sargent, Westford, Mass. App. filed Nov. 21, 1913. Embodies synchronously rotating dials and indicators at the stations.
- 1,102,451. FIRE ALARM; J. Stevens, Tasmania, Australia. App. filed June 4, 1913. Thermostatic arm releases clock-work.
- 1,102,455. STARTING AND CONTROLLING EXPLOSIVE ENGINES; A. Sundh, Yonkers, N. Y. App. filed Aug. 2, 1909. Has a pilot explosive engine for starting the main explosive engine.
- 1,102,458. DRY BATTERY AND METHOD OF MANUFACTURING THE SAME; H. Utard, New York, and J. Smith, Brooklyn, N. Y. App. filed Feb. 3, 1913. Lays electrolyte sheet on battery element blank and rolls same into sheet.
- 1,102,459. MOTOR CONTROL DEVICE; H. S. Valentine, Reading, Pa. App. filed May 16, 1913. Particularly for traveling cranes.
- 1,102,488. SYSTEM OF MOTOR CONTROL; L. Fleischmann, Berlin, Germany. App. filed May 3, 1912. Speed control of induction motors.
- 1,102,491. MOTOR CONTROLLING APPARATUS; E. L. Gale, Sr., Yonkers, N. Y. App. filed Nov. 21, 1906. Embodies reversing switch and automatic resistance inserting means.
- 1,102,507. ELECTRIC CURRENT TRANSFORMER; P. Hilderbrand, Munich, Germany. App. filed Feb. 10, 1913. Converter for weak D. C.
- 1,102,513. TRANSFORMER; S. E. Johansen, Pittsfield, Mass. App. filed Dec. 20, 1912. Two sets of primary and secondary windings disposed magnetically substantially at right angles to each other.
- 1,102,521. ALTERNATING CURRENT MOTOR CONTROL; D. L. Lindquist, Yonkers, N. Y. App. filed Dec. 18, 1905. For controlling A. C. motors independently of predetermined voltages on the mains.
- 1,102,522. ALTERNATING CURRENT ELECTROMAGNETIC BRAKE APPARATUS; D. L. Lindquist, Yonkers, N. Y. App. filed May 7, 1908. Multiphase-lost motion between armature and brake shoe is taken up before the brake spring is compressed.
- 1,102,523. BRAKE APPARATUS FOR TRACTION ELEVATORS; D. L. Lindquist, A. C. Smith & G. John, Yonkers, N. Y. App. filed Oct. 24, 1908. Facilitates adjustment and replacement of parts.
- 1,102,525. COMMUTATOR PROVIDED WITH SEGMENTS OR SLIP-RINGS; B. Ljungstrom, Stockholm, Sweden. App. filed Jan. 24, 1913. Has additional commutator of lesser diameter whose segments are connected with rings.
- 1,102,528. ELECTROMAGNETIC BRAKE MECHANISM; W. D. Lutz, Allendale, N. J. App.

- filed Dec. 9, 1909. Overcomes residual magnetism and "sticking."
- 1,102,562. ELECTRIC SWITCH; N. O. Anderson, San Francisco, Cal. App. filed Jan. 23, 1913. For controlling multi-colored electric lights.
- 1,102,564. SIGNAL SIGN FOR VEHICLES; F. W. Ayres & R. A. Barnett, Fruitvale, Cal. App. filed Apr. 15, 1913. For signaling chauffeur's intentions to pedestrians.
- 1,102,566. THERMOSTATIC CIRCUIT-CONTROLLER; L. S. Besley, Salt Lake City, Utah. App. filed Jan. 29, 1912. For electric cookers.
- 1,102,571. ALARM FOR PROTECTING PERMUTATION LOCKS; A. E. Colby, Portland Ore. App. filed Apr. 22, 1911. Alarm given when attempt to operate is made by unauthorized party.
- 1,102,579. ELECTRIC FUSE CUT-OUT; E. J. Giblin, Evansville, Wis. App. filed Jan. 27, 1913. Has a rotary switch post which can be turned to cut out burned fuse and cut in new fuse.
- 1,102,593. IGNITION SYSTEM; C. Fied May 22, 1911. For high speed engines uses single induction coil.
- 1,102,600. TELEPHONE TRANSMITTER; F. R. McBerly, New Rochelle, N. Y. App. filed Mar. 1, 1911. Has means for rapidly dissipating the heat generated in the carbon chamber.
- 1,102,621. WATCHCASE RECEIVER; H. B. Wier, Jersey City, N. J. App. filed Apr. 16, 1912. Magnet system carried by a plate embedded in the shell.
- 1,102,623. TELEPHONE SYSTEM; E. F. W. Alexanderson, Schenectady, N. Y. App. filed Apr. 14, 1913. Multiplex long distance telephony.
- 1,102,633. INSULATING COMPOSITION; J. W. Aylsworth, East Orange, N. J. App. filed Jan. 2, 1912. Varnish gum and phenyl phthalimid.
- 1,102,638. INCANDESCENT ELECTRIC LAMP SOCKET; R. B. Benjamin, Chicago, Ill. App. filed Oct. 28, 1907. Special lock for telescopic parts of shell.
- 1,102,639. PULL SWITCH SOCKET; R. B. Benjamin, Chicago, Ill. App. filed Nov. 3, 1910. Pull chain brought down inside the shade.



1,102,355—Connector for Batteries

- 1,102,640. MOISTURE-PROOF TWIN SOCKET; R. B. Benjamin, Chicago, Ill. App. filed Sept. 14, 1912. Screw shell lamp terminals insulated from surrounding shell by vitreous support.
- 1,102,655. INSULATOR; R. B. Haden, Cincinnati, Ohio. App. filed Dec. 15, 1913. Two-part with meeting recesses for conductor.
- 1,102,664. ELECTRIC RAILWAY SWITCH; H. Jackson, Clinton, Ind. App. filed Mar. 27, 1914. For shunting mine cars.
- 1,102,666. AUTOMATIC AND ELECTRIC FIRE-ALARM SYSTEM; J. M. Johnson, Kansas City, Mo. App. filed May 1, 1912. Operated on closed circuit from a central office.
- 1,102,673. RETRIEVING TROLLEY; C. E. Lang, Los Angeles, Cal. App. filed Jan. 20, 1910. Special latching and spring construction.
- 1,102,697. LOCKING DEVICE FOR LAMP SOCKETS; G. I. Silbert, Chicago, Ill. App. filed Oct. 18, 1912. Operated by key inserted from outside.
- 1,102,719. TELEPHONE INDICATOR; H. Christensen, Seattle, Wash. App. filed Feb. 13, 1913. Indicates to the party calling the presence or absence of the party called.
- 1,102,728. HIGH TENSION SWITCH; R. J. M. Daxley & H. S. Bolton, Toluca, Mexico. App. filed Jan. 9, 1914. For sectionalizing high tension lines.
- 1,102,733. SYSTEM OF ELECTRICAL DISTRIBUTION; S. Ferguson, Schenectady, N. Y. App. filed July 13, 1903. Improved construction of lamp or rectifier.
- 1,102,756. FUSE BLOCK; C. N. Johnson, Chicago, Ill. App. filed Sept. 17, 1913. Fuses have direct contact with bus bars.
- 1,102,757. ELECTRIC LAMP SOCKET; G. S. Joyce, Gloucester, Mass. App. filed July 31, 1913. Rotatable annulus makes and breaks the circuit.
- 1,102,766. OVERHEAD CROSSING; J. Ledwinka, Philadelphia, Pa. App. filed Sept. 27, 1909. For use at crossings of overhead and "trackless" trolley systems.
- 1,102,769. APPARATUS FOR PRESERVING; J. C. Collier, East Cleveland, Ohio. App. filed Dec. 14, 1908. Avoids contamination by electrolysis.
- 1,102,775. INSULATING JOINT; H. P. McBride, Chicago, Ill. App. filed Oct. 20, 1913. "Hickey" incorporated with the joint.
- 1,102,779. ELECTRICALLY OPERATED RAILWAY SIGNAL MEANS; G. F. Mergell, Los Angeles, Cal. App. filed Nov. 20, 1911. For railway crossings.
- 1,102,783. RAILWAY SIGNALING SYSTEM; W. Moore, Schenectady, N. Y. App. filed Mar. 8, 1912. "Three-position" system.
- 1,102,793. PORTABLE SIGNAL APPARATUS FOR MINES; J. W. Paul, Davis, W. Va. App. filed July 5, 1914. For use in mine rescue work (dedicated to the public).
- 1,102,795. STAMP; G. E. Perry, Chicago, Ill. App. filed Oct. 7, 1908. "Time Stamp."
- 1,102,797. ELECTRIC WELDING MACHINE; R. C. Pierce, Cincinnati, Ohio. App. filed Dec. 31, 1913. Special insulation for die-carrying horns.
- 1,102,805. ELECTRIC LIGHT AND POWER SWITCHBOARD; F. W. Scharf, Sioux City, Iowa. App. filed Mar. 22, 1911. For medium and small sized installing plants.
- 1,102,819. ELECTRIC MOTOR; J. D. Taylor, Edgewood Park, Pa. App. filed Mar. 8, 1912. Oscillating type.
- 1,102,821. SIGNALING DEVICE FOR RACING COASTERS; L. M. A. Thompson, New York, N. Y. App. filed Nov. 1, 1913. Announces start of race and winning car.
- 1,102,827. PROCESS OF PRODUCING SULFONIC ACIDS; A. Vagt, Cologne, Germany. App. filed Dec. 6, 1911. Employs an electrolytic bath.
- 1,102,831. APPARATUS FOR GOVERNING THE PASSAGE OF CARS OR VEHICLES ALONG A RAILWAY AND THE CONTROL THEREOF; H. A. Wallace, New York, N. Y. App. filed Apr. 23, 1912. For controlling the two switches of a crossover by a single control lever.
- 1,102,961. SIGNAL SYSTEM; E. F. Bliss, Schenectady, N. Y. App. filed Aug. 26, 1909. Single track block systems.
- 1,102,907. TELEPHONE CENTRAL SWITCHING SYSTEM; E. A. Gray & E. C. Molina, Boston and Arlington, Mass. App. filed May 17, 1907. Combines best features of manual and automating practice.
- 1,102,916. SIGNAL SYSTEM; L. A. Hawkins, Schenectady, N. Y. App. filed Nov. 29, 1907. Single track.
- 1,102,917. BLOCK-SIGNAL SYSTEM; L. A. Hawkins, Schenectady, N. Y. App. filed Aug. 7, 1909. Means controlled by train movements for shifting phase of track current to three different positions.
- 1,102,944. CIRCUIT-CLOSING INSTRUMENT; W. C. Neahr, Denver, Col. App. filed Apr. 17, 1912. Embodies vibratory element affected by vibrations of track-rail.
- 1,102,951. SIGNALING SYSTEM FOR MINE AND THE LIKE; C. T. Plumb, Johnstown, Pa. App. filed May 13, 1909. To enable engine driver to differentiate between false and true signals.
- 1,102,963. OZONE APPARATUS; J. E. Seely, Los Angeles, Cal. App. filed Aug. 1, 1913. Resonator with dielectric bulb mounted thereon.
- 1,102,967. PUSH BUTTON SWITCH; G. F. Thomas, Bridgeport, Conn. App. filed July 14, 1913. Special frame and switch lever construction.
- 1,102,981. FUSE; A. F. Daum, Pittsburgh, Pa. App. filed June 8, 1912. Prevent fuse from being cut at point of exit from end plug.
- 1,102,985. FUSE; P. E. Goldmann & A. I. Daum, Pittsburgh, Pa. App. filed Jan. 24, 1912. Refillable type.
- 1,102,990. MEANS FOR GENERATING ALTERNATING ELECTRIC CURRENTS; G. Marcon London, Eng. App. filed Jan. 27, 1911. High frequency for wireless work.
- 1,103,006. SWIVELED ATTACHMENT-PLUG; F. E. Seely, Bridgeport, Conn. App. filed Feb. 9, 1908. Swivel and terminal construction.
- 1,103,018. SYSTEM OF ELECTRICAL DISTRIBUTION; S. Ferguson, Schenectady, N. Y. App. filed July 13, 1903. For operating vapor lamps in multiple.

# Electrical World

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## Utility Monopoly in Idaho

Because the Idaho Supreme Court has upheld the action of the state commission in refusing to authorize competition against established plants, regulation is under attack in Idaho. Those who are condemning the position of the commission profess to believe that competition will assure development of resources while regulated monopoly will not. They overlook the very important fact that under the prevailing doctrines both consumers and resources require regulation. The state limits the rate of return and establishes the charges for service, and in consideration of these advantages protects utilities from destructive competition. As part of the agreement the utility is, of course, to furnish good service. Competition in public utility service in a single community results eventually in consolidation of the competing plants and hence monopoly. Therefore the commissions have held almost uniformly that it is better public policy to recognize monopoly of this kind in the beginning and protect it during good service than to permit two plants where one would do. The cost of two is greater than the cost of one and in the end, after a union of competing utilities, the public is asked to pay a return on the value of both. To construct new facilities by the side of existing and adequate facilities is not only a waste of private capital, but is an exhibition of public foolishness wherever permitted. Idaho may want to develop its resources, but development at the expense of existing reasonable investment is a sign to the newcomers that their investment may also be jeopardized when another competitor appears.

## Politics in Commissions

Do good service and reasonable rates relieve a public utility from serious attack by the community? Is it only when they drop below these fair standards that trouble falls? The perfection of the policy of private ownership with public regulation would assure the acceptance of these standards by consumers. If commissions have a lofty conception of their office they can do much to bring these conditions into existence. Even commissioners who think that no lofty conception of duty moves them can justify these conditions on the plain, wholesome ground of a square deal. The reason why good service and reasonable rates do not carry immunity from attack lies a little below the surface in human nature. The hope that men find in politics has something to do with the answer. One of the easiest roads to public office has always been the one which runs over a public service corporation. There was a

very general feeling that the commissions would take the companies out of politics. In the case of many companies this conclusion was correct. The companies did go out of politics. But in some of the states when the companies went out of politics the commissions went in. A growth of this tendency in commission will result in a still worse state of affairs. Both the companies and the commissions ought to be out of politics and stay out. When commissions play politics they level themselves to the plane of politicians. When the politician secures a place on a commission and tries to serve a political party instead of the public as a whole he introduces a weakness which is dangerous to the entire system of regulation. Assuming that they render good service at reasonable rates the companies have the serious task of letting the public know the facts frankly and directly. It is a pity to maintain a property, service and rates that are worthy of public confidence and fail to let the public know it. The public is a safer friend than the professional politician whether or not he is on a commission.

## The Senate and Trust Legislation

There has been a good deal of comment on the slim attendance of senators in the Senate chamber during the consideration of trust legislation. The absent senators have not made public explanations of their reasons, but some have gone on vacations and others have simply stayed away. If the measures are to be passed a majority of the Senate will have to take the responsibility for action. The minority will escape the responsibility for action but it will not escape the responsibility for its failure to protest if it is to be found later that the new laws harm business. While the President is the force that is pushing the bills toward enactment he is, after all, merely the head of the executive department of the government. He may ask, he may urge, he may threaten, but the responsibility for the laws as they appear on the statute books will rest partly on Congress. The majority may feel so secure in its strength and ultimate success that it can afford to let matters take any course they will until the day of final votes. The minority may feel impotent in its inability to change the set policy of the controlling party and conclude that any effort is a waste of time. But neither the majority nor the minority can fail to realize that the pending legislation is of grave concern to business. It is proposed to change the rules of business, to introduce a paternalism over trade and industry of greater influence than any other similar legislation



ever enacted in this country. If this legislation shall prove to be harmful to business no one who has the history of the nation in mind will fail to predict an overwhelming rebuke at the polls. Such a rebuke would apply alike, in the end, to the executive and the legislative branches of government. The thing that is really desirable is that the laws shall help business. The House of Representatives lost its opportunity to give careful consideration to the bills by putting them through when the administration or party whip snapped. The conscientious senators will receive the praise of business men for such work as may be done to render the bills really workable instead of impertinent obstacles to straightforward business.

### Construction Under Difficulties in Mexico

As showing both the splendid activity in the development of the resources of Mexico and the disastrous effect of conditions there upon industrial enterprises the article by Mr. A. C. Hobble in this issue is much to the point. The hydraulic resources of our neighbor republic are great, and power is sadly needed in the mines for in many districts fuel is almost unattainable even at a very large price. The chances of successful hydroelectric development have been so admirable as to attract capital from this country and from abroad, and under reasonably peaceful conditions industrial development ought to go on with astonishing rapidity. The particular plant which Mr. Hobble describes is that of the Mexico Northern Power Company, a project of exceptional hydraulic interest. High head and adequate storage were to be obtained together by erecting a dam nearly 250 ft. across a canyon with an auxiliary dam 110 ft. high across an adjoining valley. When the great dam is completed the water will be backed up for some 30 miles, giving a storage lake with a capacity of a hundred billion cubic feet, which is enough to compensate admirably for the somewhat variable natural flow of the stream. The power house, which is being built as part of the dam in the bed of the river, is laid out for six 10,000-hp units for feeding energy to a 110,000-volt three-phase aluminum-cable line transmitting 50 miles into the mining district.

A specially striking feature of the undertaking was a 2000-kw steam-turbine plant used for crushers, concrete mixers, hoists and a large variety of other purposes connected with the construction of the two enormous dams. Started three years ago work has been blocked and interrupted repeatedly by the successive revolutions which have overwhelmed industrial Mexico, making it almost impossible to transport supplies or to obtain necessary materials. Toward the end of last year, after a sharp fight had occurred actually in the construction camp, it was necessary to suspend operations and give up the work until political conditions became more stable. Mr. Hobble himself, who fully describes the work up to the time it was necessary to take leave, had to travel 300 miles overland with a party of compatriots to reach the hospitable Texan border. It is

earnestly to be hoped that with the efforts now being made at rehabilitating the Mexican government and establishing order once more, it will be possible soon to reopen all the interrupted lines of communications and to draw to conclusion a task so important for the mining interests upon which Mexican prosperity largely depends.

### A New Type of Search-Lantern

In the current issue there is described a new type of search-lamp of German invention which is being experimented with by the United States Navy and seems to possess some very interesting and valuable properties. The search-lamp has thus far shown a gradual evolution in size and efficiency unmarked by any very striking innovations since the introduction of the electric arc for this purpose. With the introduction of the arc a source of high intensity became available and search-lantern mirrors were gradually improved until they have now reached a high degree of efficiency. The limitation found has always been the difficulty of getting a sufficiently bright source without increasing its area to an extent to interfere with its efficiency. A point source in a parabolic reflector would convert into an accurately parallel beam the light received on the whole area of the mirror from the source placed exactly at its focus.

The source is never a point and cannot be concentrated accurately at the focus and the beam ceases to be parallel so that the intensity at any point in it, other things being equal, diminishes. In the effort to get more and more powerful search-lanterns larger and larger reflectors have been designed and higher and higher current densities have been employed in the arc, but there has always been the limitation due to the temperature of volatilization of the carbon, which is practically reached in the light-giving crater so that increase of size does not produce a proportionate increase in illuminating effect. The crater is larger, to be sure, but not materially increased specific intensity. What is wanted for maximum efficiency in the search-lantern is a lamp in which the specific brilliancy of the source is much increased without materially increasing its dimensions. Moreover, there has always been the trouble in large search-lamps of rapid consumption of carbon under the large currents used and the tendency to irregular burning of the positive electrode, both tending to displace the crater from the focal point and thus to interfere with the performance of the mirror.

The search-lantern described in this issue is in ingeniously planned to meet the difficulties just mentioned. Use is made of a very high current density, from 120 amp to 150 amp in a positive electrode only 16 mm in diameter and a negative one even smaller, about one sixth the area of those usually employed. The small dimensions are made practicable by directing a stream of alcohol vapor into the arc which ignites and burns with a non-luminous flame so much lower in temperature than the crater that it actually serves to cool the

exterior of the electrodes which are kept in revolution to insure steady burning and uniform cooling. The cooling around the electrodes keeps the arc central and reduces it to a small area of intense brilliancy. It is quite obvious, too, from the description of the lamp that use is made of a positive electrode with a mineralized core somewhat analogous in composition to that employed in white-flame lamps. Certainly one does not obtain a crater filled with snow-white fumes from an unmineralized electrode. It seems very probable that a large part of the effectiveness of the lamp is attributable to this mineralization which can be successfully utilized under the conditions of burning obtained. At all events the source of light in the new lamp is intensely brilliant and of very limited area; it can be kept quite accurately in the focus of the mirror and consequently gives a remarkably steady and intense beam. The light-giving area is perhaps no smaller than the area of maximum intensity in the ordinary search-lantern, but the specific brilliancy seems to be considerably higher. The result, therefore, is a beam which while not much more accurately parallel than that obtained from the best existing types is still of extreme brilliancy, its effective strength being said to be about six times as great as in the ordinary search-lantern operating at the same current. The improvement is of a most interesting character and seems to be highly satisfactory in its results.

### Progress of the Electrical Contractors

Any electrical man who is pessimistic as to the business outlook should have attended the annual convention of the National Electrical Contractors' Association held in Detroit last week. Both in outward appearance and in private discussion the convention was an assemblage of optimists. Business was reported good or bidding fair to become so. The spirit, the atmosphere of the gathering was indeed refreshing. The leaders in the association are, and probably all members are becoming active, alert business men who constitute a tremendous asset in the electrical industry. Nearly all of the meetings were designated as "business sessions" closed to non-members. These star-chamber meetings of the association are rather inconsistent with that spirit of broad-mindedness, of co-operation, which we are all striving to foster in the various branches of the electrical industry. After all, what have the electrical contractors to conceal? The business is necessary and legitimate. It has relations with other classes of business men and with workingmen, of course; but is there any strategy comparable with the power of open, straightforward dealing? We have no doubt that all of the business transacted could well have been proclaimed from the housetops. Mists of prejudice are blown away by the breeze of publicity.

Many persons will be surprised to learn that the contractors adopted a "code of ethics"—a brief and simple set of recommendations as to business conduct, such as are usually confined to organizations of strictly pro-

fessional men. Other important actions taken by the association were the declaration in favor of double-braid wire, the approval of the separation of electrical work from general contracting and the consideration of the possibility of national co-operation in supplying liability insurance for electrical contractors.

In attendance, in friendliness among business competitors, in sustained interest, the Detroit convention left little to be desired. The relations with central-station companies are more intimate, more satisfactory than in the past. The National Electrical Contractors' Association is now more influential and prosperous than ever before. It "made good" years ago, and it is now rounding out, learning, mellowing and expanding into one of the great electrical societies of the country, a fact that is highly gratifying not only to the members of the society itself but to all others engaged in electrical pursuits.

### Temperature and Output of Electrical Apparatus

Until within recent years it was the almost invariable custom to measure the temperature attained by a loaded machine at some part or parts of its surfaces exposed to the air. But when machines are built for fairly high voltage the thickness and quality of the insulating walls on its conductors are such that a very considerable drop of temperature must occur within the walls. That is, the temperature on the inside of the insulation must be considerably higher than that on the outside near the external air. Hence the hottest spot in the insulation tends to be considerably hotter than those parts the thermometer can ordinarily reach. The introduction of thermocouples or thermo-coils into the inner recesses of coil windings is now a regular expedient available for large and expensive machines, whereby the hottest-spot temperatures may be indicated at the switchboard. The operator is thereby not only confidently apprised of the actual internal thermometric state of affairs in the machine, but he may also maintain, occasionally, loads considerably in excess of the rating, when the cooling air happens to be at a low temperature.

By experimental methods the central-station operator is led to perceive that the power capacity of a machine at any particular time, so far as relates to heating, may differ considerably from the rating, either above or below, and that the rating is the power capacity under conventionally assigned conditions as to hottest-spot and ambient temperatures. Great changes in opinion have manifested themselves recently among electrical engineers in these matters, largely as a result of investigations into the temperatures attained inside the windings of large machines. In recognition of these changes the standardization rules of the American Institute of Electrical Engineers have been revised to take effect Dec. 1, 1914. In the meanwhile manufacturers of electrical apparatus will rerate or redesign their machines where necessary to conform to the new rules which seemingly meet with universal approval.



# The News of the Week

## Activities and Events in the Electrical Field— Reports of Meetings—Commission Findings, Etc.

### Movement of Mayors on Public Utilities

To carry out the plan for a conference of mayors advanced by Mayor Blankenburg, of Philadelphia as noted on page 4 of our issue for July 4, 1914, a convention will be held in Philadelphia on Nov. 12, 13 and 14. It is the plan to organize a National Bureau of Public Utilities Research. Mayor Blankenburg has asked the mayors of other cities to suggest speakers and subjects.

### Ohio Convention Opens at Cedar Point

With a registered attendance of more than 200 members and guests the twentieth annual convention of the Ohio Electric Light Association opened at Cedar Point July 21. A full report will appear later.

In his preliminary address Mr. J. C. Martin, Wilmington, Ohio, sketched the work of association committees during the past year and pointed to the constructive effort necessary for the coming twelve months. Reports were presented by the secretary and treasurer, executive committee, advisory committee, insurance committee and membership committee.

As the closing feature of the day's program the report of the illuminating committee, read by Mr. S. E. Doane, Cleveland, was enthusiastically received. It was discussed at length by Messrs. W. R. Powers, Huntington, W. Va.; Harry Schroeder, Harrison, N. J.; W. Culver, Cincinnati; Thomas F. Kelly, Dayton; L. C. Anderson, Franklin; J. C. Martin, Wilmington. At the close of the discussion Mr. Robert Hutchings, Dayton, presented a motion creating a committee to take up the question of standard distribution voltage as suggested in the report of the illuminating committee.

### Boston Street Lighting Contract Situation

Mayor Curley, of Boston, has issued a statement advocating the acceptance by the City Council of the street-lighting contract offered by the Edison Electric Illuminating Company and pointing out that the attempted interference of labor interests on the ground that the Edison company is not unionized is entirely unwarranted. The Mayor said that the company's offer to furnish 6.6-amp magnetite lamps at a price of \$87.53 per year each in place of the present price of \$103.54 will save the city about \$800,000 in the course of the ten-year contract, about 5000 lamps being involved. In addition, the contract provides that the company shall share with the city in the benefits of any further economies in lamp design, such as the possible substitution of nitrogen-filled lamps instead of arcs, should these prove desirable. At the offered price, the profit to the company would be about 6½ per cent on its street-lighting investment. The Chamber of Commerce, the Boston Finance Commission and its consulting engineer, Mr. Guy C. Emerson, an experienced street-lighting man, have not advanced the view that the offered price is unduly high, whereas an engineer brought forward by the union interests has already issued contradictory statements regarding the equitable

character of the terms. Full provision for arbitration is offered. The Mayor's statement concludes with a vigorous observation that the municipal corporation should show that it possesses the business sense to conduct its affairs as would a private concern.

### Booming the Export Trade

Mr. Alba B. Johnson, president of the National Foreign Trade Convention, has announced the personal of the Foreign Trade Council. At the convention recently held in Washington a resolution was passed for the selection of a council. The first meeting of the council will be in the early fall in New York City, at which time it is expected that a committee will be appointed to co-operate with a committee of the Chamber of Commerce of the United States of America. The business of the council is to effect a co-operation for the extension of our foreign trade. Included in the list of members are the following men prominent in the electrical industry: Mr. Walter L. Clark, vice-president Niles-Bement-Pond Company, New York; J. Maurice Coster, foreign manager Westinghouse Electric & Manufacturing Company, New York; Mr. E. Hurley, president Hurley Machine Company, Chicago; Mr. M. A. Oudin, foreign manager General Electric Company, Schenectady, and Mr. John D. Ryan, president Amalgamated Copper Company, New York.

### Phenomenal Patent Issue

During the week ended July 14 the United States Patent Office issued 907 patents, which is the largest number granted during any similar period in the history of the institution. The Patent Office receipts for April, May and June were also unusually large, being \$60,137.67 for the quarter. During the fiscal year ended June 30, 1914, an average of about 1330 patent applications were filed and 690 patents were issued each week while during the previous year 1310 applications were filed and 670 patents were issued weekly. It is interesting to note that during the first half of 1913 the average weekly issue of patents was 660 as compared with 730 for the same half of 1914. With the opening of 1914 approximately 31,900 applications were on hand at the Patent Office awaiting action, while on July 1 only 22,400 remained to be passed upon, showing for the first months a decrease of 9500 in the applications pending.

### Anti-Trust Legislation

Considerable speed is being manifested in Washington official circles during the present week. On Wednesday the committee of the judiciary presented to the Senate its report on the Clayton anti-trust bill and the committee on interstate commerce finished its work of amending the Rayburn stock and bond bill, thereby practically completing the President's entire trust program. Commenting on the Clayton bill, Senator Cull-



FIG. 1—THE COURT OF HONOR AND THE 64-FT. ELK STATUE, ELKS' GOLDEN JUBILEE, DENVER, COL.

...n, of the committee of the judiciary, stated that it is  
 at proposed by the bill or amendments to change in any  
 spect the original Sherman anti-trust act of July 2,  
 1890. The purpose is only to supplement that act and  
 e other anti-trust acts referred to in section 1 of the  
 ill. Broadly stated, the bill seeks to make unlawful cer-  
 in trade practices which are not covered by the act of  
 July 2, 1890, or other existing anti-trust acts, and thus  
 arrest the creation of trusts, conspiracies and  
 monopolies in their incipency and before consumma-  
 tion. Among other of these trade practices which are  
 announced and made unlawful may be mentioned dis-  
 crimination in prices for the purpose of wrongfully in-  
 juring or destroying the business of competitors, ex-  
 cessive and tying contracts, holding companies and  
 interlocking directorates.

#### Elks' Jubilee Illumination at Denver

Unusual illumination features marked the Elks' Golden Jubilee held at Denver, Colo., July 13 to 18. Purple and gold, the order's colors, predominated in the thousands of lamps used to decorate the city's downtown streets. The great court of honor on Champa street extended a distance of four blocks, from the

"electric sunset" to the 64-ft. statue of a huge elk done in white plaster powdered with glass which sparkled in the rays of a number of powerful searchlamps and spotlamps. The curb-lines of the court of honor were flanked with 48 electric fountains, each bearing aloft the familiar Elks' clock symbol, as shown in Fig. 1. Green art glass formed the panels of the standards and above these were octagonal glass prisms within which water was sprayed from special nozzles forming a fog or mist which, as it floated away, resembled live steam. A 400-cp lamp at the top and a 200-cp lamp below provided the illumination for the water effects in each electric fountain.

The "sunset" structure at the other end of the court revealed a Rocky Mountain scene lighted by several thousand amber-colored lamps. Fifteenth Street was decorated with strings of 18-in. stucco stars each lighted by eight 20-cp lamps. On the other thoroughfares streamers of purple and yellow lamps were lavishly employed. The lighting for the Elks' jubilee was carried out under the direction of Mr. W. J. Barker, general manager of the Denver Gas & Electric Light Company, from designs prepared by Mr. George B. Williamson, illuminating engineer for the company, who also designed the notable conclave lighting of the previous year.



FIG. 2—STAR AND CLOCK STREAMERS ON FIFTEENTH STREET



FIG. 3—LIGHTING OF FOURTEENTH STREET AND AUDITORIUM



## National Contractors' Association Holds Important Convention and Adopts Code of Ethics

Considered in all its aspects, the fourteenth annual convention of the National Electrical Contractors' Association of the United States, at Detroit July 15, 16 and 17, was the most important and enthusiastic the association has ever held. The attendance was about 455, consisting of about 215 members, 125 supply men and visitors and 115 ladies. Important business was transacted, including the adoption of a code of ethics and various declarations in relation to wiring practice. A number of important committee reports were presented. The whole atmosphere of the convention was most enthusiastic, and it was felt that the association had advanced to a higher plane as a result of the meeting. Four sessions were held, the first one being open, the others closed to non-members. A number of manufacturers made exhibits.

At the opening session of Wednesday morning, as noted in our issue of last week, Police Commissioner John Gillespie, of Detroit, welcomed the visitors and Mr. Freeman made an appropriate response.

### Business, Wages and Employers' Liability

Mr. John Trix, of Detroit, president of the American Injector Company and vice-president of the National Association of Manufacturers, followed with a talk on business conditions. Among other things he said that perhaps the best contractor is one who can turn down a contract because it isn't right. The speaker suggested that the association say to the architects: "Write in plain English what you mean, and we will carry it out." As to the business outlook, Mr. Trix said that the prospect to-day is that the farmers will have the biggest crops in the history of the country. There is no reason why the country should not branch out into good business. The community has been in a business fog, as it were, and has been running under check. Mr. Trix discussed briefly the question of foreign competition. Foreign manufacturers are now enabled to sell machinery in this country more cheaply than can American manufacturers. Wages in Germany, for instance, are not more than 50 per cent of corresponding wages here. The United States is the only country where a workingman can afford an automobile. Whereas the average American workingman has two suits of clothes a year, the German mechanic must wear one suit three years.

Mr. W. N. Matthews, of St. Louis, reigning Jupiter of the Jovian Order, dwelt on the fact that Jovianism brings together all branches of the electrical industry. He mentioned that a correspondence course in electrical work is being planned for the members of the order.

Hon. John E. Kinnane, chairman of the Michigan Industrial Accident Board, gave a thoughtful address on workmen's compensation and employers' liability, especially as treated in the Michigan law on the subject. Twenty-two states are now working under compensation laws, and, although there are differences, all these laws are substantially alike.

### Relations with Central Stations and Municipalities

Mr. T. I. Jones, general sales agent of the Edison Electric Illuminating Company of Brooklyn, and until recently chairman of the Commercial Section of the National Electric Light Association, addressed the convention at the business session on the afternoon of July 15. Mr. Jones discussed the relations of electrical contractors and central-station companies. He expressed himself as not in favor of selling appliances below cost unless for some special reason, in making a campaign for the selling of electricity, with which the

contractors and dealers were well acquainted. Mr. Jones spoke frankly and without notes and made a good impression on the contractors. He urged his hearers to put their electrical merchandizing on a modern business basis. There was considerable discussion following Mr. Jones' address.

### Report of Committee on Legislation

A number of committee reports were also presented. One was from the committee on legislation, of which Mr. Paul H. Jaehnig, of Newark, N. J., is chairman. This was a carefully prepared report in printed form. The committee has endeavored to collect all the state laws and city ordinances bearing on electrical work. Not all of these laws are working out satisfactorily. This is due partly to defects in the laws and partly to laxity in enforcement. Much remains to be done to secure ideal legislation. The committee made a number of suggestions in relation to proposed laws and ordinances. One is that the law should not attempt to create a monopoly for the electrical contractor, but should be framed so as not to restrict the freedom of those who wish to engage in the business. The committee says: "The licensing of electrical contractors is at present receiving much attention throughout our country, as it seems to be the only solution of certain abuses and weaknesses in the trade. One of the chief difficulties in obtaining uniformly good results in electrical construction work is the irresponsible contractor—one who has just sufficient knowledge of the business to be dangerous. He, through lack of knowledge of correct principles, the use of inferior material and poor workmanship, tends to create a life-and-fire hazard, instead of a safe installation." The compendium of law in the report is valuable. It will be sent to any on interested.

### Election of Officers

On the recommendation of a nominating committee of which Mr. W. C. Peet, of New York City, was chairman, officers were elected as follows: President, Mr. John R. Galloway, Washington, D. C.; first vice-president, Mr. J. C. Hatzel, New York City; second vice-president, Mr. W. L. Hutchison, Kansas City; third vice-president, Mr. John C. Rendler, Los Angeles; treasurer, Mr. James Hilton, Syracuse, N. Y.; secretary, Mr. George H. Duffield, Utica, N. Y.; sergeant-at-arms, Mr. J. C. Sterns, Buffalo.

Mr. Galloway, the newly elected president, has been the treasurer of the association for a number of years. It may be of interest to note that the treasurer's report as presented at the Detroit convention, showed the largest balance in the history of the association. So well has Mr. Galloway conducted the finances of the association that he has been promoted to the highest office in the gift of the organization. He is a prominent electrical contractor in Washington, D. C., and a member of the Jovian Order.

### Jovian Rejuvenation

At a rejuvenation and joviation of the Jovian Order held at the Detroit Board of Commerce Building on the night of July 15, a class of twenty-eight candidates was initiated. During the evening Mr. Martin J. Wolf of St. Louis, made a strong plea for attendance at the annual meeting of the Jovian Order to be held in St. Louis Oct. 14-16. The degree team did excellent work. It was made up as follows: Jupiter, Mr. L. N. Pyle; Vulcan, Mr. J. M. Griffin; Neptune, Mr. F. M. McAdams; Mars, Mr. T. E. Lowe; Hercules, Mr. J. I. Turko; Mercury, Mr. H. C. Clarke; Pluto, Mr. W. C. Tiermann; Apollo, Mr. A. C. Ford, and Avenim, Mr. J. T. Pearson.

### Protection of Threaded Ends in Shipping Iron Conduit

At the Chattanooga convention of last year a Pacific Coast delegate called attention to the fact that where iron conduit is shipped long distances the threaded ends of the pipes are often badly damaged. A committee was appointed to see if the manufacturers could not be induced to make some form of protection. The greater number of manufacturers said that protecting the threads would necessitate an advance in price equivalent to about 2.5 per cent of the total price. One manufacturer, however, has devised a method of placing protectors, apparently fiber, on the conduit immediately after the pipe is threaded. This protects the threads until the sleeve is removed. This stripping can be done quickly. The association adopted a resolution expressing appreciation of the idea.

Mr. E. McCleary, of Detroit, chairman of the committee on National Electrical Code, made a report. One point he emphasized was that care must be exercised in wiring for the new gas-filled tungsten lamps. Some of these lamps take many amperes and there is no present provision in the code for incandescent-lamp wiring where such large currents are necessary.

### Association Favors Double-Braid Wire

Mr. M. K. Foxworthy, of Indianapolis, said the association should discourage the manufacture of single-braid wire and should use its influence to cause manufacturers to make double-braid wire instead. This proposal caused much discussion. It was pointed out that single-braid wire is used in the wiring of small houses, where open work is allowed, and the cost of this class of wiring would be increased if double-braid wire is required. One estimate was that this increase would amount to \$1 in the wiring of a cottage. The use of double-braid wire is compulsory in iron-conduit work, and the contractors say that where single-braid wire is also used there is danger of getting the two mixed. In practice the use of the two types of insulation seems to be a nuisance, and the association went on record as favoring double-braid wire only.

The association adopted officially as its standard the National Electrical Contractors' Association conduit and wire charts, previously described in the *Electrical World*.

Mr. S. E. Doane, chief engineer of the National Lamp Works of the General Electric Company, gave an illustrated lecture on "Observations of Central Stations and Contracting Conditions in Foreign Countries." Taking the contractor's point of view, Mr. Doane presented an account of his investigations into electric-service conditions in European countries. Practical information in relation to wiremen's wages and labor conditions was given.

The American Institute of Architects has adopted a resolution approving the segregation of electrical work from general contracting. Furthermore a bill, No. 14288, now pending in the House of Representatives, provides for this segregation on government work to a certain extent. The National Electrical Contractors' Association favors the plan and adopted a resolution advocating the passage of the bill mentioned.

### San Francisco Next Year, New York in 1916

Mr. George W. Hill, of Utica, N. Y., made his report to the association as its special representative. Mr. Hill has been traveling in the Middle West and in the South, explaining the purpose of the association to electrical contractors and securing new members. He has been successful, and his report made a good impression.

Sometime ago it was decided that the 1915 convention of the association should be held in San Francisco.

At the Detroit convention there was a good deal of campaigning in relation to the 1916 convention. A strong delegation was present from New Orleans to present the claims of that city. In the end the men from the Louisiana city withdrew gracefully in favor of New York, and it was voted to hold the 1916 convention in the latter city. New Orleans served notice, however, that it would expect the 1917 convention.

### Adoption of a Code of Ethics

On the recommendation of a committee consisting of Mr. Joseph A. Fowler, of Memphis, and Mr. J. T. Marmon, of Rock Island, Ill., the association adopted a "Code of Ethics for the General Guidance of the Members of the National Electrical Contractors' Association." This code consists of eight sections and is brief. Members are required to use every honorable means to uphold the dignity of their vocation. Not even under a customer's instructions should a member engage in any practice contrary to the rules safeguarding life and property. Public officials having in charge the enforcement of regulations of this character should be supported. Members should expose, without fear, dishonest practices of other electrical contractors.



PRESIDENT-ELECT J. R. GALLOWAY

Members should refuse to furnish estimates to general contractors "who do not regard bids as final and binding upon which they are awarded general contracts." The business reputation of a fellow member of the association shall not be maliciously attacked. After a member has secured a contract another member shall not attempt to supplant him. Where differences arise between members provision is made for arbitration.

### Closing Business

Mr. E. J. Burns, of Rock Island, secretary of the Illinois Electrical Contractors' Association, told of the work which has been done by that association in reducing the cost of liability insurance. By a concerted effort a reduction of from 35 to 40 per cent has been obtained. Mr. Burns suggested the adoption of some form of national co-operation in securing liability insurance.

At the closing session Charles L. Eidlitz, of New York, the first president of the association, was made an honorary member. Mr. Eidlitz has retired from the electrical contracting business.

On accepting office, Mr. John R. Galloway, the new president, presented the official past-president's emblem of the association, a gold watch charm, to Mr. Ernest Freeman, the retiring president.



Mr. M. L. Barnes, of Troy, N. Y., past-president, addressed the association on behalf of the *National Electrical Contractor*, its official organ. Mr. Barnes spoke in terms of cordial praise of the work of Secretary George H. Duffield as editor of the monthly magazine.

#### Entertainment Features

There was a large attendance at the annual dinner held at the Hotel Cadillac on the evening of July 16. Mr. E. McCleary, of Detroit, was toastmaster and speeches were made by Messrs. John R. Galloway, of Washington, D. C.; John Trix, of Detroit; Robley S. Stearnes, of New Orleans, Joseph A. Fowler, of Memphis, and Ernest Freeman, of Chicago.

Friday, July 17, was observed as the birthday of the association. There was a forty-three mile automobile ride in the forenoon and a steamboat ride and outing in the afternoon and evening. Other entertainment was provided for the ladies during the convention.

#### Convention Notes

On the night of July 14 the Chicago electrical contractors gave a rendezvous entertainment in the Oak Room of the Congress Hotel, Chicago, for members and visitors who gathered at that point to proceed to Detroit. A party of thirty-five ladies and gentlemen sang, listened to music by professionals and partook of refreshments while waiting for train time. The Chicago men took charge of all train, baggage and hotel arrangements. Mr. Joseph N. Pierce, of Chicago, looked after things generally.

The *Detroit Free Press* of July 15 issued a "Convention Number" supplement. It contained articles and portraits relating to electrical contractors and the electrical industry, also a number of advertisements of electrical concerns.

A fine example of exterior "flood lighting" by the use of the new gas-filled tungsten lamps was the special illumination of the lofty Dime Bank Building with the aid of seventy-three 1000-watt units contained in special reflectors. The lamps were installed on surrounding structures and lighted three sides of the glistening white bank building. Messrs. Ward Harrison and H. T. Spaulding, of the engineering department of the National Lamp Works, Cleveland, Ohio, arranged this novel flood-lighting installation.

As already noted, about four hundred men attended the complimentary luncheon given July 15, by the Detroit Jovian League to visiting contractors, Jovians and other electrical men. Statesman J. M. Griffin, of Detroit, presided, and Major Robley S. Stearnes, of New Orleans, performed the duties of toastmaster very acceptably. Speeches were made by Messrs. Ernest Freeman, Chicago; Ernest McCleary, Detroit; W. N. Matthews, St. Louis; M. Frank Knapp, Pittsburgh; H. E. Niesz, Chicago; James R. Strong, New York; Sam A. Hobson, Chicago; George W. Hill, Utica, N. Y., and Joseph A. Fowler, Memphis, Tenn.

The report of the committee on legislation, of which Mr. Paul H. Jaehnig, of Newark, N. J., is chairman, is elaborate, consisting of 96 closely printed double-column pages. An effort has been made to collect all the state laws and city ordinances bearing on electrical work, particularly the licensing of electrical contractors.

Arkansas was represented by several delegates who were conspicuous by bright yellow ribbons bearing the name of their state in large black letters.

The Detroit contractors were hospitable and attentive. Mr. Ernest McCleary was convention chairman of the Michigan Electrical Contractors' Association and Mr. L. W. Eddy was local chairman.

Massachusetts and California, Minnesota and Texas, and nearly all the states between, were represented in

the attendance, which was indeed notably representative.

Before the Jovian rejuvenation on Wednesday evening there was a street parade. The degree team headed the line in carriages, but the common or garden variety of Jovians were made to march lock-step. The spectators appeared to enjoy the sight.

Secretary Duffield was certainly one busy man. It was rather warm in the convention hall (the New Orleans men said they were almost prostrated by the Detroit heat), but George was always "on the job" there and elsewhere.

#### Errors in Meter Readings Subject to Correction

The New Jersey Court of Errors and Appeals has recently handed down an interesting decision in the case of the Borough of Vineland, operating an electric plant, against the Fowler Waste Manufacturing Company. The borough furnished the company with electric energy for its business, and rendered bills from June, 1910, to May, 1912, for \$867. It was later found that the meters had been misread during this period through failure to multiply the face readings by the constant 10, and that the actual value of the energy used was \$5,243, which, with discounts, resulted in a net sum of \$4,375.

In its suit to recover this sum the borough was sustained by the Cumberland Court and the Supreme Court, and now, upon appeal, by the Court of Errors and Appeals. In its defense the company held that the plaintiff had free access to the meters, that bills were rendered monthly and it was given a receipt in full for the energy used, and that the plaintiff should be bound by its own error. It was further argued that the defendant company had based the selling price of its goods upon the amount actually charged for energy, and if it were obliged to pay ten times as much it would be the loser by that amount.

The borough held that there was no misrepresentation or concealment, but simply an innocent mistake. In handing down its decision in favor of the borough, the Court of Errors holds that the claim of the company as to loss of fixed selling price was contradicted by the company in its claim that it sold its products at the highest price obtainable, and that at the end of two years it was in charge of a committee of its creditors.

#### Water-Power Regulation in British Columbia

The British Columbia water act of 1909 has lately been amplified by a set of "Rules and Regulations" which specify and explain the legal procedures necessary in acquiring and developing government water-powers and also establish a new system for the collection of revenue from the users of such powers.

The new rules and regulations cover matters which were only partly provided for in the water act of 1909 and go into full detail in regard to (1) petitions and fees, (2) expropriation by municipalities, (3) the use and occupation of crown lands, (4) fees for the use of water for domestic, irrigation and other purposes, (5) fees for the use of water in the development of water-power, (6) headgates, structures and measurement of water, and (7) the filing of plans, office procedure and fees.

Under these several headings a new policy has been laid down which will make a radical change in the administration of provincial water rights. The comptroller is vested with judicial authority in settling questions and disputes, while the Executive Council can order a license revoked in certain cases, such as a re-

usual or failure to develop the full amount of power covered by the license within a period of five years after there is a public demand for such power. However, the outstanding feature of the new policy is in the manner of determining the fees, which will from now on be based on the capacity of the site as measured by the net horse-power which can be produced at 70 per cent efficiency.

In order to exclude at the outset all who are not bona fide investors, a substantial sum is required as a record or application fee. A bond is also required varying from 50 cents to \$2.50 per hp as the total power of the site decreases from 100,000 hp to 1000 hp. It is not to be less than five times the amount of the record fee. All rental payments made during the survey-construction period are rebated to the licensee as credit upon the rental account in the operation period, this being designed to lessen the expenses of early operating periods, as well as to hasten the completion of the plant. The amount of the rental fee during the operating period, which fee is fixed by the board of investigation, is in no case to be less than 25 cents nor more than \$1 per hp per annum.

### **Ptentative Rules for Service Standards in Illinois Discussed at Springfield**

At a meeting at Springfield, Ill., July 16, members of the Public Utilities Commission of Illinois, the commission's engineers, and representatives of electric and gas utilities of the state participated in an open discussion of rules suggested by the commission for establishing standards for electric and gas service in Illinois. At the opening of the meeting Commissioner Walter A. Shaw, who presided, announced that no action or statement of the commission made at this session would be considered as binding, since the meeting was called primarily that the commission might receive the ideas and learn the viewpoints of the utility operators. Suggestions and additions to the proposed rules, said he, would be welcomed and would be given fair consideration.

Passing at once to the sections dealing with electric service, Rules 15 and 16, declaring against "creeping" meters and placing the allowable error for an electric meter, between one-tenth load and rated load, at 4 per cent, were read and accepted without objection or comment.

#### **Small Company Representatives Present Views**

Rule 17, providing that each watt-hour meter shall be checked for correct connection, mechanical condition, suitable location and accuracy within thirty days after installation, was criticised by Mr. Elmer W. Smith, of the Kewanee (Ill.) Light & Power Company. Stating that he spoke from the standpoint of the small company Mr. Smith said that the thirty-day limit should be raised to sixty days to allow more of these tests to be made by a single man in one trip. Where there is no regularly organized meter department an extension of sixty days would lighten the burden of this work. In reply to a question propounded by Mr. R. M. Feustel, chief engineer for the commission, Mr. Smith said he was unable to express an opinion on the advisability of classifying companies as to the number of customers under this rule. Mr. A. D. Mackie, Springfield, stated that a thirty-day rule would work no hardship upon the Springfield Railway & Light Company.

The advisability of periodic tests of meters of different ratings and dates of manufacture, stipulated under Rule 18, was questioned by Mr. C. E. Schutt, supervisor of the light and power department of public service of

the city of Chicago. Mr. Schutt stated that the portion of the rules requiring meters of the same rating but of different date of manufacture to be tested at differing intervals, would lead to practical difficulties in execution. Mr. Feustel replied, however, that in this case utilities probably would test all meters of identical type at the shorter period to save confusion. Rule 19, covering meter test records and meter records, was passed without comment.

#### **Working Standards and Referee Tests**

Following a question by Mr. John Maury, Rossville, Mr. S. P. Farwell, an engineer for the commission, gave his opinion that Rule 20 should be changed to read, "Each utility furnishing metered electric service should have available" [instead of "own"] "suitable working standards"—so that two or more small companies might use the same meter. Rule 21, declaring that a company shall test meters at the request of the customer, was passed without question. Although there was no objection to Rule 22, fixing fees for referee tests made by an inspector employed by the commission, Mr. C. E. Schutt, of Chicago, recommended that an additional paragraph be appended providing for the adjustment of bills following the discovery of a fast meter. Meter readings on bills, interruptions of service, and records and reports required by these rules were taken up in Rules 23, 24 and 25 and created no objections.

It was the intention of the commission in framing Rule 26 that any prospective customer should be entitled to a maximum free line extension of 200 ft., if necessary. Beyond this free limit it was intended that the customer should deposit with the electric-service company an amount equal to the cost of the additional extension, the company agreeing to pay rebates to the original consumer as additional customers were taken on the extension. However, the question brought up by Mr. John Maury, Rossville, showed that with the present wording the company might be called upon to build 400 ft. of line for a single customer. An additional suggestion made by Mr. Harry E. Brown, vice-president of the Spring Valley Gas & Electric Company, provided that the rule should carry a one-year contract feature. He also asked whether the company would have to build a line extension for a man with poor credit. To this query Mr. Feustel replied that the existing rules of a company governing service extension deposits should cover such cases.

#### **Suggestions by Chicago's New Department of Public Service**

Representing the department of public service of the city of Chicago, Mr. C. E. Schutt also offered a revised rule to take the place of Rule 26. The reasons given for objecting to the former rule were that in it no recognition was taken of the diversity of types of customers, or of the comparative value of service, or the comparative value of the return. Moreover, the rule provided no means for returning the investment of an isolated customer upon whose extension no future customers might be connected. In this connection Mr. Montague Ferry, commissioner of public service, Chicago, said that the city is now renting about 1100 arc lamps from the Commonwealth Edison Company, and with the present wording of the rule the city would be required to deposit with the Commonwealth company about \$100,000 for these extensions.

Rule 27 specifies that "each electric utility operating in a city having a population of 1500 or more shall adopt a standard voltage for the entire constant-potential system and shall maintain the voltage within 3 per cent of such standard on all lighting circuits during lighting hours." To this provision Mr. Peter Junkers-



field, assistant to the second vice-president of the Commonwealth Edison Company, Chicago, objected on the ground that regulation within 3 per cent to every customer was a difficult stipulation. Three per cent as an average, he said, was fair; but under the stipulations of the rule cases might arise where the business of a large consumer would have to be temporarily refused in order to comply with the spirit of the rule. Especially would this condition be true among the smaller companies where the addition of a large customer might temporarily affect a portion of the constant-potential system.

Following the reading of Rule 28, providing for voltage surveys, on which there was no comment, Mr. Farwell asked for an expression of opinion on additional rules regarding customers' deposits, grounded secondaries and frequency variations. In reply to the latter two questions Mr. Junkersfeld said he believed electrical men generally agree upon the advisability of grounding secondaries but differ somewhat as to methods. On the question of frequency variation he stated that any provision for close regulation of frequency would tend to bring the same result as close voltage regulation and might prohibit the small companies from taking on large customers without expensive preparations.

Discussion of the electrical rules was short and there seemed to be a tendency on the part of the commission to consider every suggestion made. Although a fairly large representation of electric-utility men was present, few took part in the discussion.

### Mexican Northern Waterpower Plant to Be Ready This Fall

With the settlement of Mexico's internal troubles in sight and the resumption of operations in a number of mines in its vicinity, the 50,000-hp Santa Rosalia hydroelectric plant of the Mexican Northern Power Company (which is the subject of an illustrated article on a following page) is now to be pushed to completion, and it is expected that the station will be ready to supply energy by September or October of this year. Mines and other industries in Chihuahua in the vicinity of the partially completed water-power plant are already starting up, and by the time the new station is ready for operation it is believed that a large market for energy will be available. As noted in the article already referred to, work on the water-power plant has been suspended since October of last year. Floods during the last twelve months have, however, filled the reservoir until now a body of water 30 miles long by several miles wide has been formed. When the plant was abandoned last fall the hydroelectric machinery had already been installed and the transmission line was nearly completed.

## PUBLIC SERVICE COMMISSION NEWS

### California Commission

The Railroad Commission has rendered a decision in the complaint filed by the town of Antioch, Contra Costa County, against the Pacific Gas & Electric Company. The complaint charged that the company's rates for electricity for general domestic and commercial use and street lighting were unreasonable. In arriving at its decision, the commission made an investigation of the company's entire hydroelectric system, and its steam plants as well as its local distributing system at Antioch. The company held that it should be allowed a re-

turn on the basis of the cost to reproduce its plant new plus an allowance for going-concern value. In figuring the basis of return, the commission reduced the overhead percentages to be added for administration, taxes insurance, etc., from about 25 per cent, as estimated by the company's engineers, to about 12 per cent. The commission then fixed an average cost for electric energy deliverable at substations. At the hearing of the case it was agreed by the company that the basis fixed in this decision might be used as the basis upon which to ascertain the cost of energy delivered to any of the cities which it serves, and in fixing rates hereafter it will only be necessary for the commission to determine the cost of distribution in any locality. This average cost as found by the commission is 0.7312 cent per kw-hr.

### Idaho Commission

The Public Utilities Commission of Idaho is under attack. The republican and democratic State conventions have inserted planks in their respective platforms providing for the amendment of the utilities act.

It is said by those who are familiar with the intent of the republican plank that it means a declaration for an amendment to the utilities act that will take from the commission power to require companies to apply for certificates of public convenience and necessity before competing in districts where corporations are operating and reasonable rates prevail.

The democratic platform says in part: "The law has been interpreted by the republican commission and affirmed by the Supreme Court of the State of Idaho as giving the commission sole and autocratic power to permit existing public utility monopolies to continue their exclusive possession of the market supplied by them; competition is killed; the needed and desired development of Idaho's natural resources is blocked and discouraged. We condemn this substitution of three men commission rule for the public policy of competition and development of natural resources. We pledge the democratic party to such changes in the public utilities law as will secure regulated competition in place of protected monopoly."

### Illinois Commission

The commission has given authority to the East St. Louis Light & Power Company to change rates on installations of 500 hp or over where the customer will agree that the company will not be required to furnish energy during the time of maximum demand of other business on the company's lines. The rate in this case is fixed at about one-half of the regular rate.

### Massachusetts Commission

The Massachusetts Gas & Electric Light Commission has ordered a reduction in various prices of electric energy by the Northampton Electric Lighting Company, acting upon two petitions addressed to the board by Mayor W. H. Feiker. The company is one of the properties of the Massachusetts Lighting Companies, whose headquarters are in Boston. At the hearings the company offered to reduce its maximum net price from 14 cents to 12 cents per kw-hr. to private customers, and offered yearly prices for street lighting, with its existing installation, of \$85 for all-night and \$71 for midnight-early-morning arc lamps, and \$24 for all-night and \$18 for midnight incandescents. The arc lamps in service at the close of the 1913 fiscal year were 106 6.6-amp, alternating-current inclosed units, there being 498 50-watt tungsten street lamps in operation. Under the existing prices the company charged \$90 per year for each arc lamp lighted all night and every night, or 4000 hours per year, and \$70 for each arc lamp used until midnight, or 2250 hours yearly, with an additional charge of \$5.56 per lamp for each midnight arc lamp

operated from 5 a.m. to daylight between Nov. 15 and March 1. The prices for the incandescent lamps were \$19 and \$28 per lamp per year, respectively, with an additional \$1.51 for early morning service. On Main Street, by agreement with the company, the city and the Board of Trade, twelve arches carrying 208 50-watt tungsten lamps have been operated every night until 11 p.m. for \$1,200 a year.

The board points out that since 1888 the company has failed to pay dividends in only two years, and has paid less than 6 per cent in but seven years. In 1902 it began paying regularly 8 per cent and in 1906 10 per cent, and in only one year since has it paid less than 12 per cent and in some years a much higher rate. Its earnings have been ample to make good in renewals and extensions all the depreciation which has occurred. On June 30, 1913, the company had a plant with a book value of \$216,278, with other assets of \$78,017. At the hearings some stress was laid upon the need of early additional outlay for station expansion and underground construction. In the face of this the company declared an extra dividend, which, with other available funds, would have met most of the cost of these projected improvements. Although the annual dividends in the last five years have averaged in excess of 20 per cent, the earnings in excess of operating expenses, interest and dividends have exceeded \$19,000 a year. The board is therefore convinced that the prices given below will allow earnings ample to cover all reasonable operating expenses, including a proper provision for depreciation and a fair return on the value of the property.

Since the hearings the company has adopted a somewhat simpler motor-service schedule with a lower base price, which the board considers will be advantageous to both the company and its customers. It seems undesirable to the board to deal specifically with any prices other than those for street lighting and the maximum net price to commercial customers. The commission says: "Other prices both for power and light are made chiefly from motives of commercial expediency to obtain business which cannot otherwise be secured. To the extent to which such business is strictly competitive it is able to take care of itself and needs no help from this board. . . . While the minimum charges for power in force may in some instances work some hardship and might perhaps be rearranged to advantage, and while they have little value to the company as producers of actual revenue, they tend to make a fairer adjustment of the responsibility for station loads as between customers and should lead to decreasing average costs and to lower prices. For these reasons the board has not deemed it necessary to make any specific recommendations with regard to such minimum charges." No recommendation is made regarding the arch display lighting, as the commission notes that this is governed by special agreement and at a rate as low as the board under the conditions would care to recommend.

The board orders the company to establish a maximum net price, dating from July 1, of 9 cents per kw-hr., with a price of \$82 per year for all-night arc-lamp service and a price of \$68 for midnight and early-morning lamps, and a price of \$17 per year for all-night and of \$13.50 for midnight-daylight incandescent lamps.

#### New Hampshire Commission

The Public Service Commission of New Hampshire has prescribed a classification of accounts for electric utilities effective as of July 1, 1914. The text issued for electric utilities classifies the companies into four groups on the basis of their gross earnings. For the smallest companies, those which have been grouped as having annual earnings of less than \$3,000, there has

been provided a very much condensed set of instructions as an appendix to the regular rules.

The general instructions regarding the classification require that each electric plant serving a distinct locality, and separately operated, shall be considered a separate utility even though two or more plants are held in common ownership. Plants connected by transmission lines, but otherwise separately operated are, however, considered separate plants, unless in any case upon application and for good cause shown the commission shall permit it to be treated as a single operating unit. Overhead expenses common to several plants held in common ownership may be distributed to the several plants, but the distribution must be made upon an equitable basis and such basis must be reported to the commission. Companies owning plants separately operated are required to show the stock, bonds, notes and other securities issued to acquire or improve the properties of each plant. The commission requires the keeping of accounts for the utility as a whole, showing the aggregate plant investment, the liabilities of each class and the operating expenses and revenues thereof, together with all financial transactions between the utility as a whole and each separate plant regarded as a separate utility.

The commission indicates the probability that it will be compelled to make a further and more explicit requirement in particular cases. Under the provisions of the New Hampshire law no public utility is permitted to transfer or lease its property or contract for its operation without the assent of the commission. By virtue of this provision the commission has at hand information of the value of plants when purchased and there has accordingly been inserted in the classification the provision that when any property in the form of a going and completed plant is purchased, the actual amount paid therefor shall be distributed to the appropriate accounts of the purchasing utility; but before such distribution is made the plan thereof must be approved by the commission. The method of treating the "cost of plant as of July 1, 1914," the date upon which the classification went into effect, differs from the procedure adopted in other classifications. The utilities are given their option of either bulking the total property of the company devoted to its operation or of allocating it to the various investment accounts. If the latter course is adopted by any utility it is provided that the charges shall be so designated upon the books of the utility as to show clearly that they relate only to property installed prior to the close of that date.

The policy adopted by the utility of considering discount on securities as an item not generally chargeable to property has been incorporated in the classification. It is provided that this discount must be in no case be charged to property accounts without authority.

The amount of sales as compared with the energy produced was considered one of the principal factors tending to disclose efficiency. This is manifested in the provision for accounting uniformly for the amount of energy used by the company. An account to show the energy used by the company must be opened as a credit to the total cost of production. The corresponding debit to this credit is to be made to the various expense accounts where the current is used. This provision differs from the New York classification which has the account "duplicate charges" to contain the credit for all energy used by the company.

"Lamp renewals" and "inspecting and testing meters" are considered as operating rather than maintenance charges; "uncollectible accounts" are made a commercial expense and "profit on merchandise sales and jobbing" are classified as non-operating revenues.



## Current News Notes

**NASHVILLE TO HAVE AN ELECTRIC SHOW.**—An electric show will be given in Nashville, Tenn., on Sept. 21-26 by the Nashville Jovian League. The co-operation of all electrical men is requested. Jovian Day will be celebrated on Sept. 24.

**LOUISVILLE PUBLIC SCHOOLS TO TEACH WIRING.**—Courses in electric wiring have been included in the curriculum of the Louisville (Ky.) pro-vocational schools by the local board of education which has ordered that the annex to the Board's administration building be fitted up and equipped for instruction of this kind.

**DRYING GRAIN BY ELECTRICITY.**—A milling company in Europe is reported to be using electricity for drying the grain prior to its being ground. The heating unit is inclosed in the spiral screw which conveys the grain from the hoppers to the grinding stones. Drying the grain before grinding is said to make the grinding easier and to insure obtaining a better quality of meal.

**LECTURE ON ELECTROMAGNETS BEFORE ANNAPOLIS POST-GRADUATE SCHOOL.**—Mr. Charles R. Underhill, electrical engineer of the Acme Wire Company, New Haven, Conn., delivered a lecture on electromagnets before the officer-students of the Naval Post-Graduate School at the United States Naval Academy, Annapolis, Md., July 15. A number of officers and instructors attended the lecture, in the course of which lantern slides and actual electromagnets of various forms were exhibited.

**ELECTRIC-LIGHT CURE FOR SURGICAL TUBERCULOSIS.**—The head of the Finsen Light Institute of Copenhagen has used the electric arc light in the treatment of patients suffering from surgical tuberculosis with promising results. The patients are placed about a yard from an ordinary arc lamp. At the beginning the exposure lasts for fifteen minutes a day, but it is gradually increased until it reaches two and one-half hours. It is expected that treatment by artificial light in many cases will give better results than prolonged and expensive treatment by sunlight.

**GROUNDING OF FIRE-ALARM BOXES.**—The United States Bureau of Standards is co-operating with the grounding committee of the International Association of Municipal Electricians on the subject of grounding fire-alarm and police-signal boxes. Several fatalities have recently occurred due to ungrounded boxes and have shown the necessity for this form of protection. Many fire chiefs, however, oppose the practice of grounding on the score that the box ground too frequently renders the signal-box mechanism inoperative owing to insufficient insulation between the box and the working parts. The subject will be discussed at the municipal electricians' convention to be held at Atlantic City, N. J., Sept. 15 to 18.

**WIRELESS CONTROL OF FOG SIGNALS.**—Along the coast of England signal guns fired by Hertzian waves are being used during fogs to warn passing vessels of impediments to navigation. These guns when once started by the Hertzian waves continue to fire (unless stopped by the same means) at intervals of about twenty seconds until the supply of acetylene gas operating them is exhausted. Tanks containing enough gas to operate the guns about two or three weeks are installed

near each gun. The function of the wireless control is to enable attendants in the coast guard stations to start or stop the operations of these fog guns from a distance, thereby eliminating the necessity of personally visiting the apparatus except to renew the charge of acetylene gas.

**NAVIGABILITY OF DESPLAINES RIVER.**—Argument has been resumed before the Supreme Court of the United States in the case brought by the State of Illinois to restrain the Economy Light & Power Company of Joliet, now a part of the Public Service Company of Northern Illinois, from building a dam in the Desplaines River at Dresden Heights, Ill. The site of this proposed hydroelectric development is near the point where the Desplaines and Kankakee Rivers come together to form the Illinois River. Work was begun a number of years ago, but on the ground that the Desplaines River was and is a navigable stream the State of Illinois brought suit to prevent the building of the dam. The State was defeated in the state courts, and the case is now pending in the United States Supreme Court. Counsel for the company contends that no interest will be injured by the building of the dam, and that there is no reason why this considerable water-power should go to waste.

### SOCIETY MEETINGS

**ELECTRICAL SUPPLY JOBBERS' CONVENTION.**—The Electrical Supply Jobbers' Association will hold its next convention at Niagara Falls, Canada, with the Clifton Hotel as headquarters, from Sept. 9 to 11. Mr. Franklin Overbush, 411 South Clinton Street, Chicago, is secretary of the association.

**CONVENTION OF ELECTRIC VEHICLE ASSOCIATION.**—The fifth annual convention of the Electric Vehicle Association of America will be held at Philadelphia October 19, 20 and 21. Coincidentally with the convention the Philadelphia Electrical Show will exhibit displays of a number of electric passenger and commercial cars.

**MAINE ELECTRIC ASSOCIATION.**—The Maine Electric Association will hold its annual meeting at the Falmouth Hotel, Portland, Maine, Friday, July 31. Following the business session at 3:30 p. m., cars will be taken to the Cape Cottage Casino where a shore dinner will be served. Mr. W. S. Wyman, Central Maine Power Company, Augusta, is secretary-treasurer of the association.

**SOUTHEASTERN SECTION, N. E. L. A.**—The Southeastern Section of the National Electric Light Association will hold its 1914 convention at the Isle of Palms, near Charleston, S. C., Aug. 19, 20 and 21. Mr. W. W. Fuller, general superintendent of the Charleston-Isle of Palms Traction Company, may be addressed concerning accommodations. Mr. T. W. Peters, Columbus, Ga., is president of the section and Mr. A. A. Wilbur, Columbus, Ga., is secretary-treasurer.

**JOVIAN OUTING AT DAYTON.**—Fifty Dayton (Ohio) Jovians held an outing July 15 at Tecumseh Park near Dayton. Baseball and field sports were followed by a general swimming party and chicken dinner. The committee in charge of the occasion comprised Messrs. C. B. Frankel, H. Maxwell, G. A. Niehaus, C. W. Hosier, C. H. Swartz, H. E. Allen, J. P. Martin, James Atwood, H. H. Wollaston, D. B. Howland, C. R. Bishop, G. B. Sayre, F. K. Ybee, E. O. Waymire, B. S. Guitteau, C. Fichter and Thomas F. Kelly. The Dayton Jovians plan another outing for Aug. 22.

## Hydroelectric Construction in Northern Mexico

**Difficulties encountered in building a 50,000-hp. electric station in Chihuahua—Personal experiences of American engineers in leaving the war-ridden country to the south. By A. C. Hobble**

**D**URING the last three years the Mexican Northern Power Company, Ltd., has been constructing a 50,000-hp hydroelectric project near Santa Rosalia in the northern state of Chihuahua, Mexico. When completed, this power station will supply electrical energy to numerous gold and silver mines in the region adjacent to the city of Parral. Construction work during almost the entire period has been carried on with the greatest difficulty owing to the continued series of revolutions interrupting railway traffic and making it next to impossible to secure cement, lumber, coal and other much needed supplies. Enduring these interruptions and inconveniences at first, the Mexican Northern Power Company finally found it necessary

mer concrete dam was more than half completed when work was suspended about the first of October, 1913. When this dam is completed a storage reservoir or lake some 56 sq. miles in area will be formed. The water of the Conchos River will be backed up some 30 miles, giving the river an average width of about 2 miles. The accompanying photographs show the dam during coarse of construction and the present status of both dam and power house.

During the year 1912 the total discharge of the Rio Conchos was 33,737,550,000 cu. ft., the maximum discharge occurring in August and September, aggregating for the months 13,236,650,000 cu. ft. and 12,140,100,000 cu. ft. respectively. Although the minimum



FIG. 1—DAM AND POWER HOUSE NEAR SANTA ROSALIA, CHIHUAHUA, AS THEY NOW APPEAR

to suspend all construction work when the project was nearing completion.

### The River, the Dams and the Station

The project itself involved the construction of a concrete dam—about 250 ft. high, with a maximum length of over 800 ft.—across the outlet mouth of the Rio Conchos River Canyon at La Boquilla, and a subsidiary masonry dam across a dry valley. The latter dam is practically completed and is over 2600 ft. long, with a maximum height of approximately 110 ft. Hydraulic cement, made from local deposits of blue limestone and clay, was used in its construction.

Extending across the Conchos River Canyon, the for-

discharge of the river sometimes falls as low as 350 cu. ft. a second, the variation in flowage is well compensated for by the immense storage lake with a capacity of 100,000,000,000 cu. ft.

The power house is a steel structure with walls of hard blue limestone and is built on massive concrete foundations in the bed of the river directly in front of, and forming a part of, the dam. Designed for six 10,000-hp units, of which three are installed ready for operation, the power house represents a considerable undertaking. The turbines are of the horizontal, double-runner, central-discharge, reactive type, built by Messrs. Escher, Wyss & Company, of Zurich, Switzerland. Oil-pressure governors are supplied with the



necessary oil by duplicate oil pumps driven by impulse wheels.

All electrical apparatus in the power house, including 6250-kw, 4000-volt, sixty-cycle, three-phase generators, exciters, 2500-kva oil-cooled and water-cooled transformers, 4000-volt low-tension apparatus and 110,000-volt high-tension apparatus, was supplied by the General Electric Company.

#### Transmission Lines and Temporary Equipment

Transmission lines to Parral, 50 miles distant, consist of No. 0000 aluminum cable supported by suspension insulators on 74-ft. double-circuit steel towers. The standard spacing is 650 ft., but the longest span measures about 1000 ft. Aluminum cable is used because of lesser first cost as compared with copper at the time of purchase, and also owing to the reduced corona loss.

Perhaps the most interesting feature of the project from the electrical engineer's point of view is the 2000-kw electric construction plant, which, though temporary, is modern in its equipment. One 1000-kw and two 500-kw Curtis steam turbines, operating condensing, are supplied with superheated steam from one Babcock & Wilcox water-tube boiler and two horizontal tubular boilers, the former using crude oil for fuel and

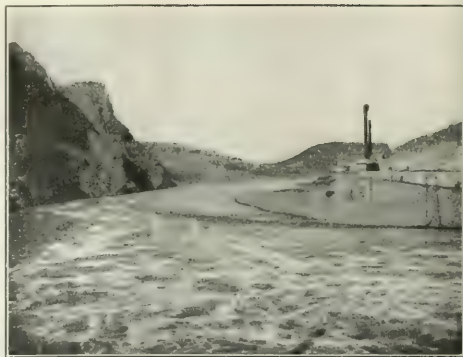


FIG. 3—RIO CONCHOS IN FLOOD—STEAM-ELECTRIC CONSTRUCTION PLANT IN DISTANCE

transformers stepping down the potential to 220 volts for alternating-current motors. Distribution lines to electric railways and Lidgerwood cableways were operated at 550 volts and were supplied with energy from two 300-kw rotary converters.

Work on the dam was carried on night and day. Ordinary illumination by means of arc lamps would not suffice, as these would be destroyed by blasting, by the movements of concrete skips from the cableways over the top of the dam, and by the swinging members of the stiff-leg derricks. However, this difficulty was solved by using five 18-in. projectors, or searchlamps, mounted at high points on both sides of the canyon several hundred feet distant from the dam.

#### War in Camp

About 2500 Mexicans were employed as laborers on this work. The field and office staff included about 100 foreigners, about seventy of these being Americans and the others Europeans. Owing to the continual excitement and disorder brought about by the revolution, Mexican laborers were especially hard to handle. At one time a battle between the forces of General Villa and the Federals was fought in the construction camp, and of course all work during the battle was suspended without orders. In this fight twelve combatants were killed and some forty were wounded. Little damage, however, was done to the property of the Mexican Northern Power Company. During one period, when General Villa was in camp with 500 followers, several horses belonging to the company disappeared unaccountably. Appealing to the general, it was discovered that the horse thieves were among Villa's army. Summary measures were taken, and, discovering the



FIG. 2—ELECTRIC-RAILWAY HAULAGE ON THE RIO CONCHOS PROJECT

the latter coal or wood. Owing to demoralized traffic conditions there was a long period of time when oil and coal could not be obtained and it was necessary to fire the boilers with wood hauled long distances across the cactus and mesquite-covered desert.

Practically all operations were electrical, more than 3000 hp in electric motors being installed to drive air compressors, stone crushers, concrete mixers, lime and sand screens, clay mills, four 150-hp Lidgerwood cableways operating across the canyon, hoists, stiff-leg derricks, pumps, channeling machine, workshops, ice plant, mine locomotives, etc. Approximately 5 miles of narrow-gage electric railway distributed sand, gravel, cement, lumber and other materials where required.

At least twelve electric mining-type locomotives were used to haul materials for construction to different parts of the job. One line of railway had to be constructed along the side of a mountain, climbing an elevation of about 300 ft. in a distance of approximately a mile. These locomotives were kept busy night and day in perhaps the most rigorous service—other conditions also being considered—that such locomotives have ever been called upon to perform.

General distribution was effected at 2300 volts,

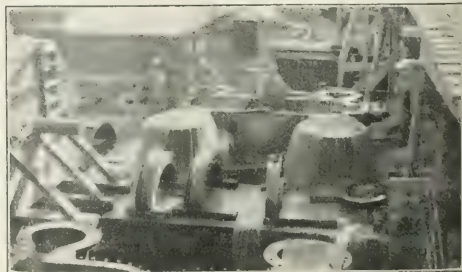


FIG. 4—ASSEMBLY OF FIRST 1000-HP TURBINE INTERFERED WITH BY FLOOD



FIG. 5—GETTING OUT OF MEXICO—CROSSING THE RIVER FLORIDA, NEAR SANTA ROSALIA

culprits, the general ordered out a firing squad and dealt with the guilty parties in Mexican fashion.

The railroads north and south being destroyed, it was necessary for the Americans to travel about 300 miles overland from Santa Rosalia northeastward via Ojinaga and Presidio to Marfa, Tex., the latter place being the nearest railway station. The trip was made by wagons equipped with provisions and water and occupied a week. The members of the party were awakened from peaceful slumbers in camp by the roadside about 3 o'clock one morning, to be confronted by a party of rebels. They inquired where the Americans were from, where they were going, examined their passports, partook of breakfast with them, bade them "adios," and left them to proceed happily on their way to the border. The party finally arrived at Marfa looking like tramps and feeling very doubtful whether they would be received at the hotel.

One were to take a trip over the Mexican Central Railway southward from El Paso, Tex., at present, he would pass mile after mile of wreckage—steel rails bent and twisted like pine shavings, telegraph lines down, the remains of burned railway passenger coaches and freight cars, and railway stations gutted by fire. Occasionally one will see numerous mounds of earth and stone hastily gathered over the remains of those fallen in conflict, bleached bones of men and horses, the figure of a man strung up on a telegraph pole—all speaking silently but with sad impressiveness of the terrible conflict being waged in Mexico.

As soon as peace and order have been restored it is expected that work will be resumed upon the project of the Mexican Northern Power Company near Santa Rosalia, and some of the American engineers expect to return to their work. Those who shared the 300-mile overland journey across the border were Messrs. R. H. Oillon, S. P. Weinberg, A. Garneringer, S. Newkirk, J. French, R. Allen and the writer.

#### Auxiliary Steam Plant for Sanitary District

As the result of an exhaustive study by Mr. E. B. Ellicott, electrical engineer for the Sanitary District of Chicago, the latter's board of trustees has contracted for the purchase of an auxiliary steam plant. As is well known, the Sanitary District operates a hydroelectric plant on the Chicago Drainage Canal at Lockport, Ill., transmitting the energy about thirty miles to a terminal station in Chicago at Western Avenue and West Thirty-first Street. The new steam auxiliary is designed to meet the anticipated demands for peak-load conditions. It will be installed in the Thirty-ninth Street pumping station of the Sanitary District (Thirty-ninth Street and Lake Michigan), and will consist, essentially, of a 4000-kw horizontal General Elec-

tric turbo-generator. The turbine is to be operated by steam taken from the bank of boilers now in place in the pumping station. The cost of this auxiliary will be about \$80,000. Acting on the advice of the electrical engineer, the trustees have also contracted to purchase a synchronous-condenser equipment to be installed in a suitable building to be erected at the Western Avenue terminal station. This equipment will consist of two 2000-kw, 12,000-volt, 600-r. p. m. synchronous condensers built by the General Electric Company. These machines will cost about \$60,000 and are intended to improve the operating and power-factor conditions of the hydroelectric system of the District.

#### Additions to St. Louis Company's Motor Load

With the completion of the new factory of the St. Louis Screw Company, St. Louis, Mo., approximately 1800 hp in connected motor load was added to the lines of the Union Electric Light & Power Company. Making steel for its nut and bolt factory, this industrial plant averages a demand of about 1000 kw, and it is thought that within the next year this demand will be increased to about 1200 kw, the connected motor load increasing to about 2500 hp.

Another isolated plant in the heart of the St. Louis business district was recently shut down when the Security Building began receiving electric service from the central-station company. The combined demand of this building will probably be 130 kw. Its old steam-electric plant will be retained by the Union Electric Light & Power Company for steam-heating purposes during the winter months. According to Mr. F. D. Beardslee, sales manager for the Union Electric company, the owners of isolated plants in downtown St. Louis are, one by one, finding it to their advantage to adopt central-station energy, and a cleaner city is resulting.

#### Electric Heater to Augment Oil-Well Flow

In the oil fields of the Whittier (Cal.) district, which is served from the lines of the San Joaquin Light & Power Company, experiments are being made with an electric heater which, it is claimed, will increase the output of flowing oil wells. The heater is a long cylinder of brass containing numerous coils. The cylinder is lowered to the bottom of the oil well and the resulting increase in flow is explained on the theory that the heat expands the gas, causing a greater upward pressure. The hourly consumption of the heater used at present is about 9 kw-hr. If the heater is a success, it will be a great income producer for the electric company and also for the oil companies which will use it.



## The Boston Edison General-Service Buildings—III

Standardizing and testing laboratory—Apparatus for high-tension tests and large-current measurements—Photometer room and photographic department. By H. S. Knowlton

IN the two preceding sections of the present article a description was given of the general features of the new general-service buildings just completed by the Edison Electric Illuminating Company of Boston at a cost of about \$1,000,000. The fireproof structures for storing material, equipment and supplies, the meter shop, the arc and incandescent lamp departments, the electric vehicle garage and the "welfare buildings" of the group were described in detail.

### Testing Laboratory

"The laboratory," or Building No. 5, is the home of the department of standardizing and testing and is one of the most complete in the world, having been designed for routine and special work of the greatest variety after conferences with experts from the Bureau of Standards, Washington, D. C., the General Electric Company's laboratory staff, and other institutions. The company is particularly indebted to the Electrical Testing Laboratories, Inc., New York, in this connection. The needs of the department have long been realized by

its officials, but until the completion of the present structure the space available for tests and investigations had been extremely limited.

In general design the new laboratory consists of two interconnected buildings, the intermediate portion being constructed in such manner that any possible vibrations from the rear portion may be prevented from reaching the front. The latter section is a two-story building in which the more delicate work is performed, the rear being set apart for heavier testing work and for investigations on a larger scale.

The laboratory organization consists of four divisions—standardizing, station testing, steam testing and electrical—about forty employees being on the roll. The services of the department are rendered at rates which make it self-supporting, all other departments being charged for work done according to a schedule which includes overhead charges and running expenses in full. The routine work includes a large amount of outside testing in generating plants and substations, on the distributing system and elsewhere. The calibration of



FIG. 38—GENERAL VIEW OF STANDARDIZING LABORATORY, SERVICE BUILDINGS, BOSTON EDISON COMPANY



FIG. 39—BATTERY SWITCHBOARD AND BUSES, STANDARDIZING LABORATORY

ation instruments and portable standards used by the company, tests of turbines, generators, cables and transformers, a large amount of photometric work, the provision of accurate time service derived from a radio installation receiving daily signals from the government plant at Arlington, Va., the calorimetry of fuel, tests of steam gages, thermometers and indicator maintenance, maintenance of instruments of precision, care and calibration of Sangamo ampere-hour meters used in the company's electric vehicles, high-potential, relay, shunt and other tests are handled by the department, which also does all the photographic work on the system and provides facilities for research by the company's consultants. A branch laboratory is maintained at the L Street station in South Boston, the principal generating plant, where two men are constantly at work at the department's service.

On the first floor of the building, at the front, are the general office and private office of the head of the department, a standardizing room, battery room, meter room and locker room with lavatory and shower bath. The second floor contains quarters for the photographic section and rooms for photometric and spectroscopic work, calorimetry, radio signal apparatus and steam testing.

The electrical center of distribution for the building is at a main switchboard in the larger testing room at the rear, cables of various sizes being run from switches on the panels to the different divisions of the laboratory in Orangeburg fiber conduit. The floors are of reinforced concrete, that in the large testing room being capable of supporting a loaded truck weighing complete 25 tons. A tar and gravel roof provides ample space for investigations out of doors, and an opening has been left for use as a porte lumière in connection with spectroscopic work. Motor-driven ventilating-fan outlets are provided at the roof level, and the photo-

graphic studio has a large skylight facing north which is brought up through the roof at one corner of the building.

#### Standardizing Room

The standardizing room, at the left of the main entrance on the ground floor, is provided with heavy slate tables and wall benches instead of the piers often found in laboratories. These benches are 1.5 in. thick, while the table slabs reach a maximum thickness of 3 in. The wall benches are carried 30 in. above the floor and are 2 ft. wide. Testing stations are in general supplied with energy from cables carried upward from the floor ducts by conduit run through a split handhole cover, the handhole being 1 ft. square at the top and about 2 ft. square at the bottom. Practically all the benches and tables are provided with shelves, and a great variety of delicate testing can be conducted at any time in this space. The benches ordinarily provide for the support of instrument cabinets, standard balances, apparatus for checking voltmeters of alternating-current and direct-current types, calibration of resistors and millivoltmeters, and galvanometer work. The tables are usually devoted to speed checking, the calibration of frequency indicators, thermometer comparisons, calibration of ammeters, shunts, current transformers and other instruments by reference to standards. The installation of the wiring in the floor ducts reduces the field effect on apparatus and gives a larger head room, while the use of brass screws and wholly non-magnetic material in the tables and benches is of obvious advantage.

Among the special features of the room are a 7000-volt non-inductive, zero-temperature coefficient resistance rack mounted just below the ceiling, storage cells arranged on trucks for instrument testing, a motor-generator designed for voltmeter calibration with instruments of varied range, a motor-driven tachometer



and frequency-indicator testing set, Kelvin balances, standard resistances and special cable connections with the high-tension test section of the larger test room. The laboratory is provided with two "chloride accumulator" storage batteries of seventy-two cells each, one having a discharge rate of 40 amp-hr. per cell for one hour and the other a rate of 60 amp-hr. These two batteries are housed in an acid-proof and fume-proof room adjoining the standardizing room, and each cell is connected to copper positive and negative contacts on a switchboard in the standardizing section, the wiring being compensated in size for the distance of each cell from the switchboard. The individual leads vary in size from No. 0 to No. 4-0, to give even discharge to all cells.

Two switchboards are provided, one for each battery, and the two boards are interconnected by heavy copper buses with terminals for the insertion of instrument shunts and with inter-bus resistors which provide a load for testing the latter. Current variation is secured by the use of plugs which cut resistance in and out of circuit with the utmost flexibility. The contacts receiving the positive and negative leads from the different cells are arranged for connection with the buses by the insertion of plugs, and any desired combination of cells in series and multiple can be made, giving a maximum current of 7500 amp with all cells of both batteries in multiple. The battery bus is connected with the large test room in the rear of the building by two 2,000,000-circ. mil cables, and current of the maximum steadiness is thus available for demand-indicator and any other tests requiring it.

The calibration of current transformers is cared for

at a special bench in the standardizing room, where Leeds-Northrup mercury ammeter, an induction regulator and a boosting transformer are installed, with reversing switches throwing the ammeter upon either the direct current of the alternating current. The table carrying the secondary instrument is 15 ft. distant from the transformer under test in order to minimize the field effect. The observer is provided with a hand wheel and a long rod with which to operate the inductive regulator. Near this test station is a storage room for laboratory instruments and supplies, all apparatus and material being card-indexed and handled by a stock clerk. In this room are installed a telephone transmitter and telegraph sounder used in furnishing the company's telephone exchange with time signals in the form of second beats from the standard laboratory clock. The transmitter and sounder are mounted in a resonating box and mechanically connected. A useful feature of the instrument stockroom is a 12-in. by 14-in. by 18-in. cabinet containing 100 pigeonholes for the housing of thermometers, the holes being numbered from the top downward according to the increasing temperature scales of the instruments.

#### Main Switchboard

The main switchboard of the laboratory, in the rear testing room, is 16 ft. long and is composed of six marble panels set about 6 ft. away from the wall, the switching arrangements having been made as simple as was consistent with the service requirements. At the rear of the board and behind a grill running from each end to the wall are sets of busbars which receive the various services from the substation on the property

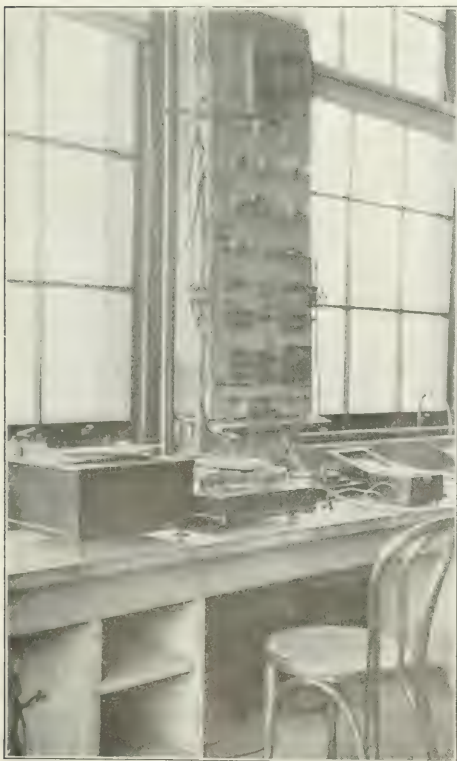


FIG. 40—VOLTMETER TEST STATION

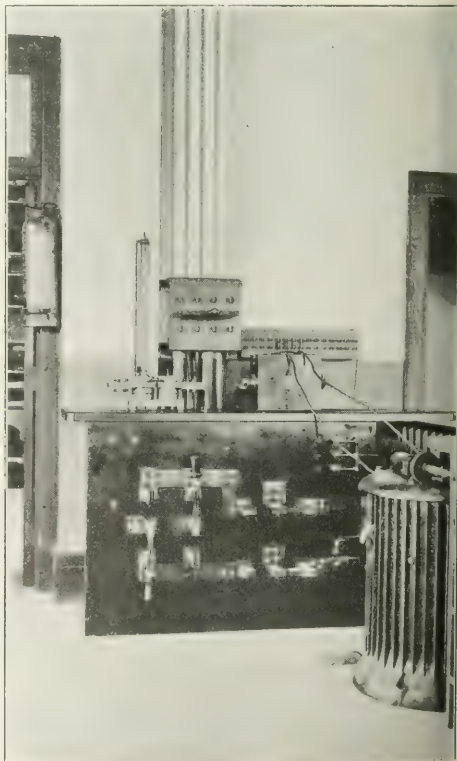


FIG. 41—CURRENT-TRANSFORMER TEST STAND

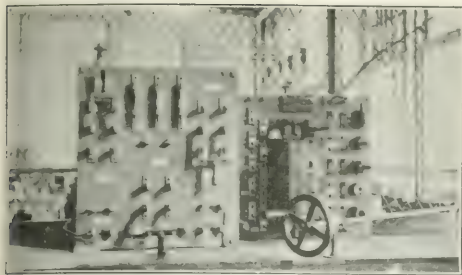


FIG. 42—LOAD BOARD AND SWITCHES FOR LARGE-CURRENT AND INSTRUMENT TESTS

and from which permanent and temporary plug connections are made for local distribution.

The top bus is for three-wire direct-current 110-220 volt service, being connected with the substation by two lines. One line is provided with horizontal taps leading to special plug receptacles on the rear of the board to facilitate transfer of energy in this form to other parts of the laboratory. The second bus installation is for three-wire alternating-current 115-230-volt regulated motor-service; the third handles the ordinary three-wire, 115-230-volt alternating-current motor service of the building, and the bottom bus cares for three-phase, 220-volt service, the central portion being broken to allow the insertion of a transformer in the floor from which three-phase, 110-volt energy may be derived. The 6.6-amp, constant-current arc circuit from the meter shop to the laboratory does not run through the main switchboard but is carried directly to the photometer room in lead-covered cable.

The absence of instruments and other complicating features from the switchboard is indeed striking. Many points in the laboratory are connected by permanent leads with receptacles on two transfer panels at the right-hand end of the board; and by plugs and jampers the utmost flexibility of interconnection is rendered possible. Service from any bus can be transferred to any local experiment station in a moment, and the interconnection of many of these stations, both in the standardizing room and in the main test room, enables circuits to be looped through the establishment as occasion demands. The absence of exposed wiring is one of the many good features of the building. At the rear of the main switchboard is a lamp bank mounted in the wall, with special connections with the standardizing laboratory, and beyond the board are benches for vacuum cleaner and other special tests. A meter test table with adjustable framing provides special cable connections to the battery buses and also the usual switchboard leads.

#### High-Tension Testing

Ample space for high-potential testing is provided behind the grill in the main test room. In this section are installed an operating switchboard controlling the supply of energy to step-up transformers, induction regulators, benches for special tests of insulating material, and sections set apart for transformers and cable submergence testing. Two transformers of 15-kw and 40-kw rating, when connected in series on their secondary sides, provide energy for testing at 90,000 volts, and a number of smaller transformers are available for lower voltage testing. At present the highest pressure employed on the Boston Edison system is 13,800 volts. To provide ample clearance in testing at the higher voltages, four buses composed of discarded brass condenser tubes have been mounted on insulators carried

on treated wooden cross-arms at a height of 9 ft. above the floor. Connections to spark-gaps and other apparatus are then made by short open runs of loose wire. The smaller testing transformers are mounted on trucks and terminals are provided in this section connecting with the standardizing room by cables insulated for 15,000-volt service. For testing reels of cable or shorter lengths of conductor under water a concrete pit 7 ft. deep is provided, with water piping for rapid and slow filling. Doors with Yale locks are provided in the high-tension test section. One of these, which is large enough to permit the entrance of heavy material, can be opened from the inside only.

Outside the high-tension test section is a space devoted to tests of apparatus requiring high current values. Heavy cables from the switchboard are run to this section via a general test table in the center of the room, and excellent facilities are available for commercial tests. A special switchboard in this section provides a group of circuits common to various switchboard instruments, the electrical features of these being mounted on the panel and arranged for connection as required in the circuits of other apparatus under test, so that full service conditions may be reproduced. Current values as high as 3000 amp and at pressures as low as 10 volts are available in this section of the laboratory, and three Siemens-Halske standard current transformers are installed for test purposes. An induction regulator is also a part of the equipment. A valuable piece of apparatus stored in the high-tension section is an oscillograph, complete in its mounting and ready for immediate shipment. This apparatus can be set up for service in thirty minutes.

The main testing room is also provided with storage racks and bins for loose wire of all sizes, lugs, station instrument parts and miscellaneous material. A shipping and receiving room, 16 ft. square, occupies one corner, and in another are an instrument repair shop equipped with a watchmaker's bench, a Hjorth lathe individually driven by a  $\frac{3}{4}$ -hp motor, a vertical drill directly driven by a 1-hp motor, stock cabinet for instrument parts, a sink and a testing bench. A three-phase load board with a rating of 500 watts is in service, and the shop is provided with outlets for alternating-current and direct-current service of various types and a millivoltmeter adjustable resistor for testing. A transformer for reducing the voltage in heavy current work is also located in the shop. The general test room is lighted at night by thirty 150-watt tungsten lamps in prismatic reflectors, the lamps being installed 21 ft.

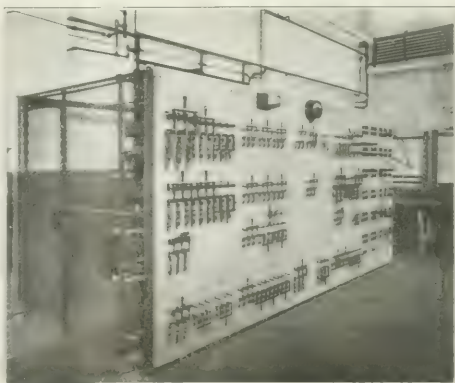


FIG. 43—MAIN SWITCHBOARD SERVING THE TESTING LABORATORY



above the floor. For testing purposes a special ground wire is run throughout the building and is connected with a coke and plate ground outside in the yard.

#### Photographic Section

The photographic section is provided with a general studio and with printing and dark rooms. Its equipment includes metal cabinets for the storage of prints and recently developed negatives and for supplies and apparatus. A photostat is in service, and ample provision for making enlargements has been afforded. Much of the work can be done by daylight, but when darkness is required double sliding curtains shut out all the light. An interior dark room reached by a winding corridor is utilized for most of the plate developing. Developing lanterns are in general equipped with an 8-cp copper-flashed lamp in each instance, and the dark rooms are ventilated by motor-driven fans. Excellent facilities are at hand for the making of lantern slides used in the company's lecture service. Among the conveniences of the section are a foot switch controlling incandescent lamps used in printing, so that the operator can give his entire attention to shading, a flexible copy board, a print-drying rack, and special facilities for drainage at sinks. Enlargements and reductions are made by the light of a 30-amp, 110-volt arc lamp placed behind a condensing lens 14 in. in diameter and equipped with ground glass diffusers mounted on a partition between the studio and the printing room.

#### Photometer Room

The photometer room is divisible into three experimental areas separated by dark curtains and is provided with various electrical service outlets and with permanent connections running to the main switchboard on the floor below. A distributing switchboard in one corner controls the supply of energy to the terminals in different parts of the room, and transfer lines are provided as in the main test room. In general, all alternating-current lines are installed at the left side of terminal boards and direct-current lines at the right. Two lines connect the battery room and photometer room. The equipment of the latter includes a bar photometer, a spectrograph, a porte lumière, four stations for series arc-lamp current supply, storage cabinets, and a 2-m. Ulbricht sphere photometer. Racks for life tests of lamps are installed, and a section of the room is devoted to swinging mirrors for arc-lamp photometry. The curtains enable different researches and tests to be



FIG. 45—HIGH-TENSION SECTION OF CHEMICAL LABORATORY

carried on simultaneously without interference, and when larger areas are required the absence of rigid partitions is of great value.

#### Chemical Laboratory

The chemical room is equipped with four hoods ventilated by a motor-driven fan, test tables, sinks and the usual adjuncts of an analytical laboratory. The outlet duct in one hood is carried close to the working plane to provide for the withdrawal of heavy gases. Electric hot-plates and a Freas constant-temperature 600-watt electric oven are included in the equipment. An electrically heated water still will probably be installed later. Space does not permit further description of the chemical equipment, but the fuel calorimeters are provided with motor-driven stirrers having an emergency connection to the laboratory storage-battery room in addition to the usual direct-current supply from the service mains in the building. A 12-volt battery circuit is used in igniting the charge in each bomb. A 1-hp motor driving a coal grinder, pulverizer and mixer and a motor-driven ventilating fan for the preparation room are other electrical features.

Rooms are also provided for general test and reclamation work, notably the salvage of platinum obtained from the leading-in wires of series incandescent street lamps. The entire laboratory is well equipped with telephone service, some eighteen stations being at present in use and operated from a supervisor's board in the general office. The wireless aerial has an effective length of 175 ft. It consists of four strands of bronze wire spaced 4 ft. apart, running north and south between the laboratory and the top of the garage building.

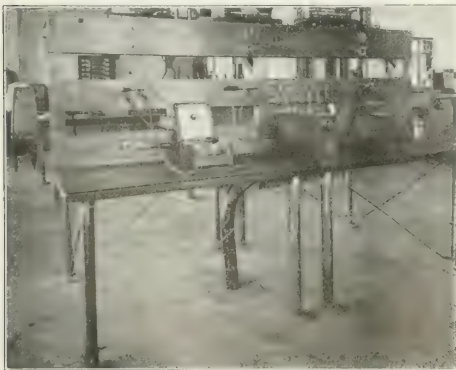


FIG. 44—TEST TABLE, SHOWING KELVIN BALANCES AND METHOD OF WIRING FROM FLOOR HAND-HOLE

#### Daylight Signaling with Illuminated Targets

With the recent developments in lenses for signal purposes, according to Mr. Thomas S. Stevens, signal engineer for the Atchison, Topeka & Santa Fé Railroad, it is now practicable to illuminate signal targets sufficiently for the different colors to be readily distinguished in daylight at a distance of 2000 ft. (609.6 m.). Of course, this method is possible only where electric light can be used, but it provides a very cheap and efficient way to signal electric roads where plenty of energy is available at a low cost. All the complicated mechanisms necessary for the mechanical operation of signal arms are eliminated and replaced by simple electrical circuits which are far more efficient and economical to maintain. In the majority of cases two 25-watt lamps are used behind an 8-in. lens. Indeed, it appears that the problem with this type of signaling is to provide a light signal sufficiently visible in bright sunlight which will not make the signal too prominent at night.

## Search Lamp with Vapor-Cooled Electrodes

Constructional features and performance characteristics of an arc lamp operating at greatly increased current density

**A** TYPE of search-lantern being tested by the United States Navy possesses many interesting constructional features and operating characteristics. As compared with the earlier types of search-lanterns it has much smaller electrodes, operates at a much higher current density and temperature, and produces a greatly increased candle-power for the same energy.

The chief feature of the lamp is the smallness of the diameter of the electrodes. As compared with the earlier electrodes for say 150 amperes of 38-mm diameter, the new electrodes have a diameter of 16 mm, the cross-sectional area being only about one-sixth as large. The current density is therefore six times as great as that used with the earlier lamps.

A limitation to the increase in current density in the earlier lamps was found in the fact that when the specific brilliancy of the crater reaches a certain value, depending upon the volatilization point of the electrode material, an increase in the current strength is accompanied by an increase in the area of the crater without change in the specific brilliancy. This limitation has been overcome in the new lamp by forcing alcohol vapor around the electrode to act as a cooling medium and to protect the electrode from combustion. This arrangement gives rise to a very striking phenomenon. The

constant cooling of the electrode mantle causes the current to emanate from only the limited front-tip of the electrode. This phenomenon is connected with an increase in the pressure which causes considerable quantities of energy to be converted at the anode-crater. The crater area hollows out the tip of the electrode like a funnel and the hollow is completely filled up by the



FIGS. 2 AND 3—FULL-SIZED VIEWS OF ELECTRODES

fumes of the core material. The crater is filled up with the illuminating fumes, the light effect of which is further increased by the white-hot carbon. The crater appears like a sharply defined point of light of extremely high specific intensity.

The illuminating part of the arc lies almost in the hollowed out positive electrode. The positive electrode



FIG. 1—EXTERIOR VIEW OF LANTERN

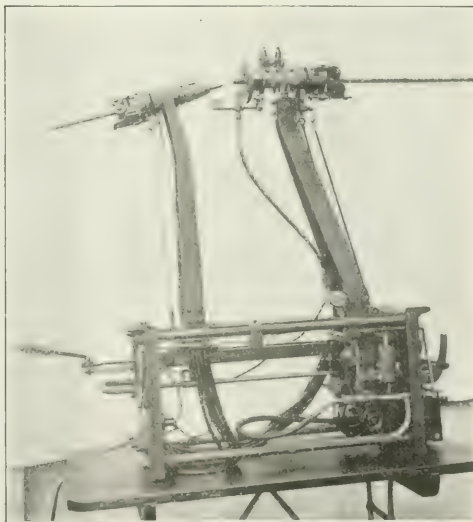


FIG. 4—ARRANGEMENT OF LAMP ELECTRODES



is not reduced to a point, as was formerly the case, but maintains its full diameter up to the crater. The negative electrode is also operated at an exceptionally high current density, the diameter for 150 amp being only 11 mm. It has proved advantageous to rotate both the positive and the negative electrode, in order to maintain a perfectly uniform bathing with gas and to insure equal or straight combustion.

The new lamp is illustrated in Fig. 4. The electrodes are not clamped in a holder, as it has been the custom formerly, but are led through special electrode-heads which act as conductors for the current. The positive electrode is placed in a horizontal position while the negative one is placed at a certain angle therewith.

During operation both electrodes are rotated uniformly by means of a clamping device which is driven from beneath by a motor. Alcohol-vapor has been found to be the most suitable as the cooling medium. It is generated in a very simple manner in a vaporizer from ordinary methylated spirit. The vaporizer is composed of a cylindrical chamber filled with wire gauze and heated by a small electric resistor. The

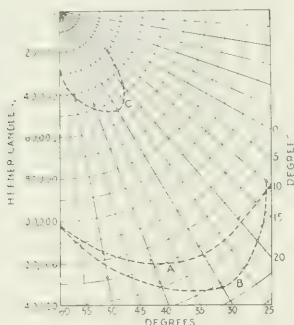


FIG. 5—POLAR CANDLE-POWER CURVES

spirit, supplied from a vessel outside the search-lantern, is admitted at a uniform rate into the vaporizer where it is volatilized immediately on the heated metal parts and escapes in the form of a gas through the nozzles. It is ignited at the hot electrodes but produced the desired cooling effect since the temperature of the alcohol is far below that of the electrode points. The feeding of the alcohol takes place automatically when the arc is struck, a valve governed electromagnetically being used for this purpose.

Fig. 1 shows a search-lantern in the course of erection. The supply tank for the methylated spirit can be seen at the side. It is well known that the crater of the arc in a search-lamp ought to stand exactly in the focus of the mirror reflector. It is stated that trials have established the fact that by means of a hand lever the crater can be kept fixed at within 1 mm. of its exact position. The operator of the search-lantern needs to pay attention only to the correct adjustment of the advance of the negative electrode and when necessary make slight corrections by means of the lever.

Despite the exceedingly small diameter of the negative carbon, the protecting gas has such a favorable effect on the combustion that the rate can be reduced to 35 mm per hour. For practical work a combustion of from 50 mm to 60 mm per hour has proved very advantageous. With the positive electrode various conditions make a limited combustion appear less advan-

tageous and a combustion of from 200 to 250 mm per hour is allowed. A new positive electrode can be inserted into a hot search-lantern in a few seconds. With the search-lamps hitherto used a quiet initial burning of the electrodes, especially at high intensities of current, was hardly possible, whereas the new search-lamp is ready for work in a few seconds.

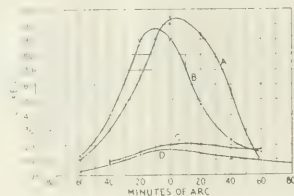


FIG. 6—ILLUMINATION PRODUCED AT 6800 FT.

A comparison of the performance of the new type of lamp with that of the older types is given by the polar-candle-power curves of Fig. 5. The values are expressed in hefner candles, one hefner being equal to 0.9 International candle. Curves A and B relate to the apparent candle-power of a lamp with alcohol-cooled electrodes, while curve C shows the apparent candle-power of a lamp with ordinary carbon electrodes operated under identical conditions as to current consumption and reflector equipment.

In Fig. 6 are shown the illuminations produced at a distance of 2075 m (6800 ft.) by the two types of lamps. Curves A and B refer to the new lamp and curves C and D to the old. The illumination is expressed in luxes, one lux being one lumen per square centimeter and hence equal to 929 lumens per square foot or 929 foot-candles. Curves A and C were taken in one plane and B and D in another at right angles thereto.

Illumination measurements similar to those shown in Fig. 6, but made at a distance of 8400 m (27,550 ft.), are reproduced in Fig. 7.

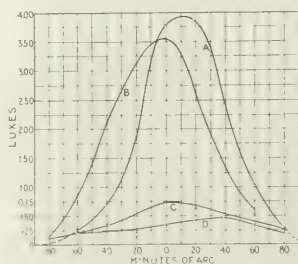


FIG. 7—ILLUMINATION PRODUCED AT 27,550 FT.

From Figs. 6 and 7 it will be noted that the spread of the beam is somewhat greater with the older than with the newer type of lamp, but the effective strength of the beam of the new lamp is about six times as great as that of the older lamp.

The new lamp with alcohol-cooled electrodes is the invention of Mr. Heinrich Beck, Meiningen, Germany, to whom patents covering it have been issued in Germany, Austria, Switzerland, Italy, United States, Canada, England, France, Belgium and Turkey. The United States patent was granted on June 18, 1912. The interests of Mr. Beck in the United States are being looked after by Mr. Louis J. Auerbacher, New York City.

# Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods, and Current Practice Among Successful Utilities

## Some Personal Testimony for Central-Station Service

About two years ago the Dean Forging Company, Muncie, Ind., was operating an isolated power plant consisting of two 300-hp boilers supplying steam for a 100-kw, 220-volt, three-phase, sixty-cycle turbo-generator set, a steam engine capable of delivering about 150 hp, and a number of steam hammers. The turbine furnished energy for several motors in the machine

TABLE I—MOTOR APPLICATIONS

Hp. Machine	Speed, R.p.m.	Drive	Machine
7 1/2	1200	Gear	Shaper.
45	900	Belted	Line shaft, 14-in. tool lathe, 24-in. engine lathe, No. 1-B B & S. milling machine, No. 2 P & W die sinker, No. 3 P & W. die sinker, 27-in. to 36-in. Putnam gap lathe, 20-in. shaper, 24-in. shaper, two 24-in. by 24-in. planers, 28-in. drill press, 20-in. drill press, cold cut-off machine, saw-grinding machine, Universal cutting grinder, No. 35 Connorsville rotary blower
9	1400	Belted	3-in. by 3.5-in. vacuum pump.
7 1/2	1200	Belted	Two cold trimming presses.
10	900	Belted	Bliss 112-ton trimming press.
10	900	Belted	Bliss 112-ton trimming press.
15	900	Belted	Bliss 112-ton trimming press.
15	1200	Belted	156-ton trimming press.
15	1200	Belted	Bliss 187-ton trimming press.
25	1200	Belted	3.5-in. National forging machine.
50	900	Belted	Two board drop hammers, small oil pump, pair snagging wheels, No. 5-B Wilbraham-Green positive pressure blower.
45	720	Belted	No. 6-B Wilbraham-Green positive pressure blower.
7 1/2	1200	Gear	180-ton trimming press.
7 1/2	720	Gear	150-ton trimming press.
7 1/2	720	Gear	150-ton trimming press.
25	1200	Belted	5-in. square Peis billet shear.
5	900	Belted	65-ton trimming press.
7 1/2	900	Belted	65-ton trimming press.

shop, and the reciprocating engine, connected by a rope drive to line shafting, drove two blowers, two hammers and a small oil pump. Tests showed that the average load on the turbine was only about 18 kw, while indicator cards for the engine showed it to be developing about 82 hp.



FIG. 1—THE REPLACED ENGINE AND TURBO-GENERATOR

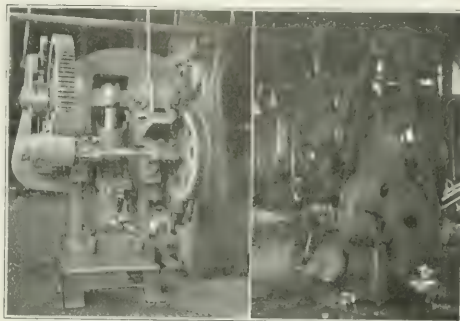


FIG. 2—7.5-HP MOTOR GEARED TO 180-TON TRIMMING PRESS

FIG. 3—25-HP MOTOR BELTED TO BILLET SHEAR

When the subject of central-station service was broached to Mr. W. H. Carpenter, manager, and Mr. J. B. Brazier, superintendent of the Dean company, they were quick to realize its advantages and signed a contract which released them from the responsibility of trying to maintain a rope-drive installation. Both the turbine and the engine were taken out of service and the steam from the boilers was used to drive the company's twelve steam drop-hammers, which range in

TABLE II—KILOWATT-HOUR CONSUMPTION FOR THE LAST TWELVE MONTHS

Date	Kilowatt-hours	Date	Kilowatt-hours
October, 1912.	25,291	April, 1913.	26,708
November, 1912.	25,312	May, 1913.	25,025
December, 1912.	22,084	June, 1913.	21,209
January, 1913.	27,163	July, 1913.	22,718
February, 1913.	24,737	August, 1913.	22,057
March, 1913.	25,553	September, 1913.	17,543

size from 200 lb. to 7000 lb. Of the eighteen 220-volt, three-phase motors now installed fourteen are of the squirrel-cage type and four are equipped with internal resistance. The aggregate rating of these motors is 288 hp. However, three motors totaling 22.5 hp have just been installed, and although listed in the accompanying table they were not used in obtaining the estimated load-factor given below. Assuming an efficiency of 80 per cent for the motors the operating load-factor of this forge shop—that is, the percentage of average load for ten hours a day to the rated capacity of the motors—is 37.2 per cent. The company makes automobile forgings of all kinds, its specialty being alloyed steels, and with a force of forty or fifty men employed the average output of the forge shop is about 175 tons of steel a month.

Commenting upon the success of central-station service in the forge-shop work, Mr. Brazier recently said: "I have gained about 30 lb. since central-station serv-



ice was put in. Anyone who could have seen me going home at 2 a. m. or 3 a. m. after working nearly all night splicing rope, as was frequently the case, would have understood one of the reasons why I gained in weight and why I favor central-station motor drive." Energy for operating the Dean Forging Company's machines is supplied from the mains of the Muncie Electric Light Company.

Table I gives a complete list of motors and the machines to which they are connected, and Table II gives the kilowatt-hour consumption by months for the past year, showing an average of 23,949 kw-hr.

### The Sales Value of Trial Motor Installations

By ROBERT C. LEONARD

It is the writer's earnest belief that the average central station fails to secure many possible motor-service customers because it has not sufficient faith in the value of its own proposition. By this is meant that, although the central station's own sales engineers may have made thorough investigations and tests of the prospective customer's plant and determined that central-station drive would effect a very marked saving, the manager of the central station too often refuses to invest the company's money to demonstrate by actual operation that the estimates of his engineers are correct.

The owner of a manufacturing establishment naturally looks with suspicion upon any proposition that means additional investment for him, and he, of course, hesitates to act on the advice of an engineer who is trying to sell him something. If the central station really knows that the many talking points for motors have a genuine money value to the prospective user, why should time be wasted in persuading the latter to spend money on what is to him a doubtful proposition?

For some time it has been the policy of the Nashville (Tenn.) Railway & Light Company, upon the recommendation of its sales engineers, to offer free trial installations to prospective customers. A proposal is made to equip fully the "prospect's" plant for electric drive without calling on the customer for the expenditure of a single cent, although he agrees to pay for all energy consumed during the trial period, which varies in different instances from two to twelve months. The agreement reads that if the customer "is not pleased with the economy and efficiency of electric drive" at the end of the trial period, the company will remove its motors and wiring without expense to the customer. If, however, he desires to continue to operate his plant by electric power, he will pay the company the amount for the motors and wiring previously set forth in the agreement.

The experience of the Nashville Railway & Light Company with this form of offer has been most gratifying. Out of probably a hundred such installations, the only instance in which there was a signal failure was the case of a motor-generator set in a large laundry. Even this equipment was operated at a loss to the laundry man for some months before he would give it up. Although Nashville is far from being a manufacturing center, being primarily an educational town, and although the manufacturing establishments are for a large part wood-working plants with large amounts of offal, the local central station has built up a motor load equaled in few manufacturing towns, its annual load-factor being more than 50 per cent, based on the average monthly peaks and more than 42 per cent based on the maximum yearly peak.

The contention is sometimes made that there is too much of the "personal equation" entering into a transaction like that above outlined; that it is too indefinite

and dependent upon the personal whim of the customer. But often this very "personal equation" is the winner for central-station service. In many instances motors have been kept and paid for where the cost of operating them was more than that of operation under the old system. They ran so smoothly and quietly and with so little attention that the plant operator did not have the heart to go back to the old system with its worries.

Why, then, should not the central station show its prospective customers that it believes in its own proposition? This liberal policy has done much with us in Nashville to maintain the confidence of the public and has put much good business on the lines. We do not advocate that such a policy be used indiscriminately, but every central station has available business that can be safely secured in this way.

### Growth of the Electrical Appliance Business in St. Louis

For the twelve months ended May 1, 1914, the electrical-appliance department of the Union Electric Light & Power Company, St. Louis, Mo., showed an increase in net returns of over 300 per cent as compared with the preceding twelve months. In discussing this record Mr. C. E. Michel, manager of the company's electrical store, recently said: "The chief factor contributing



APPLIANCE SALESROOM OF UNION ELECTRIC COMPANY  
ST. LOUIS

to the growth of our appliance sales is to be found in the manner in which this company has gained the confidence of the appliance-buying public by establishing records for prompt deliveries, immediate and proper made repairs of appliances, and liberal interpretation of all guarantees.

"To make the company's electric store as attractive a business house in the city, it has been equipped with beautifully appointed showcases and wallcases attractive and unusual show windows, and specially constructed tables enabling the goods to be displayed to the best advantage. Principles of merchandising which have been recognized as successful in other businesses have been employed and well-known commercial systems applied wherever practicable. During the time in which this remarkable record was established the company has held but very few special sales. The policy has been to maintain fair and regular selling prices. In the meantime, of course, advertising has been carried out consistently.

"Among the devices showing heavy increases in sale during the past year, chafing dishes, suction cleaner and fans stood high. There was a really remarkable increase in the sale of both irons and luminous radiators. The sale of small toasters fell off somewhat, but

this deficiency was easily made up for by the increased demand for the heavier electric grills which may also be used as stoves. The increase in vibrators and water heaters was large, but, taken on the basis of percentage, warming pads outstripped every other electrically heated device. There was somewhat of a slump in the sale of curling irons. Of the commercial devices, the tailor's iron leads in the percentage columns, with the electrically heated glue pot a close second."

### Electric Show in Small City

At Alliance, Ohio, a city of 17,000 population, an electric show was held recently having a registered attendance of about 20,000. Household appliances and commercial illumination were featured. The commercial display consisted of electrically lighted booths showing the results obtained with different types of reflectors. A model show window was also exhibited to demonstrate the value of properly selected and arranged reflectors. Many appliances were sold during the show, but the principal effect resulting therefrom is declared to be the surprising manner in which merchants who visited the show have awakened to the advantages of well-lighted stores and show windows,



VIEW AT ALLIANCE ELECTRIC SHOW

as evinced by their recent requests for further information. The show was conducted under the auspices of the Alliance Gas & Power Company.

### Irrigation Makes Double Crop Possible

Investigations which have been conducted at University Farm, Davis, Cal., show that two crops such as corn ensilage and grain can be grown successfully in rotation on the same ground in the same season if the earth is sufficiently irrigated.

In 1912 and 1913 as soon as the grain was harvested the ground was thoroughly irrigated, plowed, rolled and harrowed. Corn was then drilled in rows 10 in. apart. Plots receiving 5.6 in. of water produced 8 tons of green ensilage per acre; others receiving 10.14 in. in two irrigations yielded 10.6 tons per acre; while a third plot, in which corn was drilled 20 in. apart and upon which 15.5 in. of water was applied in two irrigations, produced 15.4 tons.

The water supplied to these tracts cost \$1.73 per acre ft. Where the heaviest irrigation was employed the total cost of production was \$16.03 per acre, and as the value of the ensilage cut was \$31.80 per acre, there was a net profit of \$15.77 per acre.

### Enlivening an Outlying Business Center

The accompanying half-tone shows a section of one of the business streets of Kokomo, Ind., which a few weeks before the photograph was taken was dark and almost devoid of traffic after sunset. Seeing that evening shoppers avoided that section of the city because of its unwelcome night appearance, the neighboring merchants co-operated to provide for cheery and at-



ILLUMINATED STREET IN KOKOMO, IND.

tractive street illumination. With the assistance of the Indiana Railway & Light Company, the local electric-service company, this section was shortly transformed by the installation of lamp-pedestals, border lamps, and signs, into a shopping district as well lighted as any in the heart of the city.

### Analysis of Meter Reader's Movements

Data published herewith disclose some interesting facts regarding the movements of a meter reader covering seven distinct territories in three and one-half days. While this information applies to Dunkirk,

#### ANALYSIS OF INSPECTOR'S MOVEMENTS WHILE READING 730 METERS

Days	Hours Engaged	Route	Meters Read	Stairs Climbed	Veranda Stairs Climbed	Doors Opened	Blocks Walked	Number Streets Crossed	Poles Climbed
1	4	1	175	60	20	376	40	25	1
	4	2	130	68	47	314	55	44	0
1	4	3	100	69	63	321	56	42	0
	4	4	92	59	50	271	44	42	0
1	4	5	121	109	65	376	36	38	1
	4	6	100	37	30	162	52	30	3
	4	7	12	4	6	17	21	17	0
Total: 3 1/2	28	7	730	496	281	1867	304	314	5

N. Y., a city of a little over 17,000 people, the figures are indicative of conditions existing in all moderate-sized cities. The data show that in reading 730 meters twenty-eight hours was consumed. During that time 681 stairs had to be climbed and 1867 doors had to be opened. In traveling from one customer's house to the next the meter reader traversed 304 blocks and crossed streets 314 times. These figures suggest that considerable time could be saved the meter readers, if the instruments were installed in more accessible places, such as, for instance, on back porches.



## Illumination and Wiring

### Electric Sign with Large Moving Element

A spectacular skeleton roof sign recently erected in Chicago has been attracting considerable attention as the main legend upon the sign rotates before the eye of the observer. The sign consists of a framework supporting a 15-ft. hollow steel ball carrying about its equator the legend "Empire Fireproof Storage", in 30-in. illuminated raised letters. A solid steel vertical axle extending through the steel globe rests upon a ball bearing situated in a pent-house on the roof. Driven by a 2-hp motor, also installed in the pent-house, the ball actually revolves. In addition to the main legend the framework of the sign carries a double-faced sign outlining a colored crown and the words "moving" and "packing," in 24-in. letters.



REVOLVING LEGEND ON ELECTRIC SIGN

Tungsten lamps of the 5-watt, 11-volt type have been used to equip the 627 sockets in the sign. These lamps receive their electrical energy from a 3-kw transformer connected to a 110-volt circuit. Those lamps on the moving ball are supplied with energy through slip-rings attached to the axle of the ball inside the pent-house. The sign was erected by the Federal Sign System (Electric).

### Convenient Burglar-Alarm Switch

BY J. W. STRIPPEL

In the installation of burglar-alarm apparatus in residences means should be provided so as to permit the owner or occupant to enter the dwelling after the instrument has been set for the night without sounding the alarm. The general method has been to provide the occupant with a Yale key with which he can open

the front-door section circuit before entering. Most methods now in use require a number of operations to switch the front-door circuit in again, such as feeling inside the door to turn a switch, thus releasing the key, and turning the switch on again to normal after the door is closed. Another scheme is to operate a cut-off drop on the burglar-alarm indicator, which is reset manually after the person has reached the room.

The weak point of these systems is that the person is liable to forget to restore the section to operating condition, thus leaving the front door unprotected. The following scheme is free from this defect, as it involves the automatic resetting of the circuit. In the diagram *K* represents a switch operated by a Yale key and *R* is a relay with front and rear contacts. The relay should have a resistance of 80 ohms for a 6-volt circuit, 150 ohms for a 9-volt circuit, etc. *DS* represents the usual burglar-alarm door spring.

In operation, the key is inserted in lock *K* and turned. Electricity then flows through the relay *R*, drawing up the armature and breaking the front-door circuit. The door is then unlocked with the proper key and opened, causing the burglar-alarm door spring *DS* to close. Since this contact is then in multiple with the key *K*, the latter can be withdrawn without releasing the relay, electricity flowing from the coils through the front contact, through the burglar-alarm door spring, battery wire, etc. When the door is now closed the

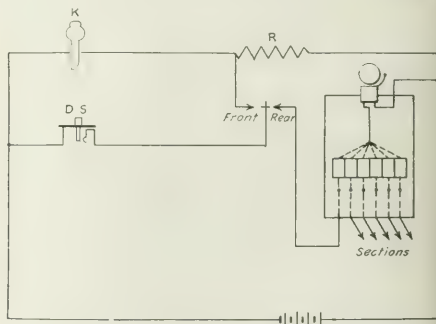


DIAGRAM OF BURGLAR-ALARM CONNECTIONS

contact *DS* will be broken, thereby allowing the relay armature to fall back and to restore the front-door section to normal. Only one extra section wire is required at the front door. The circuit connections are easily understood, and the apparatus is practically fool-proof.

### Lineman's Bag for Rubber Gloves

Electric-service companies which are having trouble in inducing their linemen to wear rubber gloves when working around dangerous voltages will be interested in the plan which the Wichita Falls (Tex.) Electric Company has adopted to cope with this difficulty.

The principal objection which had to be met was that the linemen had no convenient place to carry rubber gloves because of their bulkiness. The electric-service company has therefore furnished each man with a small leather bag which can be strapped to the body belt over the left hip where it does not interfere with the line tools, which are usually carried on the right half of the belt.

The bag is provided with a large flap cover which is held closed by a snap fastener. Only one hand has to be used in opening the flap and removing the gloves. The bag forms a part of the regular equipment of the

inemen, and as they are required to keep the bag containing the gloves attached to their belt at all times here is no excuse for not using the gloves.

### Overhead Distribution without Poles

In the older parts of Manila, Philippine Islands, the streets are very narrow, and in many places the second stories of the houses facing thereon project over the sidewalk and even into the street. Under such conditions it is impossible to erect poles to support electric-service lines, so the conductors are attached to brackets or pipes fastened to the houses. In some cases the wires are strung below the level of the second floors and fastened thereto by insulators.

### Noteworthy Lighting in Hotel Concourse

The concourse of the Windsor Hotel, Montreal, P. Q., is one of the social centers of the Canadian metropolis, and, as the accompanying illustration shows, modernized illumination plays an important part in its attractiveness. The concourse, which is daily used as



CONCOURSE, HOTEL WINDSOR, MONTREAL

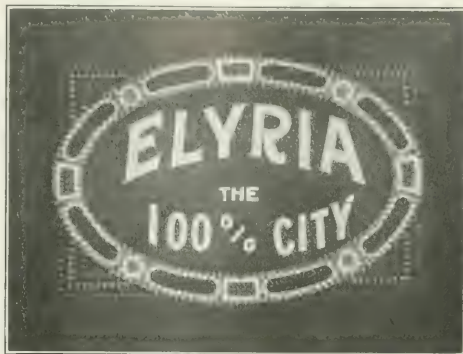
tea room, is 130 ft. long, 23 ft. wide and 15 ft. high, with white stone walls and ceiling, the floor being of light-colored tiling. Artificial lighting is provided by six semi-indirect fixtures hung 9 ft. 6 in. above the floor, and spaced 19 ft. apart on centers. Each fixture is of the bowl type, 22 in. in diameter and 9 in. deep, and contains eight 60-watt tungsten lamps. The fixtures are each wired to an independent switch in the parcel check-room of the hotel, and energy is supplied by the Montreal Light, Heat & Power Company.

### Inverted Magnetite Lighting for Penn Avenue, Pittsburgh

The lighting of Penn Avenue, Pittsburgh, Pa., between Fourth and Eleventh Streets, has been converted to inverted-type magnetite-arc illumination by means of seventy bracket-arm lamps carried on the trolley poles. The lamps are inclosed in diffusing outer globes and, unlike the former suspended-type units, have been lowered to a height of 15.5 ft. above the street level. Messrs. J. F. Froelich and Drew Johnson, of the Nesqueune Light Company, had charge of the installation.

### Electric Slogan Sign in Elyria

In Elyria, Ohio, "the 100 per cent city," electric service is supplied by R. E. Burger, agent, representing Henry L. Doherty & Company. Following the



SLOGAN SIGN PRESENTED TO ELYRIA BY DOHERTY ORGANIZATION

Doherty policy, the local concern presented to the city of Elyria a handsome and attractive electric-sign slogan. The sign, which is illustrated herewith, has a particularly fortunate location, being placed on a trunk line of the New York Central Lines (Lake Shore).

### Roof-Garden Lighting Installation

Electric lighting of the promenade is a feature of the roof garden of the Hotel Van Ness, Burlington, Vt., as illustrated in the accompanying halftone. The promenade extends along three sides of the roof, overlooking Lake Champlain, and is 10 ft. wide, its total length being about 312 ft. The lighting installation consists of twenty-seven 50-watt lamps of the metallized filament type mounted in Crouse-Hinds cylindrical opal-glass globes with rounded tops, each unit being placed about 5 1/2 ft. above the walk on a post of 1-in. iron pipe which borders the walk and serves, together with the intermediate pipe railing, as a conduit for the 125-volt supply to the lamps. The globes are 4 in. in diameter and 8 in. high, each being threaded into a metal mois-



ROOF GARDEN, HOTEL VAN NESS, BURLINGTON, VT.

ture-resistant cup 4 1/2 in. in diameter and 2 1/2 in. deep, the cup being threaded into the pipe standard at the top of the latter. The lamps are usually spaced 12 ft. apart on centers, and the roof is fed by two circuits run in





FUSE AND JUNCTION BOX, HOTEL VAN NESS, BURLINGTON, VT.

$\frac{3}{4}$ -in. conduit from a 12-in. by 5-in. by 4-in. iron fuse and junction box, illustrated herewith, attached to the rail by condulets. The circuits on the roof are controlled by a switch in the hotel office on the ground floor.

## RECENT TELEPHONE PATENTS

### Automatic Exchange Devices

In the earlier automatic telephone systems every line required practically a complete set of apparatus, and a very costly system resulted. Many improvements have been made with the purpose of bringing the apparatus nearer to the requirements of continuous service. A patent recently granted to Mr. E. E. Clement, of Washington, D. C., contemplates such an arrangement. He associates each line with relays adapted to connect the line as required to an idle connecting apparatus. Multiple contact relays, each equipped with ten sets of contacts and known as "tens" relays, are associated with single-contact relays called "units" relays. Each line is connected to the same contact in ten of the tens relays in multiple. Tens relays are mounted in banks of ten together with ten units relays. The circuits are so arranged that when a given line calls the circuit of all the tens relays corresponding to the tens digit of that line is closed, as are also all the units relays corresponding to the units digit. Only those relays are active which lie in the bank associated with the first idle trunk or connecting circuit. As soon as these tens and units relays have been operated all other relays of the bank are instantly disabled and locked as long as the calling line is in use. In order to afford a proper distribution of the load the lines are divided into groups, each group having assigned to it a definite and predetermined number of trunks.

Another patent granted to Mr. Clement describes a recording system for automatic exchanges. The operation of the selective apparatus, which picks up the calling line, causes a type wheel to rotate and come to a set with the symbol of the calling line presented to a

paper strip upon which the symbol is printed. The patent has been assigned to the Telephone Improver Company of Attica, N. Y.

Numerous suggestions have been made for combining a fire-alarm apparatus with a telephone system. Mr. John Erickson, of Chicago, has recently patented a signal box for such a combination. For an automatic system a push button on the subscribers' set serves to release the alarm box, which first sends the necessary impulses for selecting the fire-alarm line from the central office to fire headquarters, then following this selection with a signal characterizing the station from which the alarm arrives. If the telephone line is in use as a called line, the fire-alarm signal breaks in and severs the existing connection. If it is in use as a calling station, the call box is restrained until the existing connection has been broken and the switches returned to normal. This patent has been assigned to the Deni General Electric Company.

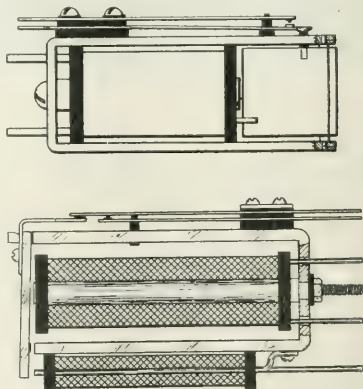
### Railway Dispatch Systems

Mr. E. R. Gill, of Yonkers, N. Y., is the inventor of an answer-back signal for railway dispatch systems. His signal is an audible one and is made by including an induction-coil primary in the local vibrating-be circuit, the secondary of this coil being bridged across the line. This patent has been assigned to the Ha Switch & Signal Company.

Where two or more loud-speaking telephones are near each other one may interfere with the other. A circuit arrangement was recently patented by Mr. H. C. Egerton, of Passaic, N. J., and assigned to the Western Electric Company. When the operator throws his key to one of the circuits, the volume produced by the other circuits is reduced by the introduction of a resistance.

### Improved Apparatus

At the top of the illustration reproduced herewith is shown a relay invented by Mr. J. A. Birsfield, of Chicago. The armature swings upon a vertical axis



RELAY AND ELECTROMAGNETIC LOCK

on a pin traveling in a horizontal arc and comes in contact with a cam face formed upon the lower spring to drive it into closed contact with the second spring.

The relay shown in the lower part of the figure is a locking relay controlled by an auxiliary locking magnet. This has been patented by Mr. H. P. Clausen. Both patents have been assigned to the Stromberg-Carlson Company.

A motor-driven telltale apparatus for party lines has been invented by Mr. Thomas Kernan, of East St. Cloud, Minn., for giving notice of the location of an interloping station. The rising receiver hook starts the motor to drive a signal wheel, giving the code of the station. The motor cannot be stopped or the circuits interrupted until the signal is completed.

## Letters to the Editors

### Daylight Peak Due to Motor Load

To the Editors of the *Electrical World*:

SIRS:—On page 1497 of the June 27 issue of the *Electrical World* there is an article entitled "Daylight Peak Caused by Motor Load at Meridian, Miss.," which is illustrated by a station load curve.

The writer is inclosing herewith a copy of the Houston Lighting & Power Company's load curve for June 25, 1914. This curve, which is representative of conditions



CENTRAL-STATION LOAD CURVE, HOUSTON, TEX., JUNE 25, 1914

for this time of the year for our station, is perhaps even more remarkable than the one for Meridian since it does not include any street-railway business. The load-factor shown is 67.9 per cent, due largely to the motor load and to the fact that isolated plants in the large office buildings and hotels are conspicuous by their absence.

W. W. REED,

Superintendent Houston Lighting & Power Company,  
Houston, Tex.

### Paralleling Steam and Gas Engine Sets

To the Editors of the *Electrical World*:

SIRS:—I beg to refer to the article "Paralleling Steam and Gas Engines" on page 37 of your issue of July 4, 1914, in which you recite the impossibility of operating in parallel our 1000-kw gas engine set with our 600-kw team set.

It is true that after the gas engine was erected we could not obtain successful paralleling between these two units. However, the manufacturers of the gas engine sent their engineers to examine and correct this difficulty and before the appearance of your article the trouble was located and remedied, and we have since been operating to our satisfaction our two directly connected sets in parallel.

I am calling your attention to this fact, as an unintentional injustice has probably been done to the manufacturers of the gas engine, which was the latest unit to be installed at our plant.

A. G. CURTIS,

General Manager Southwestern Gas & Electric Company  
Shreveport, La.

### The Determination of Glare

To the Editors of the *Electrical World*:

SIRS:—In your issue of March 21 Prof. L. R. Ingersoll describes an instrument for measuring the glare of paper, and in your issue of May 23 Dr. P. G. Nutting offers a criticism concerning the factor that Professor Ingersoll measured. It appears that the main point of the matter is yet somewhat obscure. In the first place the instrument does not measure "glare," but measures in arbitrary units a factor which contributes toward the production of glare. Although we are learning to recognize glare, we do not know exactly what causes it, and hence we cannot measure it. Doubtless there are several factors effective in producing a condition known as glare. In the case of glare from paper the decrease in the ability to read is due not only to the annoyance of the "glare spot," but largely to an actual obliteration of contrast between the type and background due to the superposition of a brightness over both the type and background caused by the regular reflection of the image of the light source. The glazed surface is responsible for this condition, and any instrument which will give a measure of the "gloss" should be valuable in obtaining data regarding the desirability of papers for printing.

By taking advantage of the fact that the light regularly reflected by many substances at a certain critical angle is practically completely plane-polarized, Professor Ingersoll has devised a simple instrument for measuring the relative brightnesses of the "glare spot" due to diffusely and also to regularly reflected light. Apparently owing to a confusion of terms, he has left his work open to criticism. Dr. Nutting points out that the glarimeter as devised and used by Professor Ingersoll does not measure the percentage of polarized light. This is quite true, but the writer believes that the measurements as made by Professor Ingersoll are more pertinent to the question of glare than measurements of the percentage of polarized light. However, the writer objects to Professor Ingersoll's specification of his results in terms of "per cent glare." As Professor Ingersoll states, the values determined with his instrument are quite arbitrary because they depend upon the dimensions of the source of light, etc. This is true, for the brightness due to diffusely reflected light depends upon the illumination—that is, in most cases, upon the candle-power of the source divided by the square of its distance from the paper—while the brightness due to specular reflection is quite independent of the distance but varies with the intrinsic brightness of the source.

It appears that measurements of the brightness of the "glare spot" and the brightness adjacent to it—which seem to be what is practically accomplished by Professor Ingersoll's instrument—afford data from which an idea of the desirability of a paper for printing purposes can be obtained. The fact that the instrument described gives data quite dependent upon the construction of the instrument should not militate against its use, for this is the case with many instruments. It is unfortunate, however, that we do not know enough about glare to be able to reduce the measurements to an absolute scale of "per cent glare."

More attention is being given to the matter of glazed paper, and it is to be hoped that specifications of "per cent gloss" will eventually be resorted to by the manufacturer and user of printing paper. Such an instrument as Professor Ingersoll's should be valuable in standardizing papers in respect to gloss.

M. LUCKIESH,

Chairman Committee on Glare from Reflecting Surfaces, Illuminating Engineering Society,  
Cleveland, Ohio.



# Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

## A Concrete Coal-Storage Pit for Muncie Plant

Excavating a pit 168 ft. long, 50 ft. wide and 17 ft. 10 in. deep, between its station and its new general utility building, the Muncie (Ind.) Electric Light Company is now constructing an under-water coal-storage pit. The floor and the 60-deg. slope will be reinforced with iron bars laid near the surface of the concrete. This reinforcement, it is intended, shall prevent excessive wear from the scraping of the heavy grab-bucket on the bottom or sides of the pit.

The present coal-handling equipment of the station

vided in the concrete storage reservoir. The combined cinder and ash pit will occupy a space 36.75 ft. by 50 ft. Water for the entire reservoir will be taken from

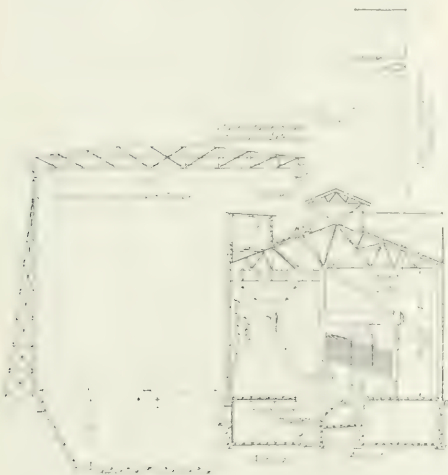


FIG. 2—SECTION THROUGH STATION AND COAL PIT

consists of a coal crane from which is operated a 2-ton grab-bucket, lifting fuel from an open yard and distributing it to the station bunkers. Anticipating the completion of the pit, however, the company has purchased a 20-ton, eight-wheel Orton-Steinbrenner locomotive crane carrying a grab-bucket of the V-type with a capacity of 1.5 cu. yd. The minimum and maximum working radii of this crane with its 55-ft. boom are 13.5 ft. and 57 ft. Acting as a locomotive, it will shift ten 100,000-lb. cars on a straight and level track or will move one similar car up a 2 per cent grade.

In order that this crane may be moved from the storage yard to the coal pit, a track has been laid across the intervening street and over piers placed on 18-ft. centers through the middle of the pit. These concrete piers extend up to the level of the pit, and the track is supported on 24-in. I-beams. When just level full the storage bin will contain 3500 tons of coal, but with the fuel heaped up against the 7-ft. walls constructed along one side and one end 6000 tons may be stored.

Fine coal and cinders from the chain-grate stokers in the station will be returned to separate pits pro-



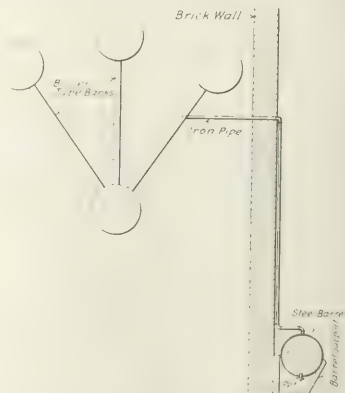
FIG. 1—LOCOMOTIVE CRANE IN USE AT MUNCIE

the adjacent river by means of pumps in the basement of the station.

Among the other improvements being carried out at the present time at the Muncie station are the addition of four 500-hp Babcock & Wilcox boilers, the erection of a 250-ft. by 12-ft. brick-lined steel stack, the erection of a new high-tension substation, and the construction of a 10,000-gal. water softener.

## Method of Taking Average Flue-Gas Samples

Of the many different means employed for taking samples of flue gases the one employed at the station of the Danville (Ill.) Street Railway & Light Com-



CROSS-SECTION OF BOILER AND SETTING

pany is one of the most ingenious. As shown in the sketch herewith, a steel barrel is placed on a support attached to the boiler setting and a small steel pipe is extended from the top of the barrel along the brick

wall. Entering the combustion chamber, the pipe is fixed with its open end in the bank of tubes at the last pass.

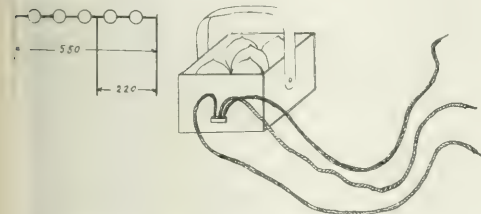
To take a sample of flue gas the barrel is filled with water and the pet cock at the bottom of the barrel opened so that the water on the interior will be entirely drained out in a predetermined period. As the water drips from the barrel the flue gas enters, and at the end of, say, six hours a barrel of gas is available to show the average flue-gas conditions during that period. Tests of samples from the barrel then are made to determine the percentage of each ingredient.

Stringing Conductors with Switching Locomotive

In stringing some 500,000-circ. mil feeder circuits on a pole line in a railway-shop yard recently it was impossible to get sufficient tension with a double block and tackle and a team of horses, so recourse was had to a novel method of stretching the conductors. The two cables being installed had to be strung between the power plant and the machine shop (a distance of 600 ft.) on fourteen steel poles spaced 100 ft. apart. Both conductors were fastened to a tower on the generating station with Brooklyn strain insulators and Matthews cable clamps and the free ends of the cables were pulled over the pole cross-arms and attached to the drawbar of a switching locomotive in the yard. The locomotive was then started up slowly, and when he sag in the conductors was reduced sufficiently they were tied to the insulators on the last two poles near the machine shop. The installation of the span between the last towers and the shop was completed by using the block and tackle.

Portable Ground Locator

The accompanying drawing illustrates a simple device for locating grounds and open circuits on either 550-volt or 220-volt circuits. It consists of five 110-volt



PORTABLE LAMP BANK AND CONNECTIONS

lamps connected in series and contained in a small uncovered box provided with a handle. The two end terminals as well as a tap between the second and third lamp are connected to flexible cords having different colored insulation to indicate which are to be used in testing.

Avoiding Red Ink on Tracing

In the preparation of location drawings for power apparatus it is often desirable that the building shall be inked in on the tracing with some kind of ink which will produce faint lines on the blueprint, while the working details and principal features of the apparatus itself are distinctly brought out on the print by the use of black ink on the tracing.

The practice of using red ink for the faint lines should be discontinued, for the color is not only injurious and confusing to the eye, but lines or dimensions

made with red ink are much more difficult to erase than those drawn with ink of the other colors.

The colors giving the best results appear to be green or blue. Tracings made with either of these colors, using the customary black lines for the apparatus itself, present a pleasing appearance and are easily erased.

Test of 115-hp Locomobile Unit

One of the first American-built locomobiles to go into commercial service has recently been installed in the power plant of the International Cork Company, of Brooklyn, N. Y., by the Buckeye Engine Company, of Salem, Ohio. The set is similar to the "Buckeyemobile" described in these columns Oct. 4 and Dec. 20, 1913.

TESTS ON 115-HP LOCOMOBILE

	Test No. 1	Test No. 2
Per cent normal load	100	120
Brake-horse-power	115	137.8
Revolutions per minute	248	252
Steam pressure	210	212
Saturation temperature, deg. Fahr.	391	391
Steam temperature at throttle, deg. Fahr.	562	560
Initial superheat, deg. Fahr.	171	206
High-pressure exhaust temperature, deg. Fahr.	286	286
Receiver pressure	30	30
Low-pressure inlet temperature, deg. Fahr.	331	347
Low-pressure superheat, deg. Fahr.	15	61
Low-pressure exhaust temperature, deg. Fahr.	209	210
Feed-water temperature, deg. Fahr.	192	194
Temperature gases at superheater, deg. Fahr.	643	730
Temperature gases base of stack, deg. Fahr.	398	424
Total steam per hour	1574.5	1811
Steam per brake-hp-hr., lb.	13.7	13.4
Steam per kw-hr., lb.	22.9	21.3
Total coal fired per hour	156.4	180
Coal per brake-hp-hr., lb.	1.56	1.31
Coal per kw-hr., lb.	2.27	2.12
Boiler and superheater efficiency	82.3	85.3
Thermal efficiency of engine	16.2	16.2
Thermal efficiency of unit	13.3	13.8
Heat value of coal, per lb.	14,074	14,074

The tandem compound engine of the locomobile drives a 75-kw alternator, which supplies energy to a number of small motors driving machinery used in the manufacture of cork and metal bottle stoppers. The engine is run non-condensing, as were the acceptance tests, in which a consumption at normal load of 13.7 lb. of steam and 1.36 lb. of coal per brake-hp-hr. was obtained. The fuel used in the tests was a Pocahontas coal of 14,074 lb.-Fahr. units. In the accompanying table are given the average results of the acceptance tests, as furnished by Mr. R. P. Williams, chief operating engineer of the International Cork Company.

A Hoisting Problem

Can a direct-current motor rated at 110 volts and 9 amp lift 5000 lb. in one minute? A. H.

In one minute the motor described should lift 5000 lb. through a height of about 5 ft. A current of 9 amp at 110 volts represents 990 watts, or, dividing by 746, the number of watts in a horse-power, 1.325 hp. As the combined efficiency of the motor and hoist is not likely to be above 60 per cent, the power available for use will be  $0.60 \times 1.325$  hp, or 0.796 hp. Since, from the familiar definition, 1 hp is equivalent to 33,000 ft.-lb. per minute, the power available may be expressed as  $0.796 \times 33,000$  ft.-lb., or 26,230 ft.-lb. per minute. Dividing this by the weight to be lifted, 5000 lb., the result obtained—5.25 ft. per minute—gives the rate at which the load would be lifted.



# Digest of Current Electrical Literature

## Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

### Generators, Motors and Transformers

**Construction of Electrical Machines.**—G. PONTE-CORVO.—An illustrated article on the construction of dynamo-electric machinery from steel and copper. Frames, bearings, feet, ground-plates, etc., are made from steel plates by rolling, punching and stamping. The article describes the practice of the Westinghouse company in this direction.—*Elec. Zeit.*, June 25, 1914.

**Mercury Rectifiers.**—A note on a recent British patent (No. 15,392, 1913) of the British Thomson-Houston Company and the General Electric Company of this country. The object is to prevent "reverse arcing" between the electrodes which normally act as the anodes. The anodes, which may be of any suitable metal such as iron or tungsten, are made hollow and filled with mercury which is kept heated at its boiling point by independent heating coils immersed in the mercury. As the mercury is vaporized, it passes into a condensing chamber and thence returns to the hollow interior of the anode. A method of sealing the anodes where they enter the rectifying chambers so as to allow for adaption to changes of temperature without allowing any air to enter the evacuated interior of the rectifier is also included in the specifications.—*London Elec. Eng'ng*, July 2, 1914.

### Lamps and Lighting

**Standardization of Metallic Filament Electric Lamps.**—At the recent general meeting of the (British) Incorporated Municipal Electrical Association a report was made by the committee on standardization of metallic-filament electric lamps. In November, 1913, a meeting of the engineering standards sub-committee was held, which the representatives of the I. M. E. A. attended. At the council meeting of the I. M. E. A., held during the morning of the same day, the question of rating metallic-filament lamps was fully discussed, and it was unanimously resolved that the standard rating of metallic-filament lamps should be in watts and not in candle-power. "The I. M. E. A. representatives urged the adoption of watt marking only. They found themselves in direct antagonism with representatives of the War Office, the Admiralty, the Post Office and the Public Works, all of whom were tied down to vote under the direction of their respective departments, though as a matter of fact, they were personally in sympathy with the views of the I. M. E. A. A letter was subsequently sent to the Tungsten Lamp Association, informing them that the standards committee, by the majority of the votes from government officials on that committee, had decided to adopt the standard of marking both the candle-power and the watts on lamps. The I. M. E. A. strongly objected to this, and urged the Tungsten Association still to adhere to the resolution already adopted by it in regard to watt marking only. The Tungsten Lamp Association in reply expressed its hearty approval in support of the marking of all lamps with watt rating only. The only exceptions made by the members of the association were where government departments made specific requests for candle-power markings. It is obvious from what took place and from the views expressed by the representatives of govern-

ment departments, that their interests in the matter do not harmonize with the interests of the public supply authorities, and thus matters have practically come to a deadlock so far as the association and the engineering standards committee are concerned. The council and the lamp manufacturers are in agreement with regard to wattage rating, but it is not likely that a specification will be issued by the standards committee which will be acceptable to the members of the association unless the contemplated rearrangement of the standards committee should result in considerable change in its constitution."—*London Electrician*, June 26, 1914.

### Generation, Transmission and Distribution

**Long Transmission Lines.**—U. DEL BUONO.—A mathematical article, illustrated by numerous diagrams, on the calculation of a long transmission line and the determination of the characteristic constants of the line.—*La Revue Elec.*, June 19, 1914.

**Steam Turbine.**—J. MORROW.—An illustrated description of the Ljungström steam turbine which is a radial-flow turbine of the reaction type. It differs from the other reaction turbines in that the alternate rows or rings of blades move in opposite directions. In the Ljungström turbine prominence is given to three important factors, namely, high efficiency, satisfactory working with superheated steam, and small size for a given output.—*London Electrician*, July 3, 1914.

### Traction

**Magnetic Coupling.**—An illustrated article on a small storage-battery locomotive which serves for switching cars in the car houses of the Swiss federal railways. The special feature of this locomotive, which was designed by Kull, is the system of magnetic coupling of the car with the locomotive. The engineer of the locomotive brings it to the car to be switched, buffer against buffer and then turns on the electric current which magnetizes the buffers so that the car is coupled to the locomotive. This saves time and expense for wages and also avoids accidents. The locomotive is equipped with a storage battery of 60 cells of 120 amp-hours capacity, of the same type as are employed for lighting the cars on the Swiss railways. These batteries have normal charge and discharge current of 40 amp. Their total weight is 1400 kilograms. The locomotive is equipped with a 110-volt 5-hp direct-current series motor.—*La Lumière Elec.*, June 13, 1914.

**Automatic Block Signals.**—A criticism by R. Pfeil on G. Kemman's recent paper relating to the introduction of the automatic block signal system on the Berlin elevated railway and subway, with a reply by G. Kemman to this criticism.—*Elek. Zeit.*, July 2, 1914.

### Installations, Systems and Appliances

**State Ownership of Swiss Central Stations.**—The districts of Aargau, Glarus, Zurich, St. Gallen, Thurgau, Schaffhausen, Schwyz, Appenzell, and Zug have formed the North Eastern Swiss Power Company which will take over the Beznau power plant on the Aare and also the Loentsch power plant. The maximum power available in winter is 6000 kw for the

former and 36,000 kw for the latter, so that the combined rating is 42,000 kw, and the energy which can be generated per year is 125,000,000 kw-hr. The company will also erect a new hydroelectric station at Ogilisau. The total energy obtainable per year from the three stations will be 171,000,000 kw-hr.—*Elek. Zeit.*, June 18, 1914.

**Electrical Industry of Austria and Hungary.**—EMIL IONIGMAN.—A review of the status of the electrical industries in Austria and Hungary during the year 1913, the conditions of manufacture and import and export trade, with numerous statistical tables and diagrams.—*Elek. u. Masch. Vienna*), June 14, 21 and 28, 1914.

**British Municipal Electrical Association.**—An account of the proceedings of the annual general meeting of the (British) Incorporated Municipal Electrical Association, at Birmingham. Mr. H. Richardson of Dundee is the new president. The membership now stands at 379. Brief accounts are given of the work of the committees.—*London Electrician*, June 26, 1914.

### Wires, Wiring and Conduits

**Wood Impregnation.**—JEAN ESCARD.—The first part of an article on processes of impregnation for the wooden poles of transmission lines. Three different kinds of processes are distinguished: First, impregnation by simple immersion; second, impregnation under pressure, and third, chemical and electrochemical processes.—*La Lumière Elec.*, June 27, 1914.

### Electrophysics and Magnetism

**Photo-Electrons.**—W. H. KADESCH.—An account of an experimental investigation of the energy of photoelectrons emitted from sodium and potassium as a function of the frequency of the incident light. The results may be expressed by an equation of the form,  $E = Kn - V_0$ , in which  $V$  is the difference of potential in volts between the electrode and the adjacent parts of the tube, which is just sufficient to prevent a reflection of the electrometer,  $n$  being the frequency of the incident light, and  $K$  and  $V_0$  being constants.—*Phys. Rev.*, May, 1914.

**Discharges of Electricity.**—J. S. TOWNSEND AND P. EDMUNDS.—A brief paper on the discharge of electricity from cylinders and points with air pressures ranging from one to 760 mm.—*Philos. Mag.*, May, 1914.

**Hall Effect in Flames.**—HAROLD A. WILSON.—An illustrated account of experiments which were undertaken with the object of measuring the Hall effect in a Bunsen flame containing different alkali salts under conditions which would permit the full value of the Hall effect gradient to be observed. The results obtained show that the Hall effect is nearly independent of the conductivity of the flame and of the current passing through it, in agreement with the theory.—*Phys. Rev.*, May, 1914.

**Positive Ions in Flames.**—A. H. SAXER.—An account of an experimental investigation of the nature and the velocity of migration of the positive ions in flames. The maximum velocity of the positive ions of the colorless Bunsen flame is 1.8 cm per second when measured in the flame itself, where the temperature is 1250 deg. C., and 2.5 cm per second when measured in hot air at a temperature of 475 deg. C. These ions have their velocities reduced in the presence of alkali salt vapors. The velocity of the positive ions of the various alkali salt vapors is less than the velocity of the positive ions of the pure flame. These ions are the nuclei of large molecular aggregates, and they carry with them the spectrum of the metal used in their production.—*Phys. Rev.*, May, 1914.

### Units, Measurements and Instruments

**Electro-Magnetic System for Measuring Instruments.**—At the recent exhibition of the French Physical Society an electromagnet system for measuring instruments due to Da and Dutilh was shown which is based on both attraction and repulsion. As shown in Fig. 1,



FIG. 1—ELECTRO-MAGNETIC SYSTEM FOR MEASURING INSTRUMENTS

the principle of operation comprises two identical systems one above the other, mounted on the same axis and displaced from each other by a certain angle. The movable plates  $M_1$  and  $M_2$  are repelled by the fixed plates  $F_1$  and  $F_2$ , but when the deflection becomes so large that the repulsion decreases considerably (which manifests itself by a bent in the calibration curve), the plate  $M_1$  will approach the fixed plate  $F_2$  of the other system and the resulting attraction will be superposed on the former repulsion. In this way it is possible to obtain any form of calibration curve desired.—*La Revue Elec.*, June 5, 1914.

**National Physical Laboratory.**—An editorial note on the recent annual inspection of the (British) National Physical Laboratory and extracts from the report of the executive committee for the fifteen months from January, 1913, to March, 1914.—*London Electrician*, June 26, 1914.

**Galvanometer.**—At the recent instrument exhibition of the French Physical Society a design was shown in which Carpentier has taken up a form of the Deprez d'Arsonval Galvanometer developed in 1887. The principle is indicated in Fig. 2. One side-arm of the mov-

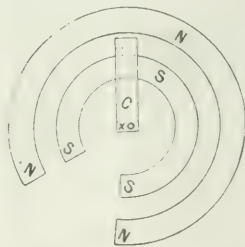


FIG. 2—GALVANOMETER

ing coil  $C$  coincides with the axis of rotation  $O$  while the other parallel side-arm moves in a uniform radial field produced between the concentric pole pieces  $N$  and  $S$ . The deflection is proportional to the current.—*La Revue Elec.*, June 5, 1914.



**Exhibit of Instruments.**—Illustrated descriptions of the various exhibits of instruments and apparatus at the recent annual exposition of the French Physical Society in Paris.—*La Revue Elec.*, June 5 and 19, 1914; *La Lumière Elec.*, June 6, 13 and 20, 1914.

**Absolute Measurement of the Standard of Electrical Resistance.**—In the recent annual report of the (British) National Physical Laboratory mention is made of the extended researches by F. E. Smith which have recently been brought to a termination, the result being that the length of the mercury column having at 0 deg. C. a resistance of 1 ohm is found to be 106.245 cm, as compared with that of 106.300 cm, the figure adopted for the international ohm. In other words, one international ohm equals  $1.0052 \times 10^9$  c.g.s. units of resistance.—*London Electrician*, June 26, 1914.

**Power Factor Meter.**—At the recent instrument exposition of the French Physical Society a power-factor meter of Carpentier based on a principle of Pestarini was exhibited, the arrangement being shown in Fig. 3. It is a combination of two double wattmeters with revolving field. Each of the double wattmeters is connected to the three-phase system, but in one of the double wattmeters the shunt coils are in series with resistances and in the other double wattmeters in shunt

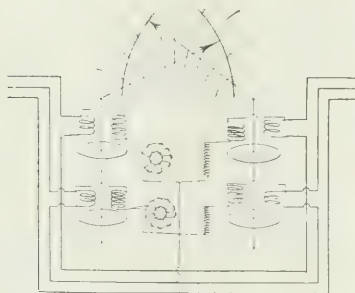


FIG. 3—POWER FACTOR METER

with induction coils. The two systems are placed in the same case. One of the two double wattmeters indicates the real power, the other the wattless power and the point of intersection of the two needles of the two wattmeters gives directly the power factor.—*La Revue Elec.*, June 5, 1914.

#### Telegraphy, Telephony and Signals

**Wave Transmission on Telephone Lines.**—L. CAHEN.—Two further mathematical articles on applications of the general formulas for the transmission of sinusoidal currents over lines. In the present instalments the author gives the theory of reflections of waves on several lines in series.—*La Lumière Elec.*, May 16 and 23, 1914.

#### Miscellaneous

**Electrical Industries of England.**—A. A. BRANDT.—The author gives a review with statistical tables of the development and the present status of the electrical industries of England on the basis of a paper by W. Koch (*Technik und Wirtschaft*, Vol. 7, pages 141, 254, 360, 1914) and a paper by F. Haardt (*Handelsmuseum*, Vienna, Vol. 28, page 589, 1913).—*Elek. Zeit.*, July 2, 1914.

**Lightning Rods.**—S. RUPPEL.—The author emphasizes that every building should be provided with lightning rod, but in order to enforce this rule suggests that the construction of lightning rods should be simplified as much as possible. Only one rule is necessary. It is that every building should be provided with a continuous metallic conductor which reaches from the upper parts of the building and is connected with the gas and water pipes and all larger metallic parts in the building. It is quite wrong, the author insists, to claim that a lightning rod which is not built with absolute accuracy, according to very stringent requirements, is more dangerous than beneficial. What are really needed are not a few absolutely perfect lightning rod installations but as many as possible of the simplest construction.—*Elek. u. Masch.* (Vienna), Jun 21, 1914.

## Book Reviews

**FURNACE EFFICIENCY. COMBUSTION AND FLUE GASES.**  
By James C. Peebles. Chicago: The Joseph C. Branch Publishing Company. 156 pages; 69 illustrations. Price, \$1.50.

The first part of this book is devoted to a brief explanation of the chemistry of combustion and a description of the Orsat apparatus for analyzing flue gases. On this as a foundation, the author proceeds to show how to determine the causes of low efficiency, mentioning particularly excess air due to leakage and to too strong a draft. A chapter is given over to the causes and prevention of smoke, and includes the Ringelman chart for smoke observations. The greater part of the book deals with appliances designed to insure smokeless combustion and high furnace efficiency, as, for example smokeless furnaces, the Wilsey fuel economy gauge, the Blonck efficiency meter, chain-grate and under-feed stokers, and the Murphy furnace. The final chapter gives furnace-arch data and point out faults to be avoided in the arrangement of breechings. The book is written for all interested in efficient steam plants from manager to fireman. The book should be of interest to the class for which it is written, though its effectiveness is lessened by the use of catalog halftones that lack clearness and detail, and by the wide range of subjects touched upon in the limited scope of its pages.

**THEORIE DER WECHSELSTRÖME.** By Dr. Ing. Alfred Fraenckel. Berlin, Germany: Julius Springer. 336 pages, 198 illus. Price 10 marks.

In treating of the theory of alternating currents, Dr. Fraenckel uses the symbolic method with which most electrical engineers are now familiar. The author starts with definitions, and the progress toward the more difficult subjects is gradual and logical. The sine wave assumption is, of course, made, although one of the best chapters in the book is devoted entirely to irregular wave shapes. The Fourier series is explained and various methods of harmonic analysis are presented in succession. The ground is very thoroughly covered. Polyphase currents are treated briefly, but in an adequate manner so far as the theoretical study is concerned. There are chapters relating to mutual induction, with magnetic lines in air; the effect of iron in the magnetic circuit; inductance and capacity; effect of magnetic leakage; power diagrams for transformer and induction motors, transient phenomena; traveling waves, etc. The printing is good and the book reflects credit on both the publisher and the author.

# New Apparatus and Appliances

An Illustrated Descriptive Record of Recently Developed  
Manufactured Products of Interest to Electrical Readers

## Device for Picking Up Broken Trolley Wire

In the accompanying illustration is shown a device for picking up a broken trolley wire. The device consists of malleable-iron jaws and a long fiber handle. Either manila or cotton rope may be used. The opera-

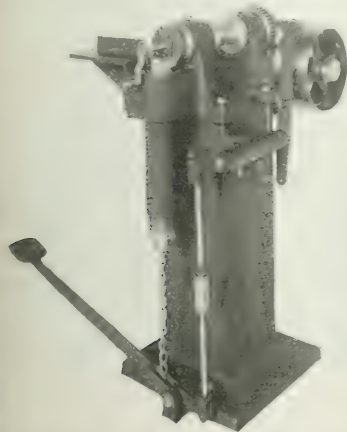


PICK-UP DEVICE FOR BROKEN TROLLEY WIRES

tor picks up the wire with the jaws, pulls the rope over a span wire or bracket to hold up the wire, and then the car is made to coast by. This "St. Louis trolley pick-up," as it is called, is being made by the Electric Service Supplies Company, Seventeenth and Cambria Streets, Philadelphia, Pa.

## Copper-Coil-Forming Machine

The machine shown in the accompanying illustration is designed to coil copper field coils for automobile lighting systems. It takes the copper in strips and coils each strip with a strip of insulation on a rect-



MACHINE FOR FORMING COPPER FIELD COILS

angular arbor. The copper strip is not only cut to length, but is also given a right-angle bend at one end, which is used for dogging purposes. A powerful spring keeps the work against the arbor and is controlled by a foot treadle. The machine trips automatically on the

completion of three revolutions of the spindle. Coils are stripped from the arbor by turning the crank handle shown in the center of the spindle. This machine, which is being manufactured by the Garvin Machine Company, of New York City, weighs 665 lb. crated.

## Portable Wireless Apparatus for Army Signal Corps

A portable wireless outfit, which is designed to send messages, under favorable conditions, within a radius of 800 miles and which, it is claimed, can be set up for use in twelve minutes, was recently put into commission by the United States Army Signal Corps. Energy for the operation of this apparatus is obtained from a generator mounted on a truck which is connected by a train of gears to the 30-hp engine of the truck. The generator delivers energy at 110 volts; and this pressure is transformed to 22,000 volts for the wireless equipment.



FIG. 1.—SETTING UP WIRELESS APPARATUS IN FIELD

The antennæ are of the umbrella type, and are mounted at the top of an 85-ft. mast which is built in nine sections. The first or top section is raised by hand, but the other sections are lifted by a block and tackle suspended from struts mounted on the roof of the truck. These struts can be quickly detached when not in use. The guy wires are attached to the fifth section of the mast. When disassembled, the nine sections of the mast are carried in long compartments built along both sides of the truck. The counterpoise, or artificial ground, consists of heavy insulated wires radiating from a common center to which is attached



the ground wire of the set. For convenience in grounding there is a socket on the outside of the truck body into which a ground-wire plug fits. In Fig. 1 soldiers are shown rigging up the wireless outfit, and in Fig. 2

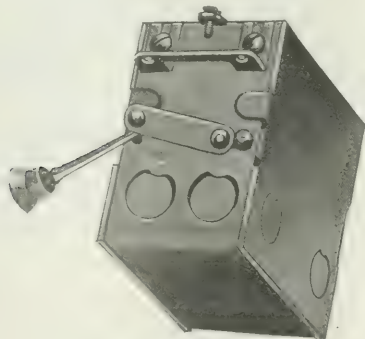


FIG. 2—REAR AND INTERIOR VIEW OF THE TRUCK

is shown a rear view of the truck, which was made by the White Company, Cleveland, Ohio.

### Pressed-Steel Switchbox

A spacer-type pressed-steel switchbox is being made by the Chelton Electric Company, Philadelphia, Pa. This box is so constructed, the manufacturers declare, that there are no loose parts. Pins held in place by rigid flat springs are used instead of screws which are



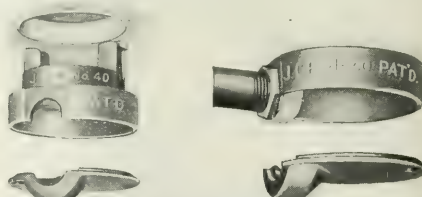
SECTIONAL PRESSED-STEEL SWITCHBOX

likely to be lost. To gang this box it is only necessary to remove the side by inserting a screw-driver, pen-knife or other sharp tool under the spring, raising the latter to the upper position as shown in the illustration. With the spring in this position the side can be readily pulled off, and a spacer may then be put in place. The side removed from the box is then placed at the end of

the spacer, and the two-gang box is ready for use. Should larger gang boxes be required, it is only necessary to add extra spacers. This box is also made in deep and shallow types for pipe and loom work as well as with clamps for use with flexible conduit.

### Outlet Box Attachment

The outlet box attachment shown in the accompanying illustrations is designed for extending conduit from an outlet-box cover plastered into the ceiling. In Fig. 1 is shown the fitting ready to be inserted into an open outlet-box cover. In Fig. 2 the attachment is



FIGS. 1 AND 2—OUTLET-BOX ATTACHMENT READY TO BE INSERTED AND PLACED IN POSITION

seen as it appears on the ceiling after having been attached to the outlet-box cover and after the conduit is connected to the fitting, the cover being removed. This fitting can be easily and securely attached, the manufacturer declares, and no special screws or lugs are necessary. This J. C. P. outlet-box attachment, No. 40, as it is called, is made by Mr. J. C. Phelps, Springfield, Mass.

### Bed-Lamp Fixture

The fixture shown herewith is equipped with a hook so that it can be hung on any convenient bed rail, back of a chair, or other support. It is designed for use in hospitals and doctors' offices, and the patient is enabled

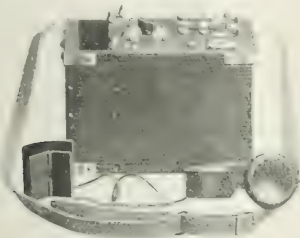


FIXTURE FOR USE AT THE BEDSIDE

to read with it while lying down. The lamp is adjustable, and the light area can be moved from place to place by moving the lamp about the pivoted hinge. This lamp may be used with a specially made stand which can be placed beside the bed. The Shiras-Chassaing Electric & Manufacturing Company, St. Louis Mo., is the maker of this device.

### Cable-Testing Instrument

An instrument designed for testing cables, finding grounds, crosses and short-circuits, and for tracing concealed wires is being made by Stewart Brothers, Ottawa, Ill. With underground cables an exploring coil is applied at various manholes, and a tone can be heard in

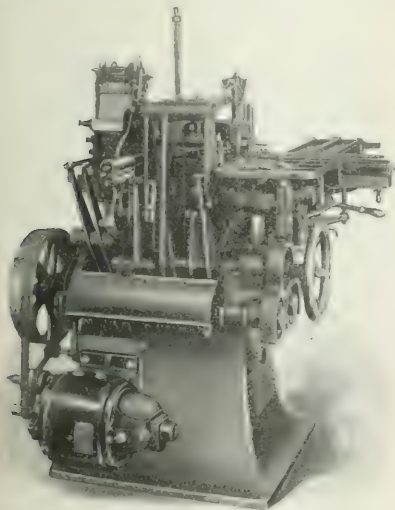


INSTRUMENT FOR TESTING CABLES

the receiver whenever the coil is placed between the sender and the fault, providing the circuit is complete. If the tone, however, can be heard in one manhole and not the next, the trouble is between these two manholes. On aerial cables the exact location of the trouble can be determined. This tester can also be used to find crosses between metal ceilings and electric circuits.

### Linotype Protected Direct-Current Motor

In the accompanying illustration is shown a direct-current motor designed for operating linotype and monotype casting machines. When used with linotype machines the usual method of mounting the motor is to place it on a separate base under the step of the



ENCLOSED MOTOR FOR OPERATING MONOTYPE MACHINE

machine. When used with monotype machines, the motor is usually mounted in a semi-inverted position on the base of the machine as shown in the illustration. The motor is equipped with an idler-pulley attachment for adjusting the tension of the belt, and this attachment is mounted on the end in such a way that it can be adjusted at any angle desired. To prevent hot metal

falling on the commutator, brushes or windings, the end-heads are inclosed by removable covers which are provided with fine-mesh screens. This form of covering gives ample protection without interfering with the ventilation of the motor. The motor is equipped with no-voltage-release starters which are designed for operation on 115-volt, 230-volt or 500-volt circuits. The Robbins & Myers Company, Springfield, Ohio, is placing this motor on the market.

### Push Buttons

The push buttons illustrated herewith are being made by the Wil-Bar Manufacturing Company, 22 Clark

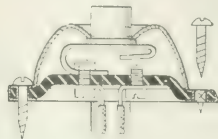


FIG. 1 ROUND PUSH BUTTON

Court, Detroit, Mich. No parts can be lost, the manufacturers declare, and the devices can be installed so that

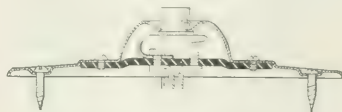
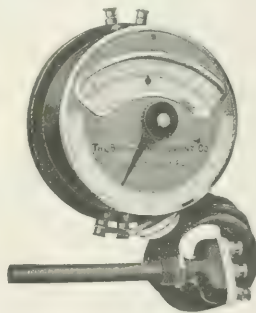


FIG. 2 -OVAL PUSH BUTTON

the backs are firmly held in place. In Fig. 1 is shown a sectional view of a round push button and in Fig. 2 one of the oval type.

### Resistance Thermometer

A resistance thermometer designed to measure at a central location temperatures from 200 deg. below zero Fahr. to 1800 deg. Fahr. is being placed on the market by the Brown Instrument Company, Philadelphia, Pa. The instrument is equipped with a bulb or coil of



RESISTANCE-WIRE THERMOMETER

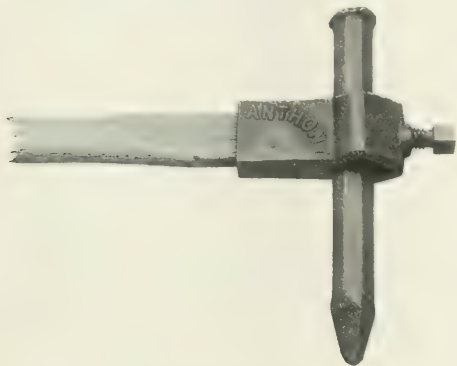
resistance wire, the resistance of this wire changing with changes of temperature. Bulbs placed at numerous points around a plant or building are connected by three-wire cable to the indicating instrument and switchboard, which can be placed at any desired position. In determining the temperature all that is necessary is to switch any bulb on to the indicating in-



strument. If a constant temperature is to be maintained, the pointer on the indicating instrument, shown herewith, can be adjusted to this temperature and the deflection of the pointer on the upper scale will show the increase or decrease in temperature. This instrument can be operated with either dry cells or storage batteries, or 110-volt or 220-volt direct current.

### Tool Holder

A tool holder for round and star drills is being placed on the market by M. B. Austin & Company, 700 Jackson Boulevard, Chicago, Ill. This tool can be used as a drill handle for drilling brick and concrete walls,



DRILL HANDLE

sidewalks, etc. By its use the danger of injuring the operator's hands is minimized. The drill can also be kept from wedging with this tool so that the drill can be withdrawn at any time.

### Stage Arc Lamp

A portable arc lamp for use in taking motion pictures and for making photographs in studios, ateliers, theatres, etc., is being placed on the market by the Universal Electric Stage Lighting Company, 240 West Fiftieth Street, New York. The lamp is mounted on a wrought-iron stand equipped with castors for easy transportation. An adjustable inclosed rheostat is fastened to the bottom of the stand as shown in the accompanying



PORTABLE STAGE ARC LAMP

ters, etc., is being placed on the market by the Universal Electric Stage Lighting Company, 240 West Fiftieth Street, New York. The lamp is mounted on a wrought-iron stand equipped with castors for easy transportation. An adjustable inclosed rheostat is fastened to the bottom of the stand as shown in the accompanying

illustration. This rheostat is wound to take 20 amp to 35 amp at 110 volts and is well ventilated. The switch is also inclosed. The hood holding the arc lamp is made of galvanized steel with grooves in the front for slides. A small windlass is provided for raising and lowering this hood. Two sets of electrodes (four carbons in all) are used, and the mechanism operating them is automatic. The lamp can be used with either alternating current or direct current.

### Unit-Type Panel Board

Panel boards with units made up of four parts are being manufactured by the Bryant-Perkins Companies Bridgeport, Conn. Each unit consists of a base which carries all the conductors and connections to the circuits, two switch mechanisms which drop into apertures in the base, and a cover which is held in place by the

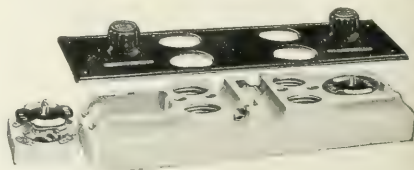


FIG. 1—DISASSEMBLED PANEL UNIT

switch knobs and fuse plugs. No live parts are accessible from the front. In case a switch mechanism requires adjustment or repair, the cover of the particular unit affected can be quickly removed, and the switch mechanism lifted from its socket. It can then be inspected and repaired without danger of short-circuit. The words "On" and "Off" are printed in black letters

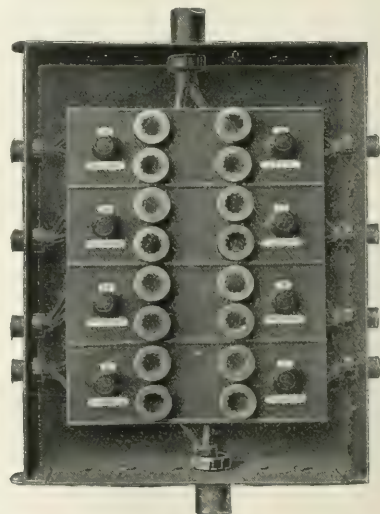


FIG. 2—FOUR-UNIT PANEL BOARD

on a white background and in white letters on a black background respectively. The fuses are self-indicating and can be replaced without the use of screwdrivers or other tools. In Fig. 1 the parts of a single unit are shown disassembled, and in Fig. 2 is seen a panel board made up of four units.

### Automatic Flashers for Single Lamps and Large Signs

So-called "thermo-blink" automatic flashers of various types are being placed on the market by Kelley & Kelley, 105 Liberty Street, Brooklyn, N. Y. In Fig. 1 is shown a flasher 1.125 in. wide and 2.25 in. long for



FIGS. 1 AND 2—ONE-LAMP AND ONE-TO-THREE-LAMP FLASHERS

use with a single 16-cp lamp. It is equipped with porcelain base and platinum contacts. The flashing period can be regulated by adjusting the platinum-pointed screw. The flasher shown in Fig. 2 is for use with



FIGS. 3 AND 4—FLASHER FOR TWO CIRCUITS OF LAMPS AND FLASHER FOR LARGE SIGNS

from one to three 16-cp lamps. The flasher illustrated in Fig. 3 is designed to flash two lamps or two circuits of lamps alternately. In Fig. 4 is shown a flasher for large electric signs. In this device the arc is disrupted in a mercury tube sealed from the air.

### Asbestos Heating Pad

An asbestos pad heated electrically is being placed on the market by the H. W. Johns-Manville Company, New York. This "J-M electrotherm," as it is called, is designed to take the place of the hot-water bottle, and is therefore particularly well adapted for sick-room use. By means of a switch the temperature can be gradually increased, so that often the patient can as a result withstand higher temperatures than would be possible if a



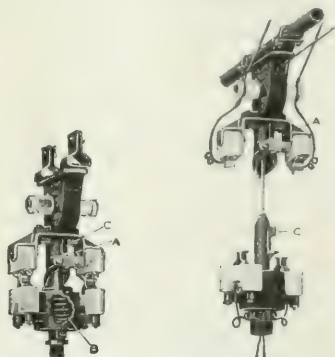
HEATING PAD

hot-water bottle were applied suddenly at the maximum temperature. This heating device is made in several sizes. One for general use is covered with eiderdown and measures 11 in. by 15 in. Another is covered with rubber and is used as an operating-table pad. Others are in the form of sweating jackets, collars and caps. An "electrotherm" bed quilt with a washable cambric

cover for use by patients sleeping outdoors is also being made by the same company.

### Single-Cord Cut-Out Hanger

A single-cord cut-out hanger for incandescent lamps or for arc lamps in multiple circuits is being made by the Thompson Electric Company, Cleveland, Ohio. The electrical connection is in the form of two simple knife contacts forced together by the spring *B* shown in Fig. 1. When in the operating position the lamp is



FIGS. 1 AND 2—HANGER IN OPERATING POSITION AND HANGER WITH CIRCUIT DISCONNECTED

secured by the pawl *A*. The lamp is lowered to the ground by pulling it up as far as it will go and giving it a quick release, as in operating a spring window shade. This action throws the pawl *A* back out of



FIG. 3—HANGER IN OPERATING POSITION CONNECTED TO LAMP

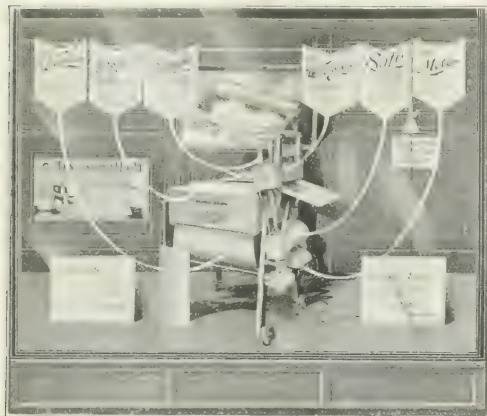
the catch *C*; then by releasing the cord quickly the catch passes out before the pawl can drop back into place. In returning the lamp to the operating position it is raised as far as it will go and then released slowly, thus allowing the pawl to fall into place. In Fig. 2 is shown the hanger with the circuit broken. Fig. 3 shows the hanger in the operating position supporting a lamp and its reflector.



## Jobber, Dealer and Contractor

### Helping the Dealer to Sell Washing Machines and Electric Fans

Some of the methods used in selling fans, which were described in the *Electrical World* of May 16, have been adopted by the Western Electric Company to dispose of its washing machines. As in the fan-selling cam-



TYPICAL WINDOW DISPLAY FOR WASHING-MACHINE SELLING CAMPAIGN

paign, the company undertakes to educate the dealer and to supply him with various advertising helps.

A large illustrated folder has been sent broadcast to dealers, telling of the ways in which the company will co-operate. This folder also illustrates various newspaper advertisements, lantern-slides for moving-picture theaters, material for window displays, mailing folders and display cards for street cars. Herewith is shown a typical window display suggested, all the material excepting the mirror for which is furnished by the company.

### Advertising to the Coming Generation

Publicity that reaches the children makes itself felt in the home. It was the realization of the foregoing



WAITING FOR CONTRACTOR'S STORE TO OPEN, JULY FOURTH

principle that led the Wadleigh & Hockett Electric Company, a comparatively young firm of electrical contractors at Kokomo, Ind., to inaugurate a successful

Fourth of July advertising campaign. Dumping a barrel of "electric sparkler" fireworks into their display window accompanied by a notice stating that the sparklers would be free to the boys and girls of Kokomo on July 4, the publicity campaign was started. The store was not opened until 7 a. m. on the Fourth, but at 6:30 a. m. a goodly representation of Kokomo's juvenile population was on hand, as the illustration herewith testifies.

When the store opened there was a concerted rush, and there followed a continuous stream of boys and girls during the greater part of the morning. In spite of the general commotion, however, it should be said to the credit of Kokomo's parents that a remarkable percentage of the youthful celebrators knew the value of courtesy and accepted the contractor's gift with a pleasant "Thank you."

A spirit of childish fairness was generally apparent except in the case of a pickaninny who tried to "repeat" on the generous contractors. His color giving him individuality in the crowd, betrayed him however, and he departed crestfallen at failing in his second attempt, but happy to have retained his first package of sparklers.

### Seasonable Advertising on Rented Electric Signs at St. Louis

In addition to selling and renting electric signs, the St. Louis branch of the Federal Sign System (Electric) is handling a complete line of electric specialties. For



A GOOD LOCATION FOR A TIMELY ELECTRIC FAN ADVERTISEMENT

advertising these devices the firm has adopted a novel scheme, using its rented signs as locations for poster advertising the specialties when the signs are not being operated by their lessees.

An illustration herewith shows a large steel sign used in the winter to advertise a theater. In summer, however, when the theater is closed the sign furnishes an excellent location for electric-fan advertising. Although this is the first season the Federal Sign System (Electric) has held the Westinghouse fan agency, reports state that business has been brisk, especially in the retail trade in the southwestern district for which St. Louis is the acknowledged gateway.

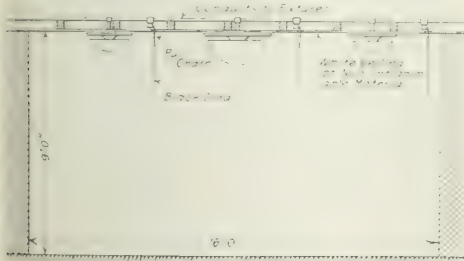
### Every Red Tack an Electric Vacuum Cleaner

Handling the sales of Frantz-Premier electric vacuum cleaners in twenty-two Illinois counties the Crawley Electric Company, Peoria, Ill., has recently been enjoying a prosperous season. Orders sent to the factory for 300 and 400 of these appliances at a time, indicate the general trend of the business.

Peoria, as the large city in the territory, is receiving the special attention of salesmen devoting their entire time to cleaner sales. To keep these representatives informed on the general saturation of the devices in various parts of the city, an interesting tally scheme has been worked out. On a map of the city mounted on a pine board measuring about 3 ft. long by 1 ft. wide, red-headed tacks are used to designate the approximate position of each cleaner sold. It was particularly interesting to note the rapidity with which additional tacks appeared in certain residential sections after the first had been placed on the board, showing how effective was the local advertising given by satisfied housewives.

### Clear Ceilings for Fixture-Display Rooms

Fixtures, especially those of the indirect and semi-indirect types, should be exhibited in rooms with ceilings free from unsightly wiring and overhanging sockets. The accompanying sketch shows how satisfactory results have been accomplished along this line by Mr. L. B. Van Nuys, of the Central Electric Company, Peoria, Ill. Choosing a room near the rear of the store, measuring about 12 ft. by 16 ft. in plan and 9 ft. high, a ceiling of white asbestos board was installed and all wiring was placed in conduit above the support-



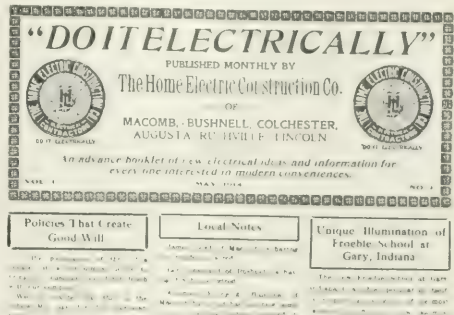
A CLEAR CEILING FOR FIXTURE DEALER'S DISPLAY

ing joists. At the fixture leads were taken out of the conduit and run to the lamps, while the conduit itself was extended to support the chain-pull switch, also installed above the ceiling. A neat hole about 0.125 in. in diameter allows a small portion of the chain to hang into the room, and a black cord attached to this chain forms an extension within reach of the salesman demonstrator. The value of this scheme may be said to be twofold, for, in addition to enhancing the beauty of the contractor's salesroom, it gives the prospective customer a better idea of how certain fixtures will look when installed in his residence or place of business.

### Electrical Contractor Publishes Monthly Newspaper

The publication of a monthly newspaper is somewhat of a departure for an electrical contractor to undertake and it is believed that the Home Electric Construction Company, an Illinois firm, of which Mr. W. I.

Savidge is president and general manager, is the first contracting firm to carry on such a feat. The first number of this publication, the heading of which is reproduced herewith, was published in May and was distributed among about 3000 of the prospective customers of the company. With electrical stores and wiring forces in six cities, namely, Macomb, Bushnell, Colchester, Augusta, Rushville, Lincoln.



HEADING OF MONTHLY NEWSPAPER ISSUED BY ILLINOIS CONTRACTOR

ter, Augusta, Rushville, and Lincoln, Ill., the company has quite a field for the circulation of its paper. The first number was distributed over the counters of the company's stores.

### Heroic-Size Instrument for Dealer's Window

A Montreal electrical supply house making a specialty of instrument repairs scored a decided hit this spring by exhibiting in its principal show window the heroic-size voltmeter shown in the accompanying illustration. The case measured some 3 ft. each way and the instrument was designed and built with a pointer, coil and scale calibrated to give correct indications. The scale was also illuminated from the front by a pair



HEROIC SIZE VOLTMETER IN MONTREAL CONTRACTOR'S WINDOW

of 15-watt tungsten lamps mounted in metal reflectors. The device was frequently cut in circuit and attracted much attention as a supplement to the regular exhibits of washing machines and other electrically operated appliances in the front of the window. The display described was that of the International Electric Company, 97 Bleury Street, Montreal.



# Industrial and Financial News

## Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

**Electric Accessories for 1915-Model Automobiles.**—The Nordyke & Marmon Company has adopted the Bosch electric lighting and starting system for its 1915-model Marmon cars.

**Company's Twenty-fifth Anniversary.**—This year there will be celebrated the twenty-fifth anniversary of the founding of the Bristol Company, Waterbury, Conn. During the last twenty years this company has grown steadily, and the floor space of its plant has been increased at a 100-per cent rate for each five years of that time.

**Lighting Batteries for Traction Company.**—The Puget South Traction, Light & Power Company, Seattle, Wash., recently placed an order with the Electric Storage Battery Company of Philadelphia, for thirty-four "iron-clad oxide" batteries of three cells each, which will be used for lighting the cable cars operated by the traction company.

**Veneer Mills Operated with Central-Station Energy.**—After several months of negotiation with the Louisville Gas & Electric Company and the James J. Clark Company of Louisville, Ky., the Louisville Veneer Mills Company has given an order to the Clark company for motors aggregating 200 hp with which it will begin the electrification of its Louisville mills.

**Synchronous Condensers for Winnipeg.**—A contract has been awarded to the Canadian Westinghouse Company by the City of Winnipeg for the installation of two 6,000-kva synchronous condensers with necessary transformers. These machines are to be installed at the terminal station of the light and power department for the purpose of improving the power factor of the system. It is expected to increase the capacity of the transmission line about 50 per cent by this means.

**Manufacturers of Electrical Accessories Combine.**—The Bosch Magneto Company, New York, and the Rushmore Dynamo Works, Plainfield, N. J., have been consolidated, the name of the former company being retained for both concerns. The plant at Plainfield will hereafter be known as the Rushmore works of the Bosch Magneto Company. This plant has a floor area of over 100,000 sq. ft. and employs about 700 men. In the Springfield (Mass.) factory of the Bosch company about 800 men are employed; in the two plants, therefore, close to 1500 men will be at work.

**Central Station Service for Flooring Mill.**—The Ironton (Ohio) Electric Company has closed a contract with the Yellow Poplar Lumber Company to supply three-phase 440-volt energy for the operation of 600 hp of induction motors used in the lumber company's hardwood flooring mill at Ironton. Direct-current motors were formerly used and energy for their operation was obtained from the lumber company's plant. The motors for the above installation were furnished by the Allis-Chalmers Company and the wiring was done by Erner & Hopkins, Columbus, Ohio.

**Large Turbine Set for Brooklyn Edison Company.**—The Westinghouse Machine Company has received a contract from the Edison Illuminating Company, Brooklyn, N. Y., for a double-flow turbine-generator with a maximum rating of 25,000 kw, which when completed, it is declared, will be one of the largest single-unit engines of this type ever built. This turbine set is for the Gold Street station and will be completed, it is stated, before Dec. 1. For this unit a radial-flow surface condenser will be used, 16 ft. 4 in. in diameter and 27 ft. long. There are 4500 1.5-in. tubes, 20 ft. 3 in. long in this condenser, giving approximately 35,000 square feet of condensing surface. Two circulating pumps with a rating of 30,000 gal. per minute will be used.

**Wireless Stations for China.**—Negotiations have been pending between the Chinese Government and the Marconi

Wireless Telegraph Company, London, for the erection of a number of wireless-telegraph stations in China. In April the Chinese government sent an official letter agreeing to authorize the Marconi company to issue \$10,000,000 of 5 per cent Chinese bonds in payment for the proposed stations. This document was filed at the British Legation in Peking and a formal contract has been sent for approval and signature.

**Turbines for the Italian Navy.**—A year ago last month the Terry Turbine Company, Hartford, Conn., received an order for nineteen turbines for the Italian navy, the last of which are almost ready for shipment. The first installations proved a success and as a result an order for eight more units was received in May. Now the Terry company is just starting work on twenty-four additional turbines ordered by Messrs. N. Odero & Company, Sestria, Ponente, Italy. The above company is also in receipt of an order for twenty turbines for the new generating station of the Philadelphia Electric Company.

**No New Sign Ordinance for St. Louis, Mo.**—A lively controversy which has been waged between the city authorities and the electric-sign interests in St. Louis now seems to have reached a definite conclusion for a time at least. St. Louis has been for some time one of those cities where ordinances prevent electric signs extending more than 18 in. over the sidewalk, and now the signs and billboards committee of the Civic League has signified its intention of strenuously fighting any ordinance introduced to extend this limit. Contending that an 18-in. space is insufficient and does not permit of the installation of proper safeguards for large electric signs, the sign men of the city would like to see the limit increased to 3 ft. The committee, however, has feared that such an ordinance would create a precedent which might lead in the future to still greater concessions.

**Electric Equipment for Metal-Mining Companies.**—The following orders were received by the Westinghouse Electric & Manufacturing Company from metal-mining companies, and tend to show that considerable activity in the metal industries can be expected in the near future: The August Mining Company, Landusky, Mont., three 75-kva transformers, one electrolytic lightning arrester, one complete switchboard equipment, complete line material for a 23,000-volt transmission line, two 4-kva lighting transformers, and twelve motors ranging in rating from 3 hp to 125 hp; the Anaconda Copper Company, Butte, Mont., three 3.5-ton 18-in. gage, 250-volt locomotives and fifteen motors ranging in rating from 7.5 hp to 100 hp; the International Smelting & Refining Company, Miami, Ariz., and Tooele, Utah, one motor-generator set, one switchboard and regulating devices and twenty-eight motors ranging in rating from 3 hp to 150 hp; the Ray Consolidated Copper Company, Hayden, Ariz., sixteen 10-hp motors; the Utah Copper Company, Magna, Utah, seven 10-hp motors; the Daly West Mining Company, Park City, Utah, one 300-hp motor; the Alaska Gastineau Mining Company, Juneau, Alaska, one 6-ton storage-battery locomotive and one 50-kw motor-generator set; the Calumet & Arizona Mining Company, Bisbee, Ariz., two 300-kva transformers and switchboard equipment, and the Empire Mines & Investment Company, Grass Valley, Cal., one 500-hp motor for double-drum hoist and one liquid condenser, three 200-kva transformers, one three-phase in duct, 45-kw regulator and six 35-hp motors.

**Street-Lighting Agreement at Montreal.**—The city of Montreal has made a new arrangement with the Montreal Light, Heat & Power Company for the lighting of those streets on which underground conduits have been laid. Poles and overhead arc lamps are to be replaced by ornate

mental standards each surmounted by a single magnetite-arc lamp. The agreement with the city is for six years, and the price per lamp is \$72.70 per 6.5-amp magnetite arc lamp and \$63.15 per 4-amp magnetite arc lamp. Provision is also made for tungsten lighting, the prices being \$23 for 80-cp lamps and \$16 for 40-cp lamps. The city will supply the lamps, standards and cables, the equipment costing \$39,500. According to Mr. A. Parent, superintendent of lighting, this will mean an additional charge of about \$20 per lamp.

**Central Station Business in the Atlantic States.**—In the last issue of the *Electrical World*, publication was made of the first available returns from the central stations for the month of May; and it was shown that, judging by the figures received from a majority of the first fifty cities in the country, the rate of increase for 1914 over 1913, as given by the May totals, was somewhat less than the value shown by April, although considerably better than the low figure established in March. A segregation of the returns from the Atlantic States for May seems to bear out this conclusion, although the actual data as here presented must be accepted with some qualifications. So far as New York state is concerned, the *Electrical World* has received complete returns for March, April and May from fifteen operating companies, the resulting totals being strictly comparable. These are given in Table I; and it will be seen that, while the May rate of increase over 1913 on gross income is somewhat better than the April figure—6.1 per cent against 5.7 per cent—a pronounced falling-off is indicated by the returns for the total energy output of stations, the increase rate of 3.3 per cent as shown by April being changed to a slight decrease for May. It must not be inferred from this that the average company in New York

of New York. The returns from New Jersey and Pennsylvania (Table II) show a rate of increase for May somewhat less than for April, and considerably more than for March, on both the revenue and the energy output, the companies reporting to the *Electrical World* in this case constituting some 65 per cent of the entire central station industry of New Jersey and Pennsylvania. In addition to the utilities whose aggregate figures are shown in these

TABLE II—NEW JERSEY AND PENNSYLVANIA. COMPARATIVE INCOME AND OUTPUT FOR MARCH, APRIL AND MAY, 1914 AND 1913, FOR SIX CENTRAL-STATION COMPANIES

	GROSS INCOME FROM SALE OF ENERGY			TOTAL ENERGY OUTPUT IN KILOWATT-HOURS		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
March	\$1,608,380	\$1,541,804	6.2	60,848,741	62,874,607	11.0
April	1,662,982	1,466,088	13.7	68,068,344	59,100,154	15.2
May	1,552,136	1,406,102	10.5	66,517,737	58,835,751	13.2

two tables, and who have made comparable reports for the three months, the *Electrical World* has received May statistics from a number of other utilities in the Middle Atlantic belt; and it is found that, for all companies reporting for May, gross income from the sale of energy increased from \$4,651,679 in May, 1913, to \$4,980,168 in May, 1914, or a rate of 9.5 per cent; while the total energy output increased from 155,905,322 to 162,792,167 kw-hr., or at a rate of 4.3 per cent (Table III). This last value is misleadingly low as an average, owing, as has been mentioned, to the temporary falling off in energy demand upon a single one of the big New York companies. For the whole of the Middle Atlantic central station industry, the energy output of all light and power stations during May, 1914, was probably a little over 300 million kw-hr. Regarding the South Atlantic Division, returns for May indicate general increases in both the revenue and the output throughout the states in that group. Comparable returns for each

TABLE I—NEW YORK STATE. COMPARATIVE INCOME AND OUTPUT FOR MARCH, APRIL AND MAY, 1914 AND 1913, FOR FIFTEEN CENTRAL-STATION COMPANIES

	GROSS INCOME FROM SALE OF ENERGY			TOTAL ENERGY OUTPUT IN KILOWATT-HOURS		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
March	\$3,340,218	\$3,224,026	3.7	99,838,526	97,484,954	2.5
April	3,227,701	3,057,382	5.7	94,787,843	91,724,287	3.3
May	3,011,830	2,839,691	6.1	87,704,501	87,716,894	*

\*Fractional increase.

state has added nothing to its load in the past twelve months. Actually the average values deduced in these tables are capable of being swayed to a very pronounced degree by the month-to-month returns of three or four of the large companies; and, in the present instance, one of the largest companies in the state certainly sold in May, 1914, a smaller amount of energy for public service than in May, 1913. Amongst all the remaining fourteen companies there is no single instance of any decrease in revenue, and only three examples of diminishing output. As an index to the conditions of the industries in these communities upon which the utilities depend, the basis of energy output is more reliable than the standard of revenue. It must be admitted that several of the smaller utilities, in New York state and elsewhere, are at present experiencing a marked falling-off in the rate of increase. Presumably this is of a temporary character; but in more than one recent instance the operators state that the business slackness is militating very severely against any satisfactory statistical report, that some of their largest industrial consumers are working on reduced time, and that all their new-business efforts are not sufficient to offset the diminished demand which is being placed on the system by some of their older old-time consumers. It may be of interest to note that the total energy output for the month for all the electric service utilities in the state is probably around 220 million kw-hr. and that the figures for the fifteen companies reporting to the *Electrical World* therefore represent some 40 per cent of the entire central station industry

TABLE III—MIDDLE ATLANTIC STATES. INCOME AND OUTPUT FOR MARCH, APRIL AND MAY, 1914 AND 1913, OF CENTRAL STATIONS REPRESENTING OVER ONE-HALF OF ENTIRE INDUSTRY OF NEW YORK, NEW JERSEY AND PENNSYLVANIA

	GROSS INCOME FROM SALE OF ENERGY			TOTAL ENERGY OUTPUT IN KILOWATT-HOURS		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
March (25 companies)....	\$3,603,720	\$3,282,154	6.1	210,843,247	196,343,544	7.5
April (31 companies)....	5,769,418	5,257,092	9.8	209,156,581	189,904,240	10.1
May (38 companies)....	4,980,168	4,651,679	9.5	162,792,167	155,905,322	4.3

month in the three-month period have been received from only a few companies. All the available figures are given in Table IV, which contains statistics for March, April and May for the three great distributing systems which have their headquarters in Washington, D. C., Baltimore, Md., and Atlanta, Ga. The returns for the three months show a marked degree of uniformity, and indicate that the demand upon the stations is more than 25 per cent greater now than it was a year ago. The rates of increase shown may hardly be regarded as typical for the whole of the South Atlantic territory, at least so far as the smaller communities are concerned. The *Electrical World* reports for May include an additional thirty-four companies in the nine states, most of them operating in cities of 40,000 population and less, and each handling gross monthly sales of between ten thousand and forty thousand dollars. Of these thirty-four companies only two show any decrease in



income for the month as compared with 1913, while five companies report a falling off in energy output. The rate of increase as shown by the combined totals for all the properties may be accepted as the average with some confidence; and it will be seen from Table V that the gross

TABLE IV.—SOUTH ATLANTIC STATES. COMPARATIVE INCOME AND OUTPUT FOR MARCH, APRIL AND MAY, 1913 AND 1914, FOR THREE LARGE METROPOLITAN COMPANIES (WASHINGTON, BALTIMORE AND ATLANTA)

	GROSS INCOME FROM SALE OF ENERGY		Per Cent Increase	TOTAL ENERGY OUTPUT IN KILOWATTHOURS		Per Cent Increase
	1914	1913		1914	1913	
March	\$61,658	\$59,850	10.9	33,860,568	25,912,792	30.8
April	604,065	537,670	12.3	32,426,161	24,827,942	30.6
May	574,160	526,081	10.2	32,374,370	25,276,426	28.0

income of these thirty-four utilities increased from \$498,160 in May, 1913, to \$567,579 in May, 1914, or at a rate of 14 per cent; while energy output increased in the same time from 24,515,240 to 26,189,986 kw.-hr., or at a rate of 6.9 per cent. These returns are combined in Table V with the totals for the three large metropolitan systems shown in

TABLE V.—SOUTH ATLANTIC STATES. COMPLETE RETURNS RECEIVED BY THE ELECTRICAL WORLD FOR MAY, 1914 AND 1913, FROM THIRTY-SEVEN OPERATING COMPANIES

	GROSS INCOME FROM SALE OF ENERGY		Per Cent Increase	TOTAL ENERGY OUTPUT IN KILOWATTHOURS		Per Cent Increase
	MAY 1914	MAY 1913		MAY 1914	MAY 1913	
Three companies shown in Table IV	\$574,160	\$526,081	10.2	32,374,370	25,276,426	28.0
24 additional companies	567,579	498,160	14.0	26,189,986	24,515,240	6.9
Total for 27 companies	\$1,141,739	\$1,019,141	12.1	58,564,356	49,791,666	17.7

Table IV. It is seen that for all the South Atlantic companies reporting to the *Electrical World* (aggregating over \$1,000,000 a month in income and nearly 60,000,000 kw.-hr. in output) there is an increase rate of 12.1 per cent on income and 17.7 per cent on output. On a basis of energy output these companies represent some 60 per cent of the entire lighting and motor service industry of the South Atlantic States.

#### NEW YORK METAL MARKET PRICES

Copper Standard spot*	July 14		July 21	
	Bid	Asked	Bid	Asked
	13.27	13.75	13.25	13.50
	Selling Prices		Selling Prices	
	£ s d		£ s d	
London, standard spot*	61 0 0		61 10 0	
Prime Lake	13.70 to 13.80		13.65 to 13.75	
Electrolytic	13.60 to 13.70		13.50 to 13.60	
Casting	13.50 to 13.55		13.35 to 13.45	
Copper wire base	15.00 to 15.12½		14.87½ to 15.00	
Lead	3.90		3.90	
Nickel	40.00 to 45.00		40.00 to 45.00	
Sheet zinc, f.o.b. smelter	7.00		7.00	
Spelter, spot	4.95 to 5.05		4.95 to 5.05	
Tin, spot*	31.50 to 32.00		31.60 to 31.75	
Aluminum				
Prompt delivery	17.50 to 17.75		17.50 to 17.75	
Future	17.50 to 17.75		17.37½ to 17.62½	

#### \*OLD METALS

Heavy copper and wire	12.00	12.25
Brass, heavy	8.75	8.75
Sheet zinc, f.o.b. smelter	7.00	7.25
Lead, heavy	3.60	3.70
Zinc, scrap	3.25	3.85

#### \*COPPER EXPORTS

Total tons to July 21.....21,521

\*From daily transactions on the New York Metal Exchange.

## Corporate and Financial

**Los Angeles City Council Acts.**—The City Council at a recent meeting authorized the public service committee to ascertain whether the Southern California Company will sell to the city its electrical distributing system, within the city, at a price based on its value to be fixed by the California Railroad Commission.

**Semi-Annual Report of Detroit Edison Company.**—The semi-annual report of the Detroit Edison Company for the period ended June 30, 1914, shows gross income of \$3,155,817, as compared with \$2,701,471 for the corresponding period of 1913, and a surplus of \$702,745, as compared with \$581,552 in 1913. The net income after deducting for operating expenses and reserve funds amounted to \$1,800,214, as compared with \$1,166,514 for the same period of 1913.

**Northern Electric Company, Ltd., Bonds.**—Lee, Higginson & Company, New York, are offering the \$3,500,000 issue of first-mortgage 5 per cent sinking fund gold bonds of the Northern Electric Company, Ltd., of Montreal, Canada. These bonds, dated June 1, 1914, and due June 1 1939, are a first mortgage on all of the company's plants and real estate now owned or hereafter acquired. The average annual net earnings for the last five years have been five and a half times the interest charges on these bonds. The company, which is engaged in the manufacture of telephone apparatus and electrical wires and cables, was incorporated in January, 1914, under the laws of Canada as a consolidation of the Northern Electric & Manufacturing Company, Ltd., and the Imperial Wire & Cable Company, Ltd.

**American Telephone & Telegraph Company.**—With it 53,737 shareholders the American Telephone & Telegraph Company stands third in number of stockholders, being exceeded only by the Pennsylvania Railroad and the United States Steel Corporation. Fifty-three per cent of the total outstanding share capital is owned in a single state. The following were credited April 1, 1914, with 10,000 share or more: Atlantic & Pacific Telephone & Telegraph Company, 128,279; Bankers' Trust Company, New York, trustee, 55,948; Mr. Joseph J. Slocum, N. Y., 20,400; Mr. Zena Crane, Dalton, 18,323; Mr. George F. Baker, New York, 16,760; Mr. Frederick Ayer, Lowell, 16,411; Mr. F. C. Welch, trustee, Boston, 13,362; Mr. Winthrop M. Crane, Dalton, 13,000; Guaranty Trust Company, New York, depository, 11,207; Mr. Eugene Higgins, New York, 10,800.

**Western Power Company's Dividend Paying Plan.**—The directors of the Western Power Company have formulated a plan for the payment of the dividends on preferred stock which shall have accumulated to the amount of 18 per cent from Jan. 1, 1912, to Jan. 1, 1915. It is proposed in this plan to reincorporate the company under the laws of New York, the company now being incorporated under the law of New Jersey. The new company then, if the plan is ratified, will issue for each 100 shares of old preferred stock 118 shares of the new preferred stock, thus making the dividend payment in preferred stock instead of in cash. At the same time the old common stock, which has a par value of \$100, is to be called in and an equal number of shares of new common stock issued, the new common stock to have a nominal or par value. The directors have appointed the following to act as a committee for the carrying out of the plan: Messrs. Irving W. Bonbright, A. W. Burchard, F. Lothrop, A. C. Bedford, M. Fleishacker and H. P. Wilson.

**Cincinnati Gas & Electric Company.**—The board of directors of the Cincinnati (Ohio) Gas & Electric Company has issued a reply to the criticisms made in a report at the annual meeting on May 4 by the stockholders' protective committee. The reply declares that the stockholders of the company are not concerned over the percentage of income of the lessee so long as its own dividends are paid as agreed. The stockholders of the lessor company have been the persons to benefit to any extent through the lease, the reply states. The board denies that it has refused stockholders access to the books and papers or information regarding the affairs of the company, but says that it did not feel at liberty to enter into correspondence with an

stockholders' protective committee, especially when the committee refused to give the names of the stockholders it claimed to represent. The board also denied that any of the artificial gas houses are in poor condition and practically abandoned, although they are not being used; should occasion arise for their operation, they could be put into condition within a very short time. Capital stock was issued to the lessee company, the board says, in payment of extensions, additions and other improvements made by that company and for which it was to be paid under the terms of the lease. The board had the right to pay for this as it did or to pay at the termination of the lease, as also provided.

**Federal Light & Traction Company Expenditures.**—The Federal Light & Traction Company will devote \$415,000 to extensions and betterments for plants of its subsidiaries from the funds secured recently by the sale of 6 per cent notes. At Trinidad, Col., \$110,000 will be used to furnish facilities for supplying the St. Louis, Rocky Mountain & Pacific Coal Company with energy to operate its mines, and \$20,000 for street lighting. In the vicinity of Tucson, Ariz., \$100,000 will be expended for power-house extensions, \$40,000 for traction company improvements, \$10,000 for gas extensions, and \$20,000 to extend the high-tension transmission service for irrigation. At Albuquerque, N. M., \$15,000 will be expended in accordance with the terms of a new street-lighting contract. The remaining \$100,000 is to be expended upon track improvement for the Springfield (Mo.) Traction Company.

**American Water Works & Electric Company.**—In accordance with the terms of the plan of reorganization, the American Water Works & Electric Company, which was organized under the laws of the State of Virginia, has taken over the assets of the American Water Works & Guarantee Company. The following are to act as the board of directors: Messrs. William Nelson Cromwell, J. B. Finley, H. C. Huffer, Jr., Samuel Insull, H. J. de Lanoy Meijer, James D. Mortimer, Charles H. Payson, Henry H. Pierce, Henry Russell Platt, H. Hobart Porter, Theodore Revillon, W. B. Schiller, Charles R. Scott, Andrew V. Stout, Guy E. Tripp, Robert Wetherell and Albert H. Wiggin. Mr. E. C. Converse, chairman of the reorganization committee, and Mr. Charles R. Brooker, president of the American Brass Company, will act as an advisory committee to the stockholders. The voting trustees are Messrs. William Nelson Cromwell, E. C. Converse, Andrew S. Squire, Albert H. Wiggin and Howland Davis. President H. Hobart Porter in his letter to the stockholders stated that since the properties were acquired as of April 27, 1914, sufficient time had not elapsed to prepare an accurate statement of the company's financial position as of that date. From present indications, however, the company will have originally available about \$2,000,000 in cash. Based on the earnings of the water works companies for the year ended April 30, 1914, together with interest on cash and securities in the treasury, it appears that the company's income will be more than sufficient to cover bond interest and dividends on the first preferred stock. In this estimate no income is included from the company's large investment in the West Penn Traction & Water Power Company stock, the payment of dividends by that company having been temporarily suspended in order to strengthen the cash resources. In view of the continued satisfactory earnings of the West Penn company, notwithstanding the depressed industrial conditions, and the further expected increase of earnings resulting from the expenditure for new construction, it may be reasonably assumed that at no distant date and in increasing measure the West Penn securities held by the company will materially add to its income. Many of the subsidiary companies will require the constant and close attention of the directors and officers in order to develop plans under which capital can be secured for maintaining and extending their earning power, while in the case of some of them it may be desirable to carry through a reconstruction so as to establish them on a firmer financial basis. The number of subsidiary companies controlled and the consequent large amount of preliminary work involved in the organization of the company have made it desirable to have the company's financial year date from July 1. The first dividend on the first preferred stock will therefore not be due until Oct. 1 and will cover the period from April 27, 1914.

## Business Notes

**The Crypto Electric Company**, of London, England, has moved from Bermondsey Street to Acton Lane, Willesden, London.

**The Bristol Company**, of Waterbury, Conn., has just established a branch office at Boston, Mass., and Mr. F. H. Emerson will be the district manager with headquarters in the Old South Building.

**The Union Metal Manufacturing Company**, of Canton Ohio, has appointed Mr. C. L. Eshleman, formerly sales manager of the Adams-Bagnall Electric Company, vice-president and general sales manager.

**United Electric Stores.**—Mr. Max Loewenthal has organized and become president and manager of the United Electric Stores, incorporated to act as distributors of electrical merchandise along the Pacific Coast. The headquarters are at 760 South Hill Street, Los Angeles, Cal.

**The Majestic Appliance Company, Inc.**, of 69 East 89th Street, New York City, was recently organized and will manufacture enclosed flaming arc lamps, 25-cycle inverted arc lamps and photo-engraving lamps. Mr. J. P. Ryan is president of the concern, Mr. A. Rosenberg is vice-president, and Mr. W. Burrows is secretary, treasurer and general manager.

## Trade Publications

**Dish Washer.**—An electric dishwasher is described in a pamphlet distributed by the Electric Dishwasher Company, Buffalo, N. Y.

**Wire Reel.**—The Wiring Equipment Company, 30 Church Street, New York, has issued a folder describing an expanding-core wire reel.

**Switches and Panel Boards.**—Switches and panel boards are described in catalog No. 6 issued by the Trio Manufacturing Company, Rock Island, Ill.

**Crane Equipment.**—The Whiting Foundry Equipment Company, Harvey, Ill., has sent out catalog No. 110 relating to cranes for all types of service.

**Artificial Meter Loads.**—Connections employed with artificial meter loads are described in Circular No. 19, issued by the States Company, Hartford, Conn.

**Elevator Safety Equipment.**—"Elevator Safety Appliances" is the subject of a pamphlet being distributed by the Safety Appliance Company, St. Louis, Mo.

**Milling Machines.**—Catalog No. 48, sent out recently by the Newton Machine Tool Works, Philadelphia, Pa., contains information on horizontal milling machines.

**Ball Bearings.**—Bulletin No. 16 has been issued by the S. K. F. Ball Bearing Company, 50 Church Street, New York, comparing its ball bearings with journal bearings.

**Winches and Winding Drums.**—Electric winches and winding drums are described in Bulletin No. 48,901 issued by the Sprague Electric Works of the General Electric Company.

**Metal Reflectors and Portable Fixtures.**—In catalogue No. 311 of the Holophane Works of the General Electric Company metal reflectors and portable fixtures for display cases are described.

**Wire, Cable and Accessories.**—Information on wire, cable, junction boxes and insulating compounds is contained in a folder put out by the Standard Underground Cable Company, Pittsburgh, Pa.

**Cement Gun.**—Apparatus for applying cement by means of a hose and nozzle is described in a booklet entitled "The Cement Gun" issued by the Cement Gun Company, Inc., 30 Church Street, New York.

**Elevators.**—The Otis Elevator Company, Eleventh Avenue and Twenty-sixth Street, New York, has issued several pamphlets pointing out how electric elevators are profitable to central stations.

**Lighting, Starting and Ignition Apparatus.**—The Bosch Magneto Company, 223 West Forty-sixth Street, New York, announces in a folder that the company is now able to supply lighting, starting and ignition apparatus in quantities.



**Heavy-Duty Block and Tackle.**—A folder distributed by the Laurent-Cherry Company, Trenton, N. J., contains information on a heavy-duty block and tackle.

**Fuse Switches.**—The method of installing and removing a high-tension fuse switch is shown in a folder distributed by W. N. Matthews & Brother, St. Louis, Mo.

**Electrical Equipment.**—Second-hand electrical equipment for sale by Macgovern & Company, 114 Liberty Street, New York, is listed in the firm's recent catalog.

**Pumps.**—Some actual installations of motor-driven Goulds pumps are described in a booklet sent out by the Goulds Manufacturing Company, Seneca Falls, N. Y.

**Heating Appliances.**—The Hotpoint Electric Heating Company, Ontario, Cal., has issued a booklet (Form 573) describing tests on two of its heating appliances.

**Geared-Type Air Compressors.**—Motor-driven geared-type air compressors are described in Bulletin No. 44,591 of the General Electric Company, Schenectady, N. Y.

**Expansion Joints.**—The Alberger Pump & Condenser Company, 140 Cedar Street, New York, has issued Bulletin No. 19, referring to its expansion joints for pipe lines.

**Iron-Clad Switches.**—Bulletins No. 27 of the Detroit Fuse & Manufacturing Company, Detroit, Mich., contains information regarding several types of iron-clad switches.

**Portable Tools.**—Portable tools and applications of flexible shafts are described in catalogue No. 14 prepared by the Stow Manufacturing Company, Binghamton, N. Y.

**Charging Storage Batteries.**—The Electric Storage Battery Company, Philadelphia, Pa., has published a booklet illustrating graphically the characteristics of its batteries.

**Steel Pulleys.**—"Transmission Experts at Your Disposal" is the title of a pamphlet on steel split pulleys issued by the Fairbanks Company, Broome and Lafayette Streets, New York.

**Meter Seal.**—An all-metal seal for meters, etc., is described in a loose-leaf filler issued by the Metropolitan Engineering Company, Forty-second Street Building, New York.

**Graphite Products.**—The Graphite Metallizing Corporation, Yonkers, N. Y., has issued Bulletins B and E on "Graphalloy" self-lubricating bushings, brushes and contacts.

**Fuse Switches.**—W. N. Matthews & Brother, St. Louis, Mo., are distributing circular letters and reprints of advertisements from the *Electrical World* referring to their fuse switches.

**Pendant Fixtures.**—Bulletin No. 1, Vol. 1, issued by the F. W. Wakefield Brass Company, Vermilion, Ohio, contains a description of its Mellowlite fixtures, including reversible bowl units.

**Data-Recording Apparatus.**—Slocum, Avrum & Slocum, Inc., 30 Church Street, New York, have published a booklet describing applications of a device for recording various data in executives' offices.

**Batteries for Signal Work.**—Prices of chloride accumulators for operating signals and time clocks are listed in catalogue Section A-1 of the Electric Storage Battery Company, Philadelphia, Pa.

**Porcelain and Glass Insulators.**—Catalog Section DS-845, issued by the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., contains a price list of high-voltage glass and porcelain insulators.

**Small Motors.**—Bulletins No. 514, 515, 516, 517 and 518, issued by the Bodine Electric Company, 564 West Randolph Street, Chicago, Ill., contain information on small direct-current and single-phase induction motors.

**Motors and Generators.**—Bulletins No. 27, 202 and 210 issued by the Fairbanks Morse Electrical Manufacturing Company, Indianapolis, Ind., relate to direct-current motors and generators, constant-speed induction motors and internal-starter motors respectively.

**Future of Electrical Industry.**—The Pittsburgh Transformer Company, Pittsburgh, Pa., is issuing a pamphlet, No. 1358, entitled "Great Future of the Electrical Industry," which is a reprint of an article published by H. P. Taylor & Company, a well-known New York bond house.

## New Industrial Companies

**The Lighting Supply Company**, of Boston, Mass., has been incorporated with a capital stock of \$200,000 by C. S. Eddy, E. W. Powell and F. C. Thomson.

**The Fein Electric Tool Company of America**, of Boston, Mass., has been chartered with a capital stock of \$10,000. The directors are: E. F. Wilmot, president; Walter D. Smith, 7 Wellington Street, Boston, treasurer, and J. L. Gleason.

**The Falls Electric Company**, of Lima, N. Y., has been incorporated by John D. Falls, Allen L. Methany, Gustav Hirsch and C. F. Metheny. The company is capitalized at \$3,000 and proposes to do a general electrical manufacturing business.

**The P. & B. Manufacturing Company** has been incorporated with a capital stock of \$5,000 to manufacture electrical fittings. The general offices are at 306 Manufacturers' Home Building, Milwaukee, Wis. Mr. A. H. Petersen is secretary and treasurer.

**The Telephone Toll-O-Meter Sales Company**, of Nutley, N. J., has been chartered with a capital stock of \$100,000 to manufacture a mechanical device known as "Toll-O-Meter." The incorporators are J. A. Hassell, G. G. Graham and G. W. Mead, of Nutley.

**The United States Insulator Company**, of Warren, N. Y., has been incorporated with a capital stock of \$450,000 to manufacture porcelain insulators and similar products. The incorporators are Michael Livingston, A. B. Livingston, L. L. George and William Newby.

**The Kinetic Electric Company**, of Norfolk, Va., has been granted a charter with a capital stock of from \$200,000 to \$500,000, to do a general electric supply business. E. R. Copper, of Baltimore, Md., is president, and W. R. L. Taylor, of Norfolk, Va., secretary.

**The Electric Light & Heat Controller Manufacturing Company**, of Johnstown, Pa., has been incorporated with a capital stock of \$50,000 by P. Lawson, J. E. Zang and H. H. Hoffman, of Johnstown. The company proposes to manufacture automatic damper adjuster.

**The Interchangeable Automatic Indicator Company**, of Brooklyn, N. Y., has been incorporated by C. Groening, P. Kropp and J. Roth, of Brooklyn, N. Y. The company is capitalized at \$50,000 and proposes to manufacture electrical and mechanical appliances for railways.

**The Gas Safety Electric Bell Company**, of New York, N. Y., has been incorporated with a capital stock of \$50,000 by D. J. Guccione, A. and M. Angelo Boua, 52 East 132d Street, New York. The company proposes to manufacture safety apparatus, gas-escape preventive devices, etc.

**The Owners' Electric Saving Company**, of New York, N. Y., has been incorporated with a capital stock of \$5,000 to manufacture meters, electrical devices, etc. The incorporators are J. Lavenberg, 431 Sterling Place, Brooklyn; A. Arnold, of the Bronx, and M. Rodgers, of New York, N. Y.

**The Triplex Manufacturing Company**, of New York, N. Y., has been incorporated with a capital stock of \$10,000 by G. E. Touloupoulos, H. A. Harman and M. L. Chizzola, 47 Forty-second Street, New York. The company proposes to manufacture gas, electric and gasoline saving devices.

**The Fargo Manufacturing Company**, of Poughkeepsie, N. Y., has been incorporated with a capital stock of \$35,000 by A. H. Fargo, of Poughkeepsie; H. L. Mills, of Brookline, Mass., and F. L. Brown, of Wappinger Falls, N. Y. The company proposes to manufacture and deal in electrical and mechanical devices, etc.

**The Lasseco Auto Signal Lamp Company** has filed articles of incorporation under the laws of the State of Delaware. The company is capitalized at \$100,000 and proposes to manufacture automobile lamps and lighting devices. The incorporators are: D. J. Shern, L. M. Abeles, Philadelphia, Pa., and J. G. Grey, of Wilmington, Del.

**The Electric Vanadium Reduction Company** has filed articles of incorporation under the laws of the State of Delaware with a capital stock of \$100,000. The company proposes to manufacture machinery for smelting and refining metals and ores. The incorporators are: F. R. Hansell, of Philadelphia, Pa.; G. H. B. Martin and S. C. Seymour, of Camden, N. J.

## Personal Mention

**Mr. Alfred J. Hixon**, of the Hixon Electric Company, Boston, has been appointed national director of the Massachusetts Electrical Contractors' Association.

**Mr. J. R. Tomlinson**, of the Pierce-Tomlinson Electric Company, Portland, Ore., was recently elected national director of the Oregon Electrical Contractors' Association.

**Mr. W. R. Wollaston**, of the firm of Wollaston & Walker, contractors, Dayton, Ohio, has been elected president of the Electrical Contractors' Club organized recently in that city.

**Mr. J. P. Clark**, formerly vice-president and general manager of W. N. Coler & Company's public utility properties, with headquarters at Greensboro, N. C., is absent on a trip to Europe.

**Mr. Eugene Lebrun**, who has been secretary of the Van Buren (Maine) Light & Power Company, has assumed the additional duties of superintendent as successor to Mr. A. E. Drapeau.

**Mr. A. C. Ford** has been appointed manager, treasurer and secretary of the Virginia-Western Power Company, Roncverte, W. Va., formerly the Consolidated Light & Power Company.

**Mr. P. P. Craft** has resigned as second vice-president and general manager of the Iowa & Illinois Railway Company to become manager of the Mobile (Ala.) Light & Railroad Company.

**Mr. Leonard Fitzgerald**, formerly manager and superintendent of the Gary (Ind.) Heat, Light & Water Company, now holds the titles of vice-president and manager of that organization.

**Mr. Albert H. Stanley**, managing director of the London underground tubes and buses, has been knighted by the King of England in recognition of his services to the British government.

**Mr. Jesse Rutledge** has been appointed manager and superintendent of the Logoootee (Ind.) Electric Light, Power & Water Company, which will commence operation about January, 1915.

**Mr. J. D. Murphy**, manager and superintendent of the Great Bend (Kan.) Water & Electric Company, now holds the position of vice-president of the company in connection with his other duties.

**Mr. Hance Newland** has been appointed manager of the Forest City (Iowa) Electric Light & Power Company, relieving President Frank Kellogg, who formerly also performed the duties of that position.

**Mr. J. E. Gilmour**, who was recently appointed merchandise sales manager of the Northern Electric Company, Ltd., Montreal, Quebec, was formerly head of the service division of the Western Electric Company.

**Mr. V. McDaniel** has been appointed vice-president and manager of the Harrison (Ark.) Electric Light & Ice Company, succeeding Messrs. W. H. and R. M. Fellows, who formerly held these positions respectively.

**Mr. J. S. S. Cooper** has resigned as chief engineer to Messrs. Samuel & Company, Ltd., Shanghai, China, and become representative engineer of Messrs. Arnhold, Karberg & Company, with offices at Shanghai.

**Mr. L. L. Kellogg**, who has been vice-president and manager of the Sioux City (Iowa) Gas & Electric Company, has succeeded Mr. Samuel T. Rodine as president. Mr. Kellogg will continue to hold the position of manager.

**Mr. Miles C. Fuller** has been appointed manager of the Boulon (Ill.) Light & Power Company, which has been controlled by an executor, Mr. J. H. Wrigley, since the death of J. G. Fuller, its former president and manager.

**Mr. Edwin L. Sellars**, formerly new-business manager of the Kentucky Public Service Company's system at Bowling Green, has been appointed superintendent of that company at Frankfort, as successor to Mr. A. J. Short.

**Mr. Heinrich Beck**, of Meiningen, Germany, is visiting the United States to supervise personally the tests at the Brooklyn Navy Yard of his search-lamp with alcohol-cooled electrodes. Mr. Beck was born in Meiningen, Dec. 20, 1878, and was educated in the Technical School at Charlottenburg, Germany. He has made numerous inventions in arc lighting and has worked for many years to develop the search-lamp.

**Mr. C. E. Schutt** has been appointed supervisor of electric light and power in the new department of public service, Chicago, Ill. Mr. Schutt was graduated from Purdue University, Lafayette, Ind., in 1905 and received the degree of electrical engineer from the same institution in 1911. After acting as instructor in power generation and distribution at Purdue he took up engineering work for the Southern Indiana Power Company at Indianapolis, Ind., in 1913.

**Mr. W. D. Uptegraff**, who has succeeded Colonel H. G. Prout as president of the Union Switch & Signal Company, Swissvale, Pa., was formerly vice-president of that concern, in addition to serving as director of the Westinghouse Air Brake Company and vice-president of the Westinghouse Machine Company. In 1907 he became financial adviser to the late George Westinghouse, and was appointed on the boards of many concerns in which Mr. Westinghouse was interested. Upon the latter's death, Mr. Uptegraff was appointed an executor of the Westinghouse estate.

**Mr. John F. Meany**, private secretary to Governor Walsh, of Massachusetts, has been appointed a member of the Public Service Commission, succeeding Hon. George W. Bishop, who resigned last month after eighteen years' service to become chief of the inspection bureau of the board. The new commissioner is thirty-four years of age and has a distinguished legislative record, having also served on the bench in southern Worcester County. He was educated at the Boston University Law School and has been active in Democratic politics in the State, serving as a presidential elector in the last campaign.

**Colonel Henry Goslee Prout**, who has retired as president of the Union Switch & Signal Company, Swissvale, Pa., has had a very interesting career. During the Civil War he served in the Army of the Potomac. Later he entered the University of Michigan, where he took up civil engineering studies and was graduated in 1871. He received the degrees of master of arts from Yale University and doctor of law from his alma mater. From 1873 to 1878 he served as major of engineers and later as colonel of the general staff in the army of the Khedive of Egypt. He commanded an expedition in the Sudan and also acted as governor of the Provinces of the Equator. After this service Colonel Prout returned to America and became editor of the *Railroad Gazette*, in which position he continued sixteen years. In 1903 he was elected vice-president and general manager of the Union Switch & Signal Company, being promoted to the position of president subsequent to the death of the late George Westinghouse.

**Prof. Edward W. Bemis**, who was recently appointed by the City of Chicago to serve as the city's representative on the Board of Supervising Engineers, Chicago Traction, succeeding Mr. George Weston, has been acting in an advisory capacity as public-utility expert for the city of Chicago for some time. Last week he was also selected to make a complete inventory and appraisal of the Detroit (Mich.) United Railway Company's property within the one-fare zone. Professor Bemis was born at Springfield, Mass., in 1860 and was educated at Amherst College, where he received the degree of bachelor of arts and master of arts. In 1885 he was given the degree of doctor of philosophy from Johns Hopkins University. For three years commencing with 1889 he was professor of history and economics at Vanderbilt University and was associate professor of political economy for a similar period at the University of Chicago. During 1896 Professor Bemis served as assistant statistician on the Illinois Bureau of Labor Statistics and during the two succeeding years was professor of economic science and history at the Kansas State Agricultural College. Later he acted as director of the Department of Municipal Monopolies, Bureau of Economic Research, New York. Professor Bemis was superintendent of the water department at Cleveland for eight years and deputy commissioner of water supply, gas and electricity at New York in 1910. Since that time he has been acting as special investigator of public utility questions for several cities. Professor Bemis is a member of the National Civic Federation. He is author of works on municipal monopolies and municipal ownership and has also prepared numerous articles on municipal government, trades unions, trusts, monopolies, etc.



## Construction New England

**ATLANS, MASS.**—The Renfrew Mfg. Co. is erecting a building on the yard of its main factory in Renfrew to transform electricity to be supplied by the New England Pwr. Co. to operate the mill.

**BROCKTON, MASS.**—The sewerage commissioners are investigating the possibility with a view to equipping the sewerage pumping with electrically operated machinery.

**PITTSBURGH, MASS.**—The State Board of Gas and Electric Light Commissioners has authorized the City of Pittsburg & E. L. Co. to extend its electrical service to the town of Townsend.

**LITTLETON, MASS.**—The town has voted to authorize the water and electric light commissioners to extend the electric-lighting system on Great Road to Lake Nagog, provided sufficient patronage can be obtained, and also voted to appropriate \$1,800 for construction of same.

**NORTH ATTLEBORO, MASS.**—Within the next 30 days the City of North Attleboro and Water Department will purchase water tube boilers for the municipal electric-light and water plant. William Plattner is manager.

**PITTSFIELD, MASS.**—The contract for changing street lamps on West Street, North Street and Park Square has been signed by Mayor P. J. Moore.

**PAWTUCKET, R. I.**—Plans have been completed for the new plant of the Phillips Insulated Wire Co. in Pawtucket. The power house will be 100 ft. long, 50 ft. wide and about 40 ft. high, and will be equipped with two 600-kw. 550-volt, three-phase, 60-cycle General Electric turbo-generators, Wheeler surface condenser, 2,400-hp Manning boilers and General Electric switchboard, etc. The new mill building will be 200 ft. by 200 ft., three stories high with basement.

## Middle Atlantic

**ADAMS, N. Y.**—The Adams El. Lt. Co. has completed arrangements for the installation of an electric-light system in Adams Center.

**BROOKLYN, N. Y.**—Plans have been filed for the construction of a power house 75 ft. by 122 ft., four stories high, at De Kalb Avenue, corner of Raymond Street, for the Brooklyn Hospital. Lord, Hewlett & Tallant, 345 Fifth Avenue, New York, are architects.

**BUFFALO, N. Y.**—The Buffalo General Electric Co. has petitioned the Common Council for authority to acquire the capital stock of the Cataract Pwr. & Conduit Co. and operate the two properties as one plant.

**CANANDAIGUA, N. Y.**—The City Council is considering the question of building a municipal electric-light plant on the banks of Canandaigua Lake.

**CANISTEO, N. Y.**—The Hornell El. Co. is contemplating arrangements for the installation of Canisteo to furnish electrical service here. L. T. Mason is superintendent.

**CUDDEBACKVILLE, N. Y.**—The property of the Orange County Pwr. Co., which furnishes electricity in Cuddebackville, has been purchased by Port Jervis Lt. & Pwr. Co. of Port Jervis.

**FILLMORE, N. Y.**—Within the next 12 months the Genesee Valley Pwr. Co. of Fillmore, expects to purchase some transformers and lighting apparatus, also standard supplies. H. G. Young is secretary and manager.

**NEW YORK, N. Y.**—Bids will be received by C. E. J. Snyder, superintendent of school building, Division of Education, corner Park Avenue and Fifty-fifth Street, New York, until July 27 for additions and repairs to electric equipment at Public School 106, 23 Lafayette Street; also for additions, alterations and repairs to the electric equipment in Public School 184, 31 West 116th Street, borough of Manhattan.

**MEXICO, N. Y.**—The capital stock of the Mexico El. Co. has been increased from \$5,000 to \$50,000.

**STRACUSE, N. Y.**—The flaming arc lamps used for illuminating the fair grounds will be replaced with 100-watt tungsten lamps, to be erected at once. The new lamps will be maintained from the plant to be erected in the main entrance. Contract for installation of lamps has been awarded to Burns Brothers.

**TROY, N. Y.**—Plans have been prepared by A. E. Roche, city engineer, for the installation of a new street-lighting system, consisting of 170 curb standards of a design similar to New York City, of the new standard. It has not yet been decided

whether to use luminous arc lamps or the new nitrogen lamps.

**WATERLOO, N. Y.**—Arrangements have been made whereby the Tracy Development Co. has secured the Seneca hose house No. 4, and the company proposes to use the site of the hose house for its electric power plant, work on which, it is understood, will soon begin.

**BLOOMSBURG, PA.**—Charters have been granted to a number of small electric light, heat and power companies, including several subsidiaries of the Northumberland County Gas & El. Co., of Bloomsburg, as follows: The Turbotville El. Co., the Eversville El. Co., and the Lewis County El. Co., all in Northumberland County. The companies will furnish electricity in their respective districts. Substations will be erected and electric systems from the main plant of the Northumberland company at Milton. The Northumberland County Gas & El. Co., which furnishes electricity in Northumberland, Montour and Columbus Counties, has established district headquarters in Bloomsburg.

**COATESVILLE, PA.**—The Chester Valley El. Co., of Coatesville, has closed a contract for purchasing electric light and silk mill in Coatesville; also to operate the pumping station and an ice plant in Parkersburg. Material for these installations has been purchased. F. W. Harris is general manager.

**GREENVILLE, PA.**—Preparations are being made by the Mercer County Lt. & Pwr. Co., of Greenville, for the erection of a new power plant, to be located on the site of the Senessee Bridge over the Little Shenango River.

**MONT ALTO, PA.**—The installation of an electric-light plant in Mont Alto is under consideration. It is proposed to utilize the site of a mill at H. M. Small's mill to operate the plant.

**NEOSCOPE, PA.**—The City Council has voted to enter into a contract with the Columbia & Montour El. Co., of Bloomsburg, for lighting the streets of the village, under which the company is to furnish not less than twenty-four 100-watt tungsten lamps.

**NEW HOLLAND, PA.**—The electric-light plant of the Conestoga El. Lt. Co., which supplies electricity in New Holland, Blue Earth and East Hope Townships, has been purchased by the United Gas & El. Corp., of New York, which controls the Edison El. Co., of Lancaster, for \$31,000. The plant, which has been in operation since supplied from the plant in Lancaster, and the local plant will ultimately be abandoned.

**PITTSBURGH, PA.**—The Pittsburgh Coal Co. has awarded a contract to D. T. H. Co. for the construction of two underground power houses to be erected at Montour Mines, Nos. 1 and 2, near Venice, Washington County, to cost about \$35,000.

**RICES LANDING, PA.**—The United States Government will build a reinforced concrete power plant at Rices Landing, about \$10,000, for which preliminary plans have been drawn.

**SHARON, PA.**—The Petroleum Iron Works Co. is erecting an addition (90 ft. by 100 ft.) to its oil refinery.

**SPRING CITY, PA.**—Bids will be received by the board of trustees of the Eastern Pennsylvania State Institution for Feeble Minded and Epileptic, Spring City, for the construction of main and connecting corridors and for heating and plumbing and electric lighting for same, in accordance with plans and specifications prepared by Philip H. Johnson, architect, Philadelphia. The building is under construction. Plans and blank forms for bids can be obtained at the office of the architect. George W. French is chairman of building committee.

**TARENTUM, PA.**—The Borough Council has awarded the contract for construction of power house for the municipal electric-light and power plant and water works system of Tarentum, to the Tarentum El. Co. Council has also granted the Central District Lt. Co. permission to lay underground conduits for its wires under the streets.

**WILLIAMSPORT, PA.**—A committee has been appointed by the Merchants' Association to look into the matter of improving the lighting system in the business section of the city.

**YORK, PA.**—The City Council has passed an ordinance granting the Edison El. Lt. & Pwr. Co., of York, to consolidate.

**CAMDEN, N. J.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Aug. 18, for conduits and wiring system, lighting fixtures, etc., for the United States post office, custom house, etc., at Camden, N. J. For details see previous issue.

**DEAL, N. J.**—The property of the New Jersey Wtr. & Lt. Co., of Deal, has been

purchased by the Atlantic Coast El. Lt. Co., of Asbury Park. It is understood that improvements will be made to the plant.

**HOBOKEN, N. J.**—Plans are being considered for the installation of an ornamental street-lighting system on Central Avenue.

**JAMESBURG, N. J.**—The Jamesburg El. Co. expects to purchase within the next 12 months one 75-kw. 60-cycle, 2200-volt generator. J. W. Pharr is superintendent.

**NEWARK, N. J.**—The New Jersey Harbor Commission has approved plans of the Public Service El. Lt. Co. for the construction of a power plant, dock and intake and electric conduits on the Passaic River at Point-No-Point, in Newark. The cost of the work is estimated at \$100,000 and contract has been awarded to the Linde & Griffith Co. of Newark.

**BALTIMORE, MD.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Aug. 11, for installation of new wiring and conduits for the United States custom house, Baltimore. For details see proposal columns.

**OCEAN CITY, MD.**—The installation of a municipal electric-light plant is under consideration. The plan is to be considered for an illuminated board walk 3 miles long.

**LOGAN, W. VA.**—Plans, it is reported, are being prepared by E. R. Weller, Hibbs & Weller, of Wheeling, for the construction of power station for the Logan El. Co.

**NEWELL, W. VA.**—Work has begun on the addition to the plant of the Newell Wtr. & Pwr. Co., which will double the output of the plant (water pumping and electric generating departments). The cost is estimated at \$36,000.

**WOODSDALE, W. VA.**—The Town Council has awarded the Wheeling Valley & Wheeling El. Co. a contract for construction for lighting the streets of the town with electricity. The contract provides for 80-cp lamps to be erected on ornamental posts. Post office address, Wheeling.

**PORT CHARLES, N. Y.**—Plans, it is reported, have been prepared by the Port Defiance Milling Co. for the construction of a hydroelectric plant to furnish electricity at Port Defiance and New Hope, 1½ miles distant. J. S. Rowland is manager.

**WINCHESTER, VA.**—The Northern Virginia Pwr. Co., of Winchester, has filed an application with the Public Service Commission for permission to institute condemnation proceedings to acquire the land which as the old Hopewell or Watson mill property and water rights on the Shenandoah River now owned by D. S. Howell. The company, which is understood, proposes to double the output of its plant.

**WASHINGTON, D. C.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Aug. 4, for furnishing of standards for electric lamps for the United States Bureau of Engraving and Printing, at Washington, in accordance with specification and drawings No. 262A. O. Wendert is supervising architect.

**WASHINGTON, D. C.**—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Aug. 4, for furnishing at the various navy yards and naval stations supplies as follows: Brooklyn, N. Y., Schedule 7655—52,500 lb. silk, flexible double conductor, 3-circuit, 250-volt, 100-ft. cotton-covered, rubber-insulated, combustion engines, circuits insulation wire; Schedule 7653—64,500 lb. 580-circ. mil. incandescent lamp sockets, 60-watt, weather-proof wire, 705 ft. annual supply igniters and spark plugs for same, annual supply spark plugs and extra porcelain for same; Schedule 7625—one 12-kw., 240-volt, 3-phase, 3-wire motor, 10-hp, 3-yr. machine; Philadelphia, Pa., Schedule 7631—three motors and three automatic motor starters; Norfolk, Va., Schedule 7624—7250-ft. 30-amp. rubber insulated single wire; New York, N. Y., Schedule 7644—5200 lb. seamless drawn brass pipe, 12-ft. lengths; Schedule 7631—4960 lb. drawn brass seamless and composition tubes, 12-in. diameter, Schedule 7637—300 lb. 1½ and 2-in. outside diameter brass tubing; Schedule 7644—700 lb. 1-in. outside diameter, composition tubing; Washington, D. C., Schedule 7627—1½-in. drawn seamless copper tubing, Boston Mass., Schedule 7637—17,400 lb. brass voice tubing; Schedule 7666—rewinding on 500-lb. cast iron chassis; New York, N. Y., house armature. Bids will also be received until Aug. 18 as follows: Mare Island, Schedule 7635—for 14 water-tight annunciators (types A-1 and B) for water-tight annunciators (types A-1 and B) for water-tight electric whistle outfit, 15 20-volt thermostats (types A-2 and A-8), one transmitter and four angle rudder indicators (water-tight), two rudder indicator, four rudder indicator; Schedule 7632—one 25-kw.





and operate a transmission line from Springfield to the Tuxhorn Mine, a distance of about 3 miles.

**SPRINGFIELD, ILL.**—The construction of a large electric plant on the outskirts of Springfield to furnish electricity to adjoining cities, is reported to be under consideration by eastern capitalists. F. E. McCarthy, of New York, N. Y., is interested.

**SULLIVAN, ILL.**—A special election will be held July 23 to submit the proposition to issue \$35,000 in bonds, of which the proceeds of \$20,000 will be used for improvements to the water works system and \$15,000 for the municipal electric-light plant.

**WAUKEGAN, ILL.**—The committee appointed to investigate different street lighting systems has recommended the installation of ornamental standards carrying five-lamp clusters on Genesee and Washington Streets.

**WHITEHALL, ILL.**—The City Council is considering the question of installing a municipal electric-light plant in Whitehall.

**WINNEBAGO, ILL.**—A movement has been started to secure the installation of an electric-lighting system in Winnebago. C. W. Mellen is interested in the project.

**BUTTERNUT, WIS.**—Bids will be received by Charles F. Graf, secretary, until Aug. 1, for the construction of a combined grade and union free high school building at Butternut. Separate bids will be received at the same time for plumbing, heating and electric wiring. Henry Wildhagen, of Ashland, is architect.

**DORCHESTER, WIS.**—The Wells Electric Construction Co. it is reported, is interested in a project to install an electric-light plant in Dorchester.

**FOND DU LAC, WIS.**—The Eastern Wisconsin Ry. & Ltg. Co., of Fond du Lac, it is reported, is contemplating extending its system into the eastern and western sections of the city. J. P. Pulliam is general manager.

**MENESHA, WIS.**—The City Council is considering replacing the present arc-lamp street lighting system with incandescent lamps.

**MILWAUKEE, WIS.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Aug. 14 for construction, complete, including plumbing, gas piping, heating apparatus, electric conduits and wiring, interior lighting fixtures and approaches, of the United States Appraisers' stores at Milwaukee, Wis. Drawings and specifications may be obtained from the above office or from the custodian of site at Milwaukee, Wis. O. Wenderoth is supervising architect.

**TOMAHAWK, WIS.**—The Tomahawk Ltg. Tel. & Improvement Co. is changing its plant from 133 cycles to 60 cycles. All machinery has been contracted for.

**VIROQUA, WIS.**—The installation of an electric-light plant in Viroqua is under consideration. Edwin M. Tainter is reported interested.

**CEYLON, MINN.**—The citizens have voted to install an electric-lighting system in Ceylon and to extend the water service.

**CLARA CITY, MINN.**—The Montevideo Ltg. & Pwr. Co., of Montevideo, is installing an electric-lighting system in Clara City; electricity for maintaining same will be supplied from the company plant in Montevideo and at Minnetonka. Overhead line material has been contracted for. The company will purchase some meters. E. A. Aspens, secretary and manager, has charge of the work.

**EVELETH, MINN.**—The City Council has offered the Home El. & Htg. Co. of Eveleth, \$130,000 for its property. The municipality proposes to take over the plant and operate the same.

**ELYSIAN, MINN.**—The Village Council has awarded the Consumers Pwr. Co. of Minnesota (Faribault division) contracts for lighting the streets of the village and for operating the pumping station. The company was granted a franchise in Elysian and will begin work on construction of the local distribution system.

**NORTHFIELD, MINN.**—The installation of an electric fire alarm system in Northfield is reported to be under consideration.

**AURELIA, IA.**—A petition has been presented to the City Council asking that a special election be held to vote on the proposal to install an electric-light plant. Two plans are reported to be under consideration, one to establish a municipal plant, the other to secure electricity from the plant at Cherokee.

**CHARLES CITY, IA.**—The Cedar Valley Pwr. Co., successor to the Charles City Htg. & Ltg. Co. has been granted permission to issue \$500,000 in bonds. The company proposes to purchase heating, lighting, power

and street car systems in several surrounding towns. A. L. Dodd, of Charles City, is secretary and general manager.

**CLINTON, IA.**—Plans, it is reported, have been completed for the installation of an ornamental lighting system on Lyons Boulevard.

**HOLSTEIN, IA.**—Preparations are being made by the Holstein Service Co. for the installation of an electric-light plant. The equipment to include a 100-hp Metz & Weiss oil engine directly connected to a Western Electric generator and exciter (already purchased) will be brought to town by Joseph K. Trauerman, manager, has charge of the work.

**IOWA FALLS, IA.**—The Iowa Ry. & Ltg. Co., of Cedar Rapids, is negotiating for a site for the new power plant just opposite the Iowa Falls. The company was recently granted a franchise.

**KEOKUK, IA.**—Bids will be received by G. Walter Barr, secretary board of education, Keokuk, until Aug. 1 for the construction of an electric-light plant, the city independent district of the city as follows: (A) for heating and ventilating; (B) plumbing; (C) electrical work; (D) general construction of work. Separate bids must be submitted for each division. Plans and specifications are on file in the office of H. E. Ratcliffe, architect, Keokuk.

**MEADVILLE, MO.**—The installation of a municipal electric-light plant in Meadville is under consideration.

**PATTONSBURG, MO.**—A franchise is reported to have been granted to O. L. Wright and G. E. Weaver to install and operate an electric-light plant in Pattonburg.

**ST. LOUIS, MO.**—Arrangements have been completed by the Franklin Avenue Improvement Association for improvements to the lighting system on Franklin Avenue, between Fourth Street and High Street.

**ST. LOUIS, MO.**—Plans are being prepared by the Union El. Ltg. & Pwr. Co. of St. Louis, it is reported, for the construction of two large buildings on its property on Charles Street, between Main and Tenth Streets, with a substation between. The total cost is estimated at \$1,500,000. A. C. Einstein is vice-president and general manager.

**BLAIR, NEB.**—The Council is considering the question of submitting the proposal to install a municipal electric-light plant to the voters.

**ARMA, KAN.**—The city of Arma is now constructing an electric-light plant and water works system. All equipment has been purchased. A. C. Moore, of Joplin, Mo., is in charge.

**GARNETT, KAN.**—Bids will be received by F. S. Mitchell, city clerk, until July 30 for furnishing material and construction of municipal electric-light plant and distribution system, including the following: 50-hp Corliss engine, one 100-kw, alternating-current generator, switchboard, etc., one 150-hp return tubular boiler; material for distribution system, including transformers, poles, etc. Plans and specifications are on file in the office of the city clerk, and copies can be obtained at the office of Worley & Black, consulting engineers, Reliance Building, Kansas City, Mo.

**HOISINGTON, KAN.**—Plans are being prepared by the Hoisington El. & Ice Co. for the installation of an ornamental street-lighting system. The present plans provide for 24 standard incandescent three-lamp clusters, maintained by underground wires, to cost about \$1,500. J. R. Murphy is manager.

**MINERAL, KAN.**—The Empire District El. Co., of Joplin, Mo., it is reported, is negotiating erecting a transmission line from its substation in Scammon to Mineral, to furnish energy to the mines to be opened here.

**PITTSBURG, KAN.**—The contract for the poles for the ornamental lighting system (combined trolley pole type) has been awarded to the United Iron Works Co., of Pittsburg. The plans provide for the installation of 173 100-watt and 18 60-watt, type C. Mazda lamps, maintained by overhead wires. The cost of the system is estimated at \$13,000. L. E. Curfman, city engineer, will have charge of the work.

**SALINA, KAN.**—Improvements are being made to the electric and gas plants of the Salina Ltg. & Gas Co., which will include the installation of a new rotary converter to furnish power for street railway service.

**TOPEKA, KAN.**—The electrical equipment in the Auditorium, it is reported, has been condemned, and will be replaced. E. J. Stewart is electrical inspector.

## Southern States

**KINSTON, N. C.**—The City Council has engaged Gilbert C. White, of Charlotte, consulting engineer, to take charge of work on improvements to the municipal electric-light plant, sewer system and paving, for which \$100,000 in bonds were recently voted.

**MORAVIAN FALLS, N. C.**—Plans are being considered by the Moravian Falls Milling & Pwr. Co. for the construction of a dam 35 ft. high, to raise the water level of the dam. J. T. Humphries is manager.

**FLORENCE, S. C.**—Preparations are being made by the Florence El. & Utility Co. to install new equipment to double the output of its plant.

**WALHALLA, S. C.**—Preparations are being made for the installation of a municipal electric-lighting system, for which \$6,000 in bonds have recently been voted. Electricity for operating the system will be obtained from the Walhalla Ltg. & Pwr. Co. W. M. Brown is Mayor.

**WALTERBORO, S. C.**—The installation of an electric-lighting system in Walterboro is under consideration.

**CONYERS, GA.**—The Panola Ltg. & Pwr. Co., of Conyers, is completing increasing the output of its hydroelectric plant by 500 hp and transmitting electricity to Lithonia a distance of 30 miles.

**GAINESVILLE, GA.**—Contract has been awarded by the Southern Ry. Co. to Fort & Boyd, Charlotte, N. C., for construction of substations at Gainesville and Howell, in connection with the installation of automatic electric block signals between Gainesville, Atlanta and Austell. B. Herman, of Washington, D. C., is chief engineer.

**ROCKMART, GA.**—At an election to be held Aug. 6 the proposal to issue \$5,000 in bonds for extension to the municipal electric-light plant will be submitted to the voters.

**VALDOSTA, GA.**—The City Council is considering the question of installing a municipal electric-lighting system. J. I. Peoples of Valdosta, Ga., light committee has been authorized to make investigations.

**FORT MEADE, FLA.**—The City Council is considering the question of calling an election to vote on the proposal to issue bonds to purchase the local electric-light plant.

**ZEPHYRHILLS, FLA.**—The installation of an ice plant in connection with its electric plant is contemplated by the Zephyrhills El. Co.

**MORRISTOWN, TENN.**—The Southern Ry. Co. has awarded the contract for construction of substation in Morristown to I. C. Powers, of Knoxville. The station will furnish electricity for operating the automatic block signals between Morristown and Knoxville.

**BIRMINGHAM, ALA.**—The Yolande Coke & Coke Co. has contracted with the Alabama Pwr. Co. to furnish electricity to operate its mines at Yolande and Abernethy beginning next October. Right of way now being secured for the transmission line.

**FALLS CITY, ALA.**—D. W. Day, Jr., of Hartsells, it is reported, is contemplating the construction of a hydroelectric power plant with transmission line to Jasper, 10 miles long. Present plans provide for two generating units, one of 200 hp and the other of 300 hp.

**RIPLEY, MISS.**—A franchise to establish an electric-light plant in Ripley, it is reported, has been granted by the city.

**TUPELO, MISS.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Aug. 26 for the construction of plant including mechanical equipment, lighting fixtures and approaches, of the United States post office at Tupelo, Miss. Drawings and specifications may be obtained from the above office or from the custodian of site. O. Wenderoth is supervising architect.

**BILLINGS, OKLA.**—Bonds to the amount of \$7,000 have been voted for the installation of a municipal electric-light plant in Billings.

**BLAKESWELL, OKLA.**—The Council, it is reported, will submit the proposal to issue bonds for a municipal electric-light plant to the voters.

**DURANT, OKLA.**—The City Council entered into a contract with the Durant Electric Co. to install and operate a municipal electric-lighting system and a pumping station for a period of six years. The municipal generating plant will be closed down.

**DALLAS, TEX.**—Contracts for install electric-lighting fixtures and fans in a new municipal building has been awarded to the Egan Fixture Co., of Dallas, Tex.

**MEXIA, TEX.**—The Mexia Wtr. & L. & Pwr. Co., recently organized, will make extensions and improvements in the electric-light plant, at a cost of about \$25,000. Contracts have been awarded for new power house and additional machinery. The present plans provide for doubling the output of the plant. O. H. Brannon is general manager.

**TAFT, TEX.**—The Taft Oil & Gin Co. will erect a new ten-stand gin plant at Taft, which will be an addition to one now operated by the company. Contracts for machinery for gin and power plants have been placed. The plant recently destroyed by fire was located at Sinton and will not be rebuilt this year. R. F. Isbell is manager.

**WACO, TEX.**—The installation of an ornamental lighting system in the business district is under consideration.

## Pacific States

**KALAMA, WASH.**—Bids will be received by H. A. Pryde, town clerk, Kalama, until Aug. 1, for furnishing electricity to the town of Kalama to maintain approximately 100 incandescent lamps and 25 arc lamps and for such additional power as may be needed. A continuous service will be required. Proposals to be submitted upon five and ten year contracts, respectively.

**REPUBLIC, WASH.**—The County Commissioners have granted a franchise to Mahlon McCain and Frank Shields to erect transmission lines on all roads in Ferry County. Lee F. Austin, of the Austin-Cain Co., states that his company will build a high-tension transmission line, which will start within 60 days. At Danville, Washington, Republic, the lines will connect with the transmission line from Bennington Falls, B. C., owned by the West Kootenai Pwr. & L. Co., from which energy will be obtained to supply the Republic district.

**SEATTLE, WASH.**—Bids will be received by Major J. B. Cavanaugh, United States Engineer Office, Burke Building, Seattle, until Aug. 10, for furnishing and installing electrical equipment and operating machinery in the locks of the Lake Washington Government Canal in Seattle. The cost of the equipment and work is estimated at about \$150,000. The original bids were recently rejected, the government considering them too high.

**ASTORIA, ORE.**—The Pacific Pwr. & L. Co., Portland, expects to erect within the next 30 days a line of 22,500-volt transmission line to supply energy to the Tacoma dredging Co., for dredging for the new municipal dock. The Hammond Lumber Co. & Co., of Astoria, Ore., recently announced that it has purchased a 1000-hp. General Electric turbine. J. B. Kilmore is general manager.

**DRAIN, ORE.**—The City Council has decided to sell \$6,000 in bonds to provide electricity to maintain the plant will be obtained from the Douglas County L. & P. Co., of Roseburg, which will extend its transmission line from Winchester to Drain.

**EUGENE, ORE.**—J. C. Gilman, president of the Oregon El. Co., recently announced that as soon as water rights on Clear Lake, 75 miles east of Eugene, are granted by the State of Oregon and the United States Government, work on the construction of a \$5,000,000 power plant can be started. The company proposes to install power plants capable of developing 90,000 hp. (combined) at the base of the Cascade Mountains, water to be carried from Clear Lake to the plants through a canal. Preliminary surveys have been made.

**GLENDALE, ORE.**—The Oregon-California El. Co., which recently purchased the plant, contemplates extending its transmission lines from Glendale to Hildreth, a distance of 20 miles.

**PORTLAND, ORE.**—The Pacific Pwr. & L. Co., of Portland, is erecting about 15 miles of 66,000-volt transmission line to connect an isolated plant in Pomeroy, Wash., to its high-tension system that now extends to Dayton, Wash.

**PORTLAND, ORE.**—The Portland Ry. & L. Pwr. Co. expects to erect within the next three months 8 miles of 66,000-volt transmission lines and to make regular extensions to its distribution lines. O. B. Caldwell is general superintendent of light and power department.

**SALM, ORE.**—The application of George W. Salm, of Portland, to appropriate 500 ft. of water power second from the Clark-Salm River for the development of a power plant, has been approved by State Engineer. The company which Mr. Holcomb represents is reported to propose to construct a power plant, at a cost about \$100,000, work to begin this season. Plans provide for an 80-ft. dam.

**SANDY, ORE.**—The City Council has granted the Portland Ry. & L. Pwr. Co. franchise to furnish electricity here. The city has also granted a transmission line to the Bull Run plant to Sandy.

**ALAMEDA, CAL.**—Bids will be received until July 28 for an exciter generator (directly connected) for the municipal electric-light plant. Specifications are on file in the office of A. D. Goldsworth, secretary, City Hall, Alameda.

**EUREKA, CAL.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Aug. 25, for an oil-burning plant for heating boiler in the U. S. Customs post office and custom house at Eureka, Cal. For details see proposal columns.

**FRESNO, CAL.**—The contract for the installation of the electrolier system in the business district has been awarded to the NeLage-McKinley Construction Co., of Seattle, Wash., at \$15,600. The plans provide for 483 standards carrying five-lamp clusters.

**GRENVILLE, CAL.**—The State Railroad Commission has authorized the Round Valley R. R. Co., of Greenville, to lease its property to the Plumas L. & Pwr. Co., of Greenville, to use the property for power. The Indian Valley El. L. & Pwr. Co., of Greenville, has also authorized the Plumas L. & Pwr. Co. to lease a portion of its property to the City of Greenville. The two leases are part of a transaction by which water stored in the Round Valley Water Co.'s reservoir is to be used for developing hydroelectric power.

**HOLTVILLE, CAL.**—The Holton Pwr. Co., of Holtsville, has applied to the State Railroad Commission for permission to issue \$200,000 in bonds, the proceeds to be used for extensions to its generating and transmission systems.

**SALT LAKE CITY, UTAH.**—The Capitol Commission has awarded the contract for furnishing lighting fixtures for the State capitol building to Mitchell, Vance & Co., of New York, for \$25,000.

**PRESCOTT, ARIZ.**—The Navajo, made of the Bridal Veil, Moon and Navajo, and Beaver falls in Cataract Canyon, with a view of developing the water power to generate electricity. It is estimated that 7000 hp can be developed. W. E. Johnson, of Prescott, is interested in the project.

**CARSON CITY, NEV.**—The Secretary of the Interior has authorized the Reclamation Pwr. Co., of Oakland, Cal., for the lease of the electric power plant, substation and transmission line of the Truckee-Carson Irrigation project, Nevada, subject to the sales of power to be made, for a term of ten years, beginning Sept. 1, 1914.

**ALBUQUERQUE, N. M.**—Plans have been completed for the installation of a new street-lighting system (to replace the present system) which will provide for 115 type C, nitrogen lamps of 200 cp, 28 ornamental brackets carrying four-lamp clusters (40 type tungsten lamps) and 24 ornamental Mazda lamps. Order for equipment have been placed. The company will do the installation work. A. F. Van Dine is manager.

**LAS CRUCES, N. M.**—The Las Cruces El. L. & Ice Co. expects soon to purchase a Deisel type crank oil engine, probably directly connected to a 150-kva, 2300-volt generator. D. W. Morgan is manager.

## Canada

**EDMONTON, ALTA.**—Plans are being considered by the officials of the Edmonton Interurban Street Railway for equipping the railway to St. Albert for electrical operation. Bion J. Arnold, of Chicago, Ill., is consulting engineer.

**NELSON, B. C.**—The Canadian government has announced its intention of erecting a telephone line along the west side of Kootenay Lake, from Pilot Bay to Kootenay. It also intends to build a telephone line from Nelson to Waneta, a distance of 60 miles. Appropriations have been made for the work.

**THE PAS, MAN.**—Tenders will be received by H. E. Elliot, M. D., secretary and treasurer of the city of The Pas, until Aug. 11, for furnishing machinery and equipment as follows: (A) Two sewerage lift pumps; (B) Two sewerage lift pumps; (C) for construction of electric house meters; and (D) Underwood, consulting engineers, of Saskatoon, Sask., at the office of the resident engineer, The Pas. A complete set of plans and specifications may be obtained on deposit of \$25, and a set covering all contracts on deposit of \$150.

**IROQUOIS, ONT.**—Tenders will be received until July 26 for improvements to

the municipal electric-light plant, plans and specifications for the same may be obtained at the office of Allen McInnis, town clerk, Iroquois.

**KINCARDINE, ONT.**—The by-law providing for the installation of an incandescent street-lighting system has been approved by the council.

**MONTREAL, QUE.**—The Montreal Arena Co. is contemplating the installation of an artificial ice manufacturing plant to be equipped with electrically operated machinery. J. Benoit, of Montreal, is designing the electrical equipment.

**OTTAWA, ONT.**—Tenders will be received by R. C. Desrochers, secretary of the Department of Public Works, Ottawa, for construction of steel gas, towers and operating machinery for the regulating dam, Big Chaudiere Falls, French River, Ontario. Plans and form of contract can be seen and form of tender obtained at the Department of Public Works, and at the offices of the district engineers, Confederation Life Building, Toronto, Ont., and St. Catharines, Ont.

**ST. CATHARINES, ONT.**—An estimate for an ornamental street-lighting system covering a number of streets has been submitted to the Council by J. S. Campbell, chairman of the St. Catharines Civic Hydro-Electric Commission. The estimate for 105 single lamp standards mounted with 1000-cp lamps on St. Paul, Queen and George Streets, to cost approximately \$11,304, for 61 standards carrying 100-watt lamps on Church and Ontario Streets, \$6,692.

**TORONTO, ONT.**—Tenders will be received until July 30 for lead-covered cable for the Toronto Electric Commissioners. Plans and specifications may be obtained from the chairman of the commissioners, 225 Yonge Street, Toronto.

**SHERBROOKE, QUE.**—The City Council has decided to erect a new street-lighting system and the installation of the main streets, estimates of cost of the latter is now being prepared by the electric committee. For experimental purposes the committee will install 1000-cp lamp standards for street lamps. An appropriation has been made for 2000 meters. It is engaged to have a consulting engineer will be engaged to do the construction with the city engineer for the construction of an additional dam at the municipal electric-light plant on the Magog River.

**PRINCE ALBERT, SASK.**—Tenders will be received by J. B. Brown, city clerk, Prince Albert, until Aug. 15, for furnishing the following apparatus: (C) two 2500-gal. per minute pumps with motors and piping; (D) one 14-in. vertical meter. Specifications may be obtained from Angus Smith, city engineer.

**PRINCE ALBERT, SASK.**—The city has authorized that the option between the city of Prince Albert and Kittle & Co., Ltd., of London, Eng., be given to the latter. The company is given 60 days in which to decide whether it will accept the amended agreement for taking over the La Colle Falls power project. The city has expended \$1,000,000 and has built a street railway system.

**SASKATOON, SASK.**—The by-law appropriating \$15,000 to purchase a site for a new power house has been approved by the ratepayers. Contracts have been awarded by the City Council for one steam driven centrifugal boiler feed pump, and two 4,000,000-cu. ft. motor driven centrifugal pumps to Escher, Wyss & Co., of Montreal.

## New Incorporations

**BLAIRSTOWN, N. J.**—The Blairstown El. L. Co. has been incorporated with a capital stock of \$100,000, by W. F. Vail, of New York, N. J., C. S. Shaffer, of Blairstown, and H. C. Hunt, of Sussex. The company proposes to build and operate lighting plant.

**WILMINGTON, N. C.**—The Wilmington & Port Fisher R. R. & Power Co. has been incorporated with a capital stock of \$100,000 to construct a railroad to be operated by electric or other power from Wilmington to Port Fisher Beach, a distance of 18 miles.

**SPAVINAW, OKLA.**—The Kay Wtr. & Pwr. Co. has been incorporated by Walter E. Kay, Thomas H. Owen and others.

**CANYON CITY, NEV.**—The Canyon Pwr. Co., a California corporation, has filed articles of incorporation with the Secretary of State. The company is capitalized at \$1,000,000 and the incorporators are: M. Grove, H. L. Breed, Charles Gross, J. E. Rowes and E. A. Herrmann, of Oakland, Cal.

**SEATTLE, WASH.**—The Lewis County L. & Power Co. has been chartered with a capital stock of \$5,000 by B. F. Walling, Jr., and L. E. Kirkpatrick, 641 New York Block, Seattle.



# Weekly Record of Electrical Patents

## UNITED STATES PATENTS ISSUED During Feb. 15, 1914

- 1,103,627. MOTOR CONTROL; B. Borland, Chicago, Ill. App. filed May 31, 1913. *See abstracts. Has special interlocking and electroresponsive devices.*
- 1,103,640. AUTOMATIC SWITCH FOR TELEPHONE SYSTEMS; A. H. Dyson, Chicago, Ill. App. filed July 20, 1905. Wipers first given a primary adjustment to select a group of contacts in the bank and then a secondary adjustment to select a contact in the group.
- 1,103,641. MULTIWELD SECONDARY; E. Fulda, New York, N. Y. App. filed Feb. 18, 1914. Number of pairs of work-engaging electrodes supplied equally with current from the same transformer secondary.
- 1,103,646. METHOD AND MEANS FOR FIXING NITROGEN; W. S. Landis, Niagara Falls, N. Y. App. filed Apr. 3, 1914. Feeds nitrogen to a carbide charge and electrically heats to the point of ignition.
- 1,103,661. PROCESS AND APPARATUS FOR FIXING NITROGEN; W. S. Landis, Niagara Falls, N. Y. App. filed Apr. 3, 1914. Resistors buried in charge of carbide to which nitrogen is fed.
- 1,103,662. METHOD OF AND APPARATUS FOR FIXING NITROGEN; W. S. Landis, Niagara Falls, N. Y. App. filed Apr. 3, 1914. Resistor buried in carbide and out of contact with the circulating excess nitrogen in the charge.
- 1,103,673. EMERGENCY SIGNALING SYSTEM FOR TELEPHONE COILS; J. O'Connell, Chicago, Ill. App. filed July 13, 1912. Permits emergency signals being sent over "prepayment" systems.
- 1,103,679. COIL CASES FOR INSERTION IN CABLES; L. F. Rhodes, Short Hills, N. J. App. filed Feb. 7, 1911. Case for loading coil in submarine cables.
- 1,103,130. CONNECTION FOR COIL-CASES AND CABLES; J. Cunningham and W. H. Horner, Riverton, N. J. App. filed Feb. 7, 1911. For submarine cables.
- 1,103,133. PRINTING TELEGRAPH RECEIVER; A. F. Dixon, Newark, N. J. App. filed Jan. 9, 1913. Controlled by plurality of current impulses imparted over a single line conductor.
- 1,103,154. REVERSING SWITCH; W. S. Morse, Philadelphia, Pa. App. filed Nov. 1, 1912. Has adjustable parts.
- 1,103,171. SEALING PLUG FOR ELECTRICAL WATER HEATERS; R. A. Bower, San Francisco, Cal. App. filed Feb. 9, 1914. Watertight joint between switch chamber and water chamber.
- 1,103,192. ROTARY CONVERTER; V. A. Evin, London, Eng. App. filed June 12, 1911. D.C. voltage regulated independently of A.C. voltage without altering magnitude of A.C. voltage impressed on converter.
- 1,103,199. SWITCH; G. W. Hart, West Hartford, Conn. App. filed Nov. 26, 1913. Auxiliary circuit breaker of a remotely controlled switch.
- 1,103,206. DIVIDED SEMI-AUTOMATIC SIGNAL LEVER; W. K. Howe, Rochester, N. Y. App. filed Jan. 19, 1912. Return indication received at the lever.
- 1,103,220. COUPLING FOR ELECTRICAL CONDUITS; A. C. Proud, Princeton, N. J. App. filed Nov. 24, 1902. Cam nut compresses fingers of coupling upon the conduit.
- 1,103,244. SEPARABLE ATTACHMENT PLUG; E. G. K. Anderson, Chicago, Ill. App. filed Aug. 10, 1909. Yielding lock between the separable parts of the plug.
- 1,103,250. SEPARABLE ATTACHMENT PLUG; R. B. Benjamin, Chicago, Ill. App. filed Aug. 10, 1909. Special connection between the parts of the plug.
- 1,103,251. SEPARABLE ATTACHMENT PLUG; R. B. Benjamin, Chicago, Ill. App. filed Dec. 4, 1909. Separable by slight rotation of one part.
- 1,103,274. "ELECTRIC HEATER; H. W. Denhard, San Francisco, Cal. App. filed July 15, 1908. Water flows between positive and negative electrodes.
- 1,103,285. ELECTRICAL INSULATING COMPOUND; T. J. Hadley, Winnipeg, Manitoba, Canada. App. filed Sept. 29, 1913. Coal tar, kerosene, Portland cement and Japan drier.
- 1,103,288. SELECTIVE SIGNALING SYSTEM; R. N. Hill, Montclair, N. J. App. filed Mar. 21, 1912. "Answer-back" for party line signaling system.
- 1,103,294. ELECTRIC SIGN; L. H. & L. M. J. Wichita, Kan. App. filed Jan. 29, 1912. Controllable to flash words, symbols, etc.
- 1,103,309. ELECTRIC FURNACE; A. Minet & H. L. Lucas, Paris, France. App. filed Dec. 30, 1913. Resistance type for treatment of zinc ores.
- 1,103,353. ELECTRIC HEATER; G. Egly, Tregtrow, Germany. App. filed Jan. 9, 1912. Coats that part of heater which is coated or impregnated with a metal, with a glaze such as boracic acid.
- 1,103,358. METHOD OF AND APPARATUS FOR TEMPERING IRON AND STEEL ARTICLES; H. Hess, Philadelphia, Pa. App. filed May 1, 1911. Electromagnet selectively diverts the improperly heated articles, such as steel balls.
- 1,103,360. PICTURE EXHIBITING DEVICE; A. A. Jackson, Norwalk, Conn. App. filed Aug. 29, 1913. Pictures changed through control of thermostatic flasher.
- 1,103,379. METHOD OF GENERATING HEAT BY MEANS OF ELECTRIC ARCS; I. Renner, Stockholm, Sweden. App. filed Mar. 18, 1913. Employs three electrodes, one of them at right angle to the other two.
- 1,103,385. ELECTRICAL SYSTEM; R. Varley, Englewood, N. J. App. filed June 16, 1913. For gas engine ignition; has means for bringing a plurality of the coils into use.
- 1,103,405. AUTOMATIC REVERSING SWITCH; A. H. Fox & A. W. Lenderoth, New York, N. Y., and Stapleton, N. Y. App. filed June 11, 1913. For dynamos of car lighting system, etc.
- 1,103,411. FUSE PLUG; J. H. Hanson & J. W. Steele, Chicago, Ill. App. filed Jan. 12, 1913. Has plurality of fuses brought successfully into use.
- 1,103,412. SNAP SWITCH; G. W. Hart, West Hartford, Conn. App. filed July 29, 1912. Push button type.
- 1,103,421. CABLE TELEGRAPHY; I. Kitzes, Philadelphia, Pa. App. filed Dec. 5, 1907. Translates impulses received into the usual time-interval or Morse impulses.
- 1,103,438. STEERING WHEEL; R. H. Scheibert, Cincinnati, Ohio. App. filed Oct. 18, 1913. Has a circumferential series of embedded push buttons.
- 1,103,498. DIRECTION INDICATOR; A. Frauchiger, San Francisco, Cal. App. filed Jan. 13, 1913. For automobiles.
- 1,103,501. MULTIPHASE ELECTRIC MOTOR; H. Gearing, Los Angeles, Cal. App. filed Aug. 10, 1912. Power is selectively varied to accommodate different working conditions.
- 1,103,504. SOCKET CAP; J. H. Goss, Watertbury, Conn. App. filed May 29, 1913. Hub and cap united by rolling over or expanding.
- 1,103,506. HAIR STEAMING DEVICE; T. Grossert & E. Unger, New York, N. Y. App. filed Jan. 3, 1914. Electric heater coil for "waving" the hair.
- 1,103,511. SWITCH; W. S. Harlow, Swampscott, Mass. App. filed Apr. 29, 1909. For cutting in meter testing instrument in consumption circuit.
- 1,103,525. ELECTRIC SWITCH AND LOCK BOX THEREFOR; D. S. McKenna, San Francisco, Cal. App. filed Sept. 8, 1913. For autos.
- 1,103,528. CURRENT CONTROLLING APPARATUS; W. S. Morse, Philadelphia, Pa. App. filed Oct. 26, 1912. Double acting limit reversing switch.
- 1,103,529. ELECTRIC SWITCH; C. C. Newburn, Chicago, Ill. App. filed Oct. 2, 1911. Flunger and key operated type.
- 1,103,530. ELECTROMAGNET; C. C. Newburn, Chicago, Ill. App. filed Nov. 27, 1911. Vibrating armature construction for bells, etc.
- 1,103,533. ELECTRIC SOCKET PLUG; E. B. Nilsson, Chicago, Ill. App. filed Aug. 25, 1911. The screw shell terminal of the plug holds the parts together.
- 1,103,544. ELECTRICAL BINDING SCREW OR TERMINAL; S. Smith, Detroit, Mich. App. filed Feb. 16, 1914. Adapted to receive the conductor at various angles.
- 1,103,572. AUTOMATIC TELEPHONE SYSTEM; B. G. Dunham, Urbana, Ohio. App. filed July 12, 1909. Number of switches employed is varied to suit the volume of connected calls rather than the total number of subscribers.
- 1,103,583. SELECTIVE SIGNALING SYSTEM; R. N. Hill, Montclair, N. J. App. filed Mar. 21, 1912. Operation of circuit closing device at any way-station causes operation of impulse relay which closes circuit for local signal at main station.
- 1,103,585. CLASS DRAWING APPARATUS; H. F. Hittner, Mt. Vernon, Ohio. App. filed Mar. 3, 1909. System of motors of generators for glass drawing operations.
- 1,103,590. EXPRESSION CONTROLLING MEANS FOR MUSICAL INSTRUMENTS; J. F. Kelly, Pittsfield, Mass. App. filed Apr. 22, 1907. Electrical supports for "semiautomatic," etc., on automatic player pianos.
- 1,103,623. MULTIPLE BRUSH SELECTOR; J. N. Reynolds, Greenwich, Conn. App. filed Nov. 21, 1913. For switches of the "panel" type used in automatic and semi-automatic systems.
- 1,103,626. ELECTRIC ELEVATOR; R. S. Sanford, Yonkers, N. Y. App. filed Feb. 20, 1912. D.C. control; for automatically slowing down and preventing too sudden reversals.
- 1,103,657. ELECTRIC CIRCUIT CONTROLLER; V. A. A. & L. Cano, New York, N. Y. App. filed Nov. 28, 1913. Conductors supported normally out of contact on an insulating strip.
- 1,103,662. AUTOMATIC STARTING BOX; M. E. Custer, Carbonado, Wash. App. filed Feb. 26, 1913. Solenoids control resistances in definite order.
- 1,103,669. ELECTRIC MESSAGE INSTRUMENT; J. E. Gibbs, Cincinnati, O. App. filed Mar. 13, 1914. Roll with projecting body contacts.
- 1,103,688. ELECTRIC RELAY; W. L. Richards, East Orange, N. J. App. filed Feb. 8, 1913. Gaseous type, for amplifying feeble currents.
- 1,103,690. ELECTRICALLY HEATED INSTRUMENT; G. J. Schneider, Detroit, Mich. App. filed Dec. 11, 1909. Sad iron; parts secured together without use of screws.
- 1,103,693. ELECTRIC CIRCUIT AND MOTOR; H. M. Shedd, Roselle, N. J. App. filed Dec. 24, 1912. Motor runs at same speed either on D.C. or A.C.
- 1,103,748. ELECTRIC FITTING FOR CIRCUIT WIRING; M. F. Finkelstein, New York, N. Y. App. filed Nov. 17, 1911. For clamping the ends of circuit wires.
- 1,103,756. AUTOMATIC WATER TEMPERATURE CONTROL SYSTEM; F. R. Gebhardt, Montclair, N. J. App. filed Feb. 12, 1914. For bath tubs.
- 1,103,777. MULTIPLE FUSE PLUG; A. J. Kalinowski, Lyons, Colo. App. filed July 18, 1913. Fuses successively placed in circuit.
- 1,103,835. HIGH TENSION CURRENT SYSTEM; R. Raines, New York, N. Y. App. filed Mar. 9, 1912. For ignition purposes.
- 1,103,860. SIGNALING DEVICE; G. L. Barrett, Springfield, Ohio. App. filed Sept. 6, 1913. For announcing approach of car at a remote point.
- 1,103,898. METHOD OF ESTABLISHING VARIABLE PATHS FOR ELECTRICAL COMMUNICATION; E. E. Clement, Washington, D. C. App. filed Mar. 4, 1912. Conveys calls, when initiated, upon an distributes said calls among correlated interchangeable connective mechanisms.
- 1,103,905. OUTLET BOX; H. C. Mills, Unionville, Conn. App. filed Apr. 18, 1911. Especially adapted for lath and plaster partitions.
- 1,103,909. TELEPHONE SIGNALING SYSTEM; F. R. Parker, Chicago, Ill. App. filed Aug. 24, 1904. Employs signal lamps (not over 5/100 ampere (138 calls)).
- 1,103,916. ELECTRIC MAKE-AND-BREAK DEVICE; G. E. Lawrence, Philadelphia, Pa. App. filed Sept. 25, 1912. Water-level recording device.

# Electrical World

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## Opportunity at the Door

European wars and rumors of wars may serve to arouse this country to realize that the domestic evils with which it is contending are not so portentous as some people would have us think. There is much truth in the statement that all that business here needs is to be let alone. It has been tinkered with entirely too long. Politicians and budding statesmen who have no real knowledge of business but regard themselves as competent to legislate it into prosperity and humility have had much to say. If they had deliberately tried to paralyze industry they could not have done more to accomplish that end. Their efforts were not successful in leading to this end because of many blessings which help this country, including enormous crops and an American common sense that keeps business in steady operation under trying conditions. Our domestic troubles are so slight compared with what might happen in the event of a national crisis that business can afford to treat them somewhat lightly. With grave disturbance in foreign securities and productive and consuming centers there is every good reason why this country should have a wise commercial policy. It is not a matter of taking advantage of the troubles of others, but of brushing aside the web of distrust of business which obscures opportunity at the door. If the lawmakers will go home and give business a chance, if the Interstate Commerce Commission will render a reasonably satisfactory decision in the rate advance case, and if the local causes of conflict can be forgotten for awhile, there is a great work of production and distribution awaiting.

## Words and Legislation

The letter of the President to Mr. Thomas D. Jones in regretful acknowledgment of the request of that gentleman for withdrawal of his name as a member of the Federal Reserve Board recalls the hopeful words in which Mr. Wilson launched his policy of trust legislation six months ago. We read now the President's belief that the country cries out for "a new temper in affairs"; that "discriminations against particular classes" should be laid aside as unworthy; that the effort for peace and prosperity should be a united one "without partisan prejudice or class antagonism," and that we have "breathed too long the air of suspicion and distrust." These are fine phrases and, not doubting the sincerity of the Chief Executive in this matter, we can but conclude that they represent a genuine feeling that business has been oppressed and that a new spirit of co-operation should animate the land. The

only reason for not accepting such utterances as indicative of the activities of the administration is that the words are removed so far from the acts of other authorities. Where does the trouble lie? Is the President so far detached from his party that he does not present its ideas? Or is he merely trying to put the best aspect on a situation that he knows is viewed dubiously by others? Surely it is clear that the wholesome views of the President are not borne out by wholesome acts on the part of the administration as a whole. It is natural to hope for industrial peace and prosperity. Public admission that the old ways of mistrust of business are wrong is a small price to pay for a return of active trade. If the President will do so, he can use his vast influence to place business in its rightful place in the political discussions of our economic structure. Industrial life and growth are a large element in the vitality of the nation, and the party which tampers with them in ignorance or prejudice plays with fire.

## The Cities and Utilities

An imposing list of trustees for the proposed National Bureau of Utilities Research has been given out. The Mayor of Philadelphia, who appears to have been the main factor in organizing this new influence in public utilities, has named Mr. Louis D. Brandeis, of Boston, to be the head of the board of trustees. The other gentlemen who are announced as members of the board are not as radical in their known views and affiliations as Mr. Brandeis. Able as the membership of the board is, it is not experienced in the problems of public utilities. It cannot undertake successfully a work of research of the properties until it has an acquaintance with them. It will need competent assistants. The appointment of Mr. Brandeis does not give assurance that the movement will be void of spectacular political features. Only he can say whether he will make use of the methods that effectively advertised his work against the railroads. It would be unjust to condemn the movement in advance of its real inauguration and before the lines of its activities can be determined. The bureau is designed to represent only the cities. There is a distinct difference between representation of the people of the cities and representation of the mayors of the cities. In the one case the bureau will protect the rights of consumers, investors and employees; in the other there is a very serious danger that it will be used to promote the political fortunes of office-holders. If the correct principles underlying regulation are carried out properly by competent men, we believe that



state commissions can best determine issues between cities and utilities. State regulation takes from the city the power to control the utility on the ground that the city is too deeply interested in the outcome to decide questions judicially. The main legitimate work which the new bureau can do is to help the state commissions to solve questions fairly. The new bureau will not help to swing the pendulum toward the corporations, but we like to hope that it will at least be free from politics.

### German Central-Station Statistics

An abstract of the latest statistical report of the German association of central stations, which shows admirably the tendency of the times in central-station practice, is given in the Digest in this issue. The report covers only a small portion of the total number of plants in Germany, but those represented not only serve a large proportion of the consumers but are thoroughly typical in character, including stations of all sizes operated from all kinds of prime movers and representing very varied commercial conditions. Perhaps the most striking data are those relating to the varying price charged for electrical energy in Germany through the years from 1900 on. These show in a very remarkable manner the cheapening of service due to improvements in the art and to increase of facilities. The average price obtained in 1900 for energy for lighting was almost exactly 13 cents per kw-hr. At the end of 1912 it had dropped to practically 9 cents. Energy for motor service, starting at about 5¼ cents average during the same period, dropped to about 3¾ cents, and the decrease in each case went steadily on with no retrogressive tendency, although variations are shown from year to year owing to local conditions.

Here then is another clear evidence of the fact that electricity, now among the necessities of civilization, has dropped steadily in price during a period of rapid increase in general costs of living. The production costs, however, also fell off to a very much less extent numerically, but along a similar gradient. Comparing the works cost with the average price obtained, the gross difference per kilowatt-hour was somewhat more than 4½ cents in 1900 and about 10 per cent less in 1912. Meanwhile, especially in the last few years, there has been a tendency toward an increase in the number of large plants, the use of large generating units, and such a general development of the business as has left the central station in a better financial condition despite the lowered cost. It is the same story in Germany as here, intensive use of the larger plants, increase in the density of distribution, and, on the whole, lower costs, permitting a reduction in average price which again, through increased consumption, will leave the stations more prosperous than before. Doubtless some German stations, like some of our own, for a while had a hard struggle to build up a paying business, but the struggle is invariably a successful one. Central-station business is just beginning to reap the reward of a policy of liberal terms and active exploita-

tion that makes electrical energy a necessity instead of a luxury. All over the world electrical service is expanding to an extent which even a decade ago would have seemed almost impossible.

### Pumping for the Small Plant

In spite of modern central-station expansion one must recognize that the ordinary plant is a small one, serving a community of no great population or wealth, and that some of the most troublesome problems of management are found in the smaller enterprises. At the present time there is a very strong tendency to unite small plants and feed energy to the districts from a common source, and there is a general feeling that when this result is accomplished most of the difficulties may be overcome. It is unquestionably true that a small system can often purchase energy from a large station with economy as to the cost at the busbars, but as a matter of grim experience the difficulty with a small plant is less in the matter of generating energy than in the inevitable disproportionate expenditure for distribution. Considerable money is required to extend distributing lines to scattered consumers, and unless the density of the service can be increased beyond a certain point no reasonable economies in generating costs are likely to help very much. The real problem in the small plant, therefore, is to increase the density of the service so as to keep down the cost of distribution, and this means not only diligence in exploiting the service in the ordinary way, but ingenuity in finding new outlets for energy.

We have noted from time to time the efforts being made to supply the farmer with energy, and it certainly is well worth while for the manager of any central station operating in a rural community to see what can be done in this direction. Anyone who has examined carefully an exhibit of appliances for farm use realizes fully the great variety of work which can be done by electric power. But too often he forgets the facts as soon as his back is turned, and nothing is accomplished thereafter.

The particular phase of rural service to which we wish here to direct attention is pumping. Around every small town not equipped with a water system there are many houses the owners of which could well afford to install their own water-supply equipment if the matter were properly brought to their attention. Some of the more enterprising have used for this purpose windmills or gasoline engines, of which the former are unsatisfactory from their irregularity, and the latter somewhat troublesome unless kept in good trim all the time. A 1-hp or 2-hp electric-motor pumping outfit can be installed for a moderate sum, and where energy is available can be run at a cost quite certainly less than the fixed and operating charges on any other motive-power equipment. Moreover, such little motors can very readily be so arranged that they are not to be used during lighting hours, so that the load may be

wholly off the peak. When operated in connection with a storage system, the pumping load is rather steady and desirable, and the energy can well be furnished at a price which would put pumping within the means of every enterprising householder. A sufficient number of farm-houses and country houses exist in the vicinity of almost every small plant to give a considerable pumping load if the business were properly solicited. There are required, first, a reasonably cheap and good small pumping equipment, and, second, active co-operation between the manufacturer and the central-station man. Apparatus of this kind might very well be sold on the installment plan and at a very small margin for the sake of the high load-factor.

### The Use of Low-Voltage Lamps

Some four or five years ago working metallic-filament lamps at exceptionally low voltage was very seriously considered by some of the American manufacturers. At that time the sintered filament in customary use was so fragile when the lamps were made for the usual distribution voltages that much doubt existed as to the ultimate future of such lamps. As the art has progressed, particularly since the commercial introduction of the drawn-wire filament, the life of the tungsten lamps at the usual voltages has considerably improved, and the extreme fragility has been very much ameliorated. At present, with 15-watt lamps in ordinary use on 110-volt circuits, the need for the lower voltages seems to have in the main passed away in American practice, except in the case of lamps for use with storage batteries or for railway purposes. In such instances convenience in battery installation, on the one hand, and extreme vibration, on the other, still give the advantage to low voltage.

In England, where distribution circuits operated at from 220 volts to 250 volts are common, the situation is somewhat different. Even now the production of 220-volt metallic-filament lamps of small candle-power involves some mechanical difficulties, and there is no doubt that under such conditions a 14-volt lamp or even 56-volt lamp would have considerable advantage over the lamp designed for the normal distributing voltage. A plan now being introduced in Germany, where the higher secondary voltage is not uncommon, goes very much further, coming down to 14 volts at the lamps, operated either in small groups or even individually through secondary transformers. Obviously, one cannot do much local energy distribution at 14 volts, so that the use of small transforming units is imperative or so low a pressure. Apparently the German workers have obtained good results even from transformers down to a minimum output of 10 watts, which can be made to give an efficiency of very nearly 90 per cent. either the weight nor the bulk is prohibitive, even the very smallest transformers weighing not much over 5 oz. per watt of output, or about 1 lb. for a 10-watt lamp, which is small enough to be used on individual lamps even in a table fixture. Working thus at ex-

tremely low voltage, the lamp can be made very cheaply, is certainly relatively much stronger than a lamp of the same candle-power for ordinary voltage, and can probably be worked safely at rather higher efficiency.

Notwithstanding the ingenuity of the plan, we are not inclined to think that it will commend itself to American practice. The constant energy loss in the system, although not at all prohibitive, is still too considerable to be endured unless there is much gain, not immediately apparent, in the use of very low-voltage lamps. At the present efficiency of the drawn-wire tungsten lamps not much saving is to be made by the slight advantages which might inhere in the low-voltage filament, although the conditions are quite different with the gas-filled tungsten unit. On account of the losses by convection and conduction the low-current nitrogen-filled lamp is much less efficient than the high-current lamp of the same type. The gain by substituting for low-current, high-voltage lamps high-current, low-voltage gas-filled units equipped with step-down auto-transformers might be well worth while in many cases.

There is here no great demand for lamps of smaller candle-power than the present 15-watt standard. The 8-cp carbon-filament lamp has never made any headway in American practice in spite of its undeniable usefulness, and the tendency is steadily toward the use of the larger units. We do not see that the consumer has anything to gain by using low-voltage vacuum-type tungsten lamps and the promiscuous use of tiny secondary transformers would seem likely to bring with it to the central station a source of annoyances and complaints which it is advisable to dodge. There are cases, such as in sign and decorative lighting and the occasional use of lamps in positions where vibration is extraordinary, in which secondary transformation can be, and is in fact, used with good results. Moreover, an auto-transformer of very modest dimensions makes it possible to use low-voltage lamps of good efficiency, and without much additional trouble except in slight added complication of the wiring. In such instances practice here tends to the use of 27 volts to 30 volts, which still gives a strong and reliable lamp in candle-powers lower than would ordinarily be useful.

Expressed in other words, the low-voltage systems, interesting as they are, do not fit in with the well-settled tendencies of American practice, where the ordinary distributing voltage is easily adapted to the smallest lamps for which there is any real demand. And we do not see even in foreign practice how the plan can have very much to recommend it when pushed so far as to demand a universal system of secondary transformation. It is a very simple matter in the case of a 220-volt alternating-current system to split the voltage by means of an auto-transformer for residence use or for special exigencies elsewhere. For general purposes we are inclined to think that the improvements in metallic-filament lamps already well under way will make such extreme measures unnecessary save in a few exceptional instances.



# The News of the Week

## Activities and Events in the Electrical Field— Reports of Meetings—Commission Findings, Etc.

### Investigation of United Gas Improvement Company

An investigation by the Department of Justice of the United Gas Improvement Company has been nearly finished. No decision has been reached, according to Washington advices, as to whether a suit shall be brought by the government against the company under the Sherman anti-trust act.

### Trustees of Cities' Bureau of Utilities Research

The trustees of the proposed National Bureau of Utilities Research have been announced by Mayor Blankenburg of Philadelphia. They are as follows:

Mr. Louis D. Brandeis, Boston, Mass., head of the board; Dr. Charles R. Van Hise, president of the University of Wisconsin; Mr. S. S. Fels, manufacturer, Philadelphia; Mr. Frederick W. Taylor, consulting engineer, Philadelphia; Dr. Frederick A. Cleveland, director of the New York Bureau of Municipal Research; Dr. Leo S. Rowe, professor of political science, University of Pennsylvania; Mr. Charles F. Jenkins, publisher, Philadelphia, and Dr. Felix Frankfurter, professor of law at Harvard University.

The trustees will take the necessary steps preliminary to the meeting of officials of municipalities to be held in Philadelphia on Nov. 12, 13 and 14.

### N. E. L. A. Convention Committees, San Francisco, 1915

At a luncheon at the Hotel St. Francis, San Francisco, Cal., July 20, when preliminary plans were discussed for the reception of National Electric Light Association convention visitors next June, Mr. John A. Britton, chairman of the general convention committee, announced the following sub-committees:

Entertainment—W. W. Briggs, S. V. Walton. Finance—G. C. Holberton, Carl Heise. Hotel and local transport—F. H. Varney, William Goodwin. Ladies' auxiliary—T. E. Bibbins, J. G. DeRemer. Local registration—W. F. Neiman, C. J. Wilson. Meetings—S. J. Lisberger, R. J. Cantrell. Information bureau—R. M. Alvord, Tom Collins. Press—A. H. Halloran, F. S. Myrtle.

### Developments in Cleveland

Mayor Newton D. Baker of Cleveland announced on July 20 that the offer made by the city administration to purchase the property of the Cleveland Electric Illuminating Company is still open. Mr. A. B. du Pont has resigned as consulting engineer for the municipal lighting plant in Cleveland.

Mayor Baker, Director of Finance Thomas Coughlin, Director of Public Utilities C. W. Stage and Commissioner of Lighting F. W. Ballard of Cleveland have been made defendants in a mandatory injunction suit brought by Mr. J. N. Patton, a taxpayer, in an effort to secure certain records and books of the municipal light plant access to which, he claims, was denied him. He

is a public accountant and made an attempt some time ago to examine the books and records of the plant. He was interfered with in the work, he alleges, and finally his request to examine the cost sheets was refused on the plea that they are the private records of Superintendent Ballard. He asks for a temporary order restraining the officials from refusing to allow him to see the books and records and that the order be made permanent on final hearing.

Mayor Baker appeared in Common Pleas Court at Cleveland on July 22 and asked that the hearing on the suit be delayed in order that the city may learn who is responsible for it. Mr. Patton said that his firm, Messrs. Haskell & Sells, ordered him to make the investigation.

### Work of the Bureau of Standards

In his report to Secretary of Commerce Redfield, Director Stratton of the Bureau of Standards shows how many interesting features there are in the varied and extensive work of testing and investigation being conducted by that bureau. For some time the bureau has been working on safety rules to be observed in the operation and maintenance of electric generating stations and substations, and on the overhead and underground distributing wires in connection therewith, and a set of rules has been prepared for publication.

The report on mitigation of electrolysis damage in Elyria, Ohio, has been completed and was presented to the city, the gas company, the telephone company and the railway company some weeks ago, and accepted by all the interests involved. The railway company has promised to do everything recommended by the bureau, which will result not only in correcting very serious electrolysis troubles, but also in improving the street-railway service in Elyria and vicinity, improving the lighting of the cars, and saving enough money to the railway company to justify fully the total expense involved apart from the consideration of electrolysis mitigation. In other words, the bureau has shown the railway company how to effect considerable economies as well as to improve its service, by a rearrangement of its distribution system and the installation of negative cables for the return of street-railway current to the power stations. Because of these economies the railway company is willing to undertake the expense of new construction and new arrangement voluntarily.

In compliance with a request received from the Auto mobile Club of America for assistance in testing methods of eliminating "glare" of head-lamps, a method of accomplishing this has been devised and is being tested. Director Stratton recommended that a patent dedicated to the public be taken on this method.

One of the interesting and important pieces of work has been the establishment of a standard of radiatio of which not merely the light in the visible spectrum was measured but the total radiation visible and invisible was accurately determined. These determination have been completed with four radiometers and show most excellent agreement as to results, within 0.5 per cent compared with the previous calibration.

### Anti-Trust Legislation Makes Progress

During the last week the Senate has continued the debate on Section 5, dealing with what is or is not unfair competition, in the Newlands federal trade commission bill. The other trust bills are before the Senate in answer to the recent demand of senators that all the proposed trust legislation should be brought on the floor at the same time so that it might be compared and considered simultaneously.

It has developed, however, that the Newlands bill is to go back to the committee again. Senator Newlands announced that on July 28, when he said that the committee would take all the amendments that have been offered, and consider them, and bring in a new bill.

There seems little prospect of agreement in the near future on the trust legislation. The debates continue with but from twenty to twenty-five senators present at most times. The vice-president has adopted a system of counting as present, when there are demands for a quorum, those senators who are paired.

Eighteen republican senators who are remaining on guard have announced, through Senator Gallinger, that they will not attempt to create filibusters against the legislation, although they intend to carry their objections to a point just as far short of that extreme measure as possible. After the Senate finishes with the bills they will have to run an entirely new gantlet in the House of Representatives and in conference.

### Progress of Water-Power Legislation

On account of a situation in the House of Representatives exactly similar to that in the Senate, due to the absence of members, the administration was defeated on July 29, when the House amended the Adamson water-power bill, known as the proposed amendments to the general dam act. The House passed, by a vote of 123 to 45, the Sherley amendment to the Adamson bill. This amendment provides that there shall be reasonable annual charges for the use of water in navigable streams by water-power companies. At the present time it is believed unlikely that the bill will pass the Senate at this session.

Defending the Adamson bill, so-called, the chairman of the committee of the House having the proposed legislation in charge said during the debate in the House:

"If the gentlemen who are insisting upon the Sherley amendment had submitted that question in the conferences, an agreement might have been reached as to that which would have supplied some provision favorable to development, while at the same time protecting the interests of the government and the people. What the president's attitude would have been I am unable to say. Probably he would have agreed with Secretary Garrison that while we have the power to impose a tax it would not be the best policy to do so, especially as all the people in those parts of the country most interested and where the greatest development under the bill is expected were fearful that federal taxation would prevent development, and preferred to leave that as one of the sources of state taxation and support and in order that private capital might be had in aid of navigation.

"We have never been able to make the so-called conservationists understand the *modus operandi* of financing and constructing these dams and appurtenant works, nor did the Secretary of War seem to understand the situation, the idea being that a few transmission lines to light a few towns or run a few trolley cars constituted the full scope and limit of hydroelectric utility. I ordered to present that feature of the case to the Secretary of War the sub-committee invited two of the

most eminent water-power experts in the United States to appear before it, and a representative of the Secretary of War was present to hear the testimony. The difficulties in the way of securing capital made an impression on the Secretary of War, and it is to be regretted that they have not had a like effect upon gentlemen who, by their objections and amendments, are in reality, whether they so intend it or not, opposing this plan and obstructing progress."

The principal cause for the adoption of the Sherley amendment was a statement issued in Washington by Mr. Gifford Pinchot, of the National Conservation Congress, which had a great effect on members of the House.

### Mayor Curley on Boston Street-Lighting Proposal

In a vigorous communication issued Monday, Mayor James M. Curley of Boston, Mass., demanded immediate action by the City Council upon the proposed street-lighting contract offered by the Edison Electric Illuminating Company. A trenchant statement by the Mayor last week was summarized in the *Electrical World* of July 25, page 164. In the latest pronouncement the attention of the Council is called to the fact that the company will withdraw its proposition of \$87.53 per 6.6-amp magnetite lamp per year unless early action is taken by the city. The withdrawal would throw the city back upon the present price of \$103.54 and would cause it a loss at the rate of \$80,000 a year. Mayor Curley said that the company has offered to date the new reduced price from April 1, 1914, if the contract is accepted, and pointed out that the subject has been under consideration four months, during which time the Council must have received sufficient information upon every point entitled to consideration in the city's interests. Regarding the price offered, the Mayor said: "It appears from figures taken from the company's sworn returns, and from the estimate based thereon by the Finance Commission's engineer, that the price of \$87.53 will yield the company a profit of less than 6½ per cent without making allowance for depreciation charges. How then can we expect that private arbitrators, or the Gas and Electric Light Commission, would fix a rate below \$87.53 and thereby reduce the company's net return, after allowing for depreciation, below 6 per cent? No business man would expect a reduction in price below a 6 per cent profit basis."

Although personally in favor of the company's larger co-operation with unionists, the Mayor courageously said: "I cannot force the company to accept this view as a condition of obtaining the contract, nor is it my duty to make the attempt. There are only two parties to the contract, the city and the company, and neither can compel the other to accept the demands of a third person or persons not parties to the contract. My duty is not to any particular class in the community, but to all the people of the city, and in the performance of that duty I should not and shall not jeopardize the interests which the people as a whole have in securing a beneficial contract by injecting into a discussion of its terms an issue which has no proper place in the discussion." The Mayor said further that the proposed ten-year term is not too long in view of the fair price offered, pointed out that under the terms the city is entitled to two-thirds of the gain resulting from the adoption of improved equipment in the future, stated that the company and the city are willing to adopt an arbitration agreement by which each party shall select a representative, with a choice of a third member by these two, and contended that the city's financial interests are not on a vacation and that final action one way or the other should be taken at once.



## Ohio Electric Light Association at Cedar Point

Spirited overtime discussions, lively interest in standardization of distributing voltages and questions of municipal ownership, and an authoritative address on the indeterminate franchise were leading features of the twentieth annual convention of the Ohio Electric Light Association held at Cedar Point, Ohio, July 21, 22, 23 and 24. Approximately 400 delegates and visitors were registered and each of the sessions was well attended.

### President Martin's Address

Despite the fact that the past year has been one of depression for Ohio's public utilities, said President J. C. Martin, many problems have been met during the twelvemonth and solved with zeal and enthusiasm. Depression has been due largely to the agitation caused by anticipated changes by the national administration and to changes in certain local civic governments where "home-rule" charters have imposed more stringent regulation upon the utilities. In direct contrast to home-rule methods the speaker cited the fact that justice had marked the actions of the state utilities commission and that events had shown that body to be proceeding under a sound businesslike policy.

Notwithstanding municipal ownership wrecks, some voters still continue to be misled, continued Mr. Martin, into believing that an average city government can successfully conduct the affairs of an electric utility. This municipal-ownership fallacy and the equally fallacious home-rule theory have made utility investment in Ohio look unsafe. And just to the extent that capitalists regard investments in Ohio utilities as doubtful of a fair return, declared President Martin, must the people suffer from the retarded development of the utilities.

Ohio utility men are viewing the acts of the utilities commission with the hope that a broad, liberal policy will be adopted which will take account of the high obsolescence factor encountered with practically all electrical apparatus.

A decision stating what is a fair rate of return is still eagerly awaited, and the commission expects to take up this point in the Bucyrus case on Aug. 11. The utilities all welcome uniform accounting, which puts the municipal plant on an equal footing with privately owned enterprises so that the deficiencies of the former can be seen. In closing Mr. Martin called attention to the *Ohio Electric Light Association Monthly*, which is being published with profit to the association, through the energy and initiative of its secretary, Mr. D. L. Gaskill.

### Reductions Wanted in Fire Insurance Rates

Reports of the secretary-treasurer, executive committee and advisory committee, taken up in turn, showed the association to be in good standing financially. The procedure adopted this year of publishing papers and program in the *Bulletin* instead of spending funds for a souvenir program was heartily indorsed.

Reporting its unsuccessful attempts at securing fire-insurance rate reductions, the insurance committee recommended that member companies try inter-insurance as a means of reducing their premiums. Mr. L. T. Block, of the Utilities Indemnity Exchange, St. Louis, Mo., explained the principle of inter-insurance, wherein, he said, central stations are able to secure lower rates than with old-line companies. In the discussion which ensued Messrs. L. K. Funkhouser, Dayton; G. E. Miller, Cleveland; J. C. Martin, Wilmington, and D. L. Gaskill, Greenville, emphasized the fact that in return for \$72,000 of insurance premiums paid by Ohio utilities just \$682 had been repaid as fire-loss indemnities. Proper procedure for reducing these premiums, some declared, lies in securing a printed rate schedule from an

inspection bureau, studying clauses covering deficiency charges, and then making such changes about the plant as are necessary to bring the property into compliance with the rules. The Dayton Power & Light Company has reduced its insurance rate from 32 cents per \$100 to between 10 cents and 15 cents per \$100. Regarding insurance policies or contracts, it was said that in Ohio insurance companies cancel policies at will and without cause, and that the state laws provide no remedy unless a special non-cancellation clause has been made a part of the contract. Mr. G. E. Miller, Cleveland, contended that Ohio insurance laws need attention.

Technical reports were submitted by the committees on illumination, Mr. S. E. Doane, chairman; meters, Mr. A. H. Bryant, and electrical transmission, Mr. M. H. Wagner. Abstracts of these reports and of the discussion following their presentation will appear in a later issue.

### Uniform Accounting

Reporting for the committee on uniform classification of accounts, Mr. L. K. Funkhouser, Dayton, suggested that companies be divided into three groups according to their gross revenues and that each of these groups be further subdivided on the same basis for the benefit of the small companies. Details of the plan have not been completed.

Dr. Thomas Darlington, secretary of the welfare committee of the Iron and Steel Institute, New York City, delivered an interesting and instructive address on "Welfare Work in Industry" at the third session of the convention, Wednesday afternoon. Among other things, he predicted that every factory to get the best efficiency from its men will soon supply each with a toothbrush. Lantern slides showing the welfare work done by steel companies were used to illustrate the lecture.

### Industrial Motor Service

In an interesting paper on industrial motor service Mr. J. H. Mitchell, Columbus, optimistically outlined the work of the motor-service solicitor, stating that "the improbable power proposition of to-day is the probable one of to-morrow." Prospective business, said he, will develop almost automatically, provided that the present customer is served as efficiently as though he were a "live prospect," and that the motor-service salesman is known personally to the prospective customer as an exponent of the ideals for which central-station service stands. Following his outline of a typical motor-service report for a prospective customer, Mr. Mitchell said that one primary object of such a report is to secure business on a basis such that it may be retained when once connected. To this end the engineering side of the contract must be as clear and unbiased as though the motor-service salesman were acting as consulting engineer to the customer.

As the result of the discussion brought out by Mr. Mitchell's paper a motion was carried increasing the size of the new-business co-operation committee by adding three men who are motor-service specialists, so that the new 1914 committee now has nine members. In commenting on the paper both Mr. L. C. Anderson, Franklin, and Mr. D. L. Gaskill, Greenville, emphasized the value of motor load to the small company, stating that motor service often marked the dividing line between the dividend-paying and the non-dividend-paying company. Mr. W. R. Power, Ironton, pointed out the value of a trial motor-service installation as an inexpensive means of securing motor business and one avoiding the necessity of an engineering report, of which the customer, as a general rule, understands but a small part. Others who commented on the paper were Messrs. T. F. Kelly and F. B. Steele, Dayton; S. G. Hibben, Pittsburgh, Pa.; F. D. Elwell, Sidney; L. R. McCleary, Cin-

cinnati; W. R. Power, Ironton; J. E. North, Springfield; Samuel Scovil, Cleveland; Weare Parsons, Springfield; P. H. Kemble, Cincinnati; J. C. Martin, Wilmington, and H. W. Brooks, Toledo. In closing the discussion Mr. Mitchell advised reducing all quantities in an engineering report to "dollars and cents," for these, he declared, are terms in which the prospective customer is able to think most easily.

### Municipal Ownership

Municipal ownership is generally a misnomer, said Mr. H. J. Gordon, publisher of *Public Service*, Chicago, for the plants in question are usually bonded, and hence the profit is called interest. What is now designated municipal ownership should be styled individual ownership under political management. Basing his talk on data obtained in eighteen municipally owned Ohio plants, Mr. Gordon declared that misrepresentation and deceit practised on the public by city officials were the rule rather than the exception, for no official will admit the occurrence of an economic loss under his administration. Of the eighteen plants investigated all had made incomplete and misleading reports, and analysis of the true conditions showed that each was losing money. An average of their deficiencies showed that as a whole the rates of these plants ought to have been raised about 100 per cent. Instead, however, the trend of rates is downward.

Speaking in particular of the municipal plant at Reading, Ohio, Mr. W. W. Freeman said that, aside from the fact that its service is unreliable, energy purchased at 10 cents per kw-hr. from the Union Gas & Electric Company, Cincinnati, is really cheaper than 6-cent municipal energy, because, receiving energy at 250 volts, the municipal-plant customers lose 17 per cent in lamp efficiency and an additional 23 per cent on account of poor regulation. Thus not only is the plant losing money, but its customers are paying too much for the light they get.

The feeling among Ohio utility men at present is that the municipal-ownership tide must be stemmed and that the dividing line between municipal and private ownership lies in cases where the entire population is served. To show to what lengths city councils and even the voters can sometimes be led astray, a specific instance was cited by Mr. Glenn Marston, of Chicago, of a case at Hudson, Ohio, where the municipal plant showed 544 per cent loss in a year. Mr. Samuel Scovil cited the case of the Cleveland municipal plant, built ostensibly for the small customer and now advertising for large motor-service business. Mr. Thomas R. Woulfe, Cleveland, told of a small city that had increased its bonded debt 46 per cent to build a plant, although offered service and street-lighting at a figure lower than any other town in Ohio. Others who spoke were Prof. F. C. Caldwell, Columbus, and Messrs. P. H. Kemble, Cincinnati; J. C. Martin, Wilmington, and S. F. Messer, Kent.

### Report of Committee on Electric Vehicles

After sketching the history of the development of the electric "horseless carriage," the report of the committee on electric vehicles, Mr. M. E. Turner, Cleveland, chairman, stated that authoritative figures show 7085 commercial electric vehicles in use in the United States to-day. Of these, 2810 are to be found in the six principal cities of the country. The accompanying table shows conditions existing in Ohio.

Regarding rates for energy and costs of operation, the committee expressed its belief that a 5-cent rate for pleasure cars and a 3-cent rate for trucks are required to develop business rapidly. The average energy consumption of electric cars was given as 104 w-hr. a month for pleasure vehicles and 500 kw-hr. a

month for a 2-ton truck. Discussing sales methods, the advantages and disadvantages of central stations' handling electric vehicles were pointed out, and co-operation with local garages was suggested as the best means for promoting sales and avoiding the necessity of direct selling.

Owing perhaps to the length of time occupied by the discussion on municipal ownership not a great deal of

### ELECTRIC VEHICLE DATA FOR OHIO CITIES

City	Population	Number of Vehicles	Number of Trucks	Number of Buses	Number of Taxis	Number of Delivery Trucks	Rate per Hour
Cincinnati	100,000	100	10	10	10	10	Ext. High
Cleveland	200,000	200	20	20	20	20	10c
Columbus	150,000	150	15	15	15	15	10c
Toledo	100,000	100	10	10	10	10	10c
Dayton	110,000	110	11	11	11	11	10c
Youngstown	70,000	70	7	7	7	7	10c
Akron	60,000	60	6	6	6	6	10c
Bucyrus	8,122	None	1	1	1	1	10c

interest was shown in the report of the committee on electric vehicles. However, declared Mr. T. F. Kelly, Dayton, the report was interesting and the subject well presented. Those who spoke were Messrs. W. R. Power, Ironton; F. C. Caldwell, Columbus; F. Nelson Carle, Long Island City, N. Y.; C. W. Chappelle, Cleveland, and Mathias Turner, Cleveland.

At the Thursday afternoon session Mr. M. Luckiesh, Cleveland, delivered an instructive lecture on "Light, Shade and Color in Illumination."

### New Business Co-operation

Details were eliminated from the report of the committee on new-business co-operation, of which Mr. Thomas F. Kelly, Dayton, is chairman, by using as appendices reports of the committee's splendid meetings held during the past year at Toledo, Dayton and Cleveland. A paper by Mr. J. E. North, Springfield, describing the use of an electric cottage as an advertising scheme, was also appended to the report. The committee recommended that action be taken to allow the continuance of its work, and suggested that five meetings of commercial men of the association be held during the next year as follows: September, Toledo; November, Cincinnati; January, Cleveland; March, Dayton, and May, Columbus.

Perhaps the most interesting and helpful idea suggested during the discussion of the report was that of "renting" salesmen from one company to another. Mr. D. L. Gaskill, Greenville, said he had at one time secured a man from Mr. W. A. Wolls, Columbus, and at an expense of only \$25 had obtained a 400-hp motor-service contract. In this connection Mr. Wolls said that he thought all of the larger companies stood ready to give similar aid to their smaller neighbors. The question of hiring a man to work among several smaller companies, brought up by Mr. T. F. Kelly, Dayton, was also discussed, but the "renting" idea seemed best to fit present needs.

Making suggestions for the future work of the committee, Mr. P. H. Kemble, Cincinnati, declared that more attention should be given to ways and means of securing business with less selling expense. Concentrated effort should be placed on the particular branches of business which pay best and cost least to secure and serve. Others taking part in the discussion were Messrs. J. E. North, Springfield; W. R. Power, Ironton, and Glenn Marston, Chicago.



### Election of Officers

Following the report of the nominating committee, which consisted of Messrs. G. E. Miller, Cleveland; O. H. Hutchings, Dayton; W. J. Marshall, Warren; L. C. Anderson, Franklin, and W. A. Wolls, Columbus, the following association officers were unanimously elected:

President, Mr. C. V. Hard, Wooster; vice-president, Mr. W. J. Rose, Alliance; secretary-treasurer, Mr. D. L. Gaskill, Greenville. Executive committee—Messrs. F. J. Derge, Toledo, and L. C. Anderson, Middletown. Advisory committee—Messrs. F. M. Tait, Dayton; W. W. Freeman, Cincinnati; R. P. Stevens, Youngstown. Finance committee—Messrs. J. T. Kermode, Cleveland; F. O. Plymale, Gallipolis; Elam Fisher, Eaton. Meter committee—Messrs. A. H. Bryant, Cleveland; George E. Snider, Toledo; Ray Wolford, Newark; John Himes, Dayton; F. L. Allen, Columbus. Editorial committee—Messrs. D. L. Gaskill, Greenville; W. Parsons, Springfield; T. F. Kelly, Dayton; W. A. Wolls, Columbus. Illumination committee—Messrs. S. E. Doane, Cleveland; P. H. Kemble, Cincinnati; Emerson Franklin, Warren. Electrical transmission committee—Messrs. M. H. Wagner, Dayton; S. M. Rust, Greenville; E. E. Noble, Cleveland; W. R. Power, Ironton. New-business co-operation committee—Messrs. T. F. Kelly, Dayton; J. E. North, Springfield; J. H. Mitchell, Columbus; L. R. McCleary, Cincinnati; R. A. McGregor, Toledo; F. C. Morrison, Newark; H. C. Gillie, Cleveland; E. Quillen, Alliance. Electric-vehicle committee—Messrs. C. W. Chappelle, Cleveland; R. H. Wright, Cleveland; J. C. Matthieu, Dayton.

### Hon. Halford Erickson on the Indeterminate Permit

The indeterminate franchise or permit, said Hon. Halford Erickson, of the Wisconsin Railroad Commission, is the outgrowth of an effort to protect the public and at the same time to stimulate private initiative among public-utility owners. In Wisconsin, the first state to adopt the indeterminate franchise, the measure has been employed as a substitute for the ordinary franchise. Previously it was argued that the perpetual franchise gave the utilities too much power, led to excessive capitalization, and did not promote progressive public policy. Against the short-term franchise it was said that utilities were unable to get capital at a reasonable interest rate; that the rate per kilowatt-hour was high and service poor; that, knowing of the loss to be borne in the end, utilities frequently tended to let their plants run down, and that the provisions of even a short-term franchise were likely to become unfair to either party before the expiration of the time limit. With an indeterminate franchise, however, fair treatment is meted to all concerned. Adequate service must be rendered at reasonable rates, for the city controls the right-of-way, that is, the streets and alleys; it can buy the utility's business if it so elects, and it can, if it is the will of the voters, extend a similar franchise to a competitive company. Although some have chosen to style the indeterminate permit a creator of monopoly, Wisconsin's Supreme Court has ruled that such is not the case.

With the coming of public-service commission regulation cities were said to be shorn of their power over utilities, although previously they could only refuse extension of franchises with no assurance of better treatment from the utilities' successors. Combining commission regulation and the indeterminate permit, however, cities can regulate the quality of service, adjust rates and control streets by appeal to the commission, and, if deemed advisable, can acquire and operate the business of the utility at a fair value or can introduce competition.

Speaking of the fallacies in the competitive theory,

Mr. Erickson said that needless duplication of plant, distributing system, offices and business force double the fixed charges, greatly increase operating expenses, cause congestion of streets and highways with duplicate wires and result in waste of capital and high cost of service. Since it is impossible for either plant ever to be used for another purpose, competition in the long run comes to an end by merger, division of territory, or establishment of identical rates with the high cost of operation and hence high cost to the consumer still continuing. In closing, Mr. Erickson characterized the indeterminate permit as a measure relieving the utilities of amortization charges and affording more protection to both public and utilities than would any other form of franchise.

Following Mr. Erickson's paper, Hon. E. W. Doty, of the Ohio commission, and Mr. J. V. Oxtoby, vice-president of the Detroit (Mich.) Edison Company, declared themselves to be hearty supporters of the features of the indeterminate permit.

### Aid for Small Companies Making Appraisals

The report of the appraisal committee, of which Mr. Robert Lindsay, Cleveland, is chairman, stated that a model inventory had been made at Greenville on standard forms approved by the commission, and that copies had been mailed to all members. In reply to a question, Mr. L. B. Webster, engineer for the committee, said that a fund is available to defray expenses of a man to help small companies get their inventories started. Commissioner Doty said that one or two of the commission's employees would also be available for this work.

More than 125 ladies attended the convention, and for their entertainment a number of dances, musicales, card parties, launch rides and bathing parties were arranged by the entertainment committee.

## PUBLIC SERVICE COMMISSION NEWS

### Ohio Commission

The Cleveland Electric Illuminating Company has appealed to the Ohio commission from an ordinance enacted by the village of Lakewood, a suburb of Cleveland, requiring service at 3 cents per kw-hr. It declares that this rate will not yield sufficient revenue to pay operating expenses. The right of the village to fix a 3-cent rate is also questioned.

### California Commission

The Railroad Commission of California will begin the valuation of generating plants and transmission systems of power companies in California which supply more than one city with energy in an effort to equalize electric rates throughout the State. Among the companies which will be included in the investigation are the Western Power Company, Northern California Power Company, Oro Electric Corporation, Sierra & San Francisco Power Company, Coast Counties Light & Power Company and Coast Valleys Gas & Electric Company, and also the companies in the San Joaquin Valley and in the southern part of the State.

### Massachusetts Commission

The Massachusetts Gas and Electric Light Commission has issued its twenty-ninth annual report, covering the year ended June 30, 1913, and including about 700 pages of matter bearing upon the utilities under its jurisdiction. The board received the returns of 141 concerns selling gas or electricity and of thirty-six municipal plants during the year, one of the latter hav-

ing ceased to do business during the period. As usual, the report includes the full text of the board's decisions for the year, its recommendations for legislation as presented at the opening of the last session, reports upon matters assigned by the Legislature, statistics of companies and municipal plants, prices and other data. The electric companies of the State showed a gain in income of from \$13,580,031 in 1912 to \$15,128,212. The total surplus at the close of the year was \$3,740,000, as against \$3,536,198 in 1913. Twenty-one electric companies reduced their rates during the year. A full printed schedule of the commercial lighting and motor-service rates of each electric company at the close of the fiscal year is a valuable addition to the report. The appendices include the names of officers and directors of all gas and electric companies in the State as of the close of the fiscal year, the earnings and principal expenses, assets and liabilities of individual companies, an exhaustive report on voluntary associations, legislation of interest to gas and electric utilities and various other related material.

#### New Jersey Commission

The Board of Public Utility Commissioners has sustained the refusal of the Public Service Electric Company to furnish direct current for motor service in Trenton. The complaint in the case was made by Messrs. H. M. Voorhees & Brother, of Trenton. The commission held that as a general proposition the use of alternating current instead of direct current for motor service is more economical and equally satisfactory except under certain conditions where direct current is necessary. In its decision the board said:

"If the supply of alternating current is more economical to the Public Service company, the public is entitled to share in the economy by the reduction of rates for electricity supplied, the respondent being entitled under the decisions of the courts to a reasonable return upon fair value of the property reasonably devoted by it to the public use.

"This board is empowered to fix just and reasonable rates. If a saving should be made by the respondent in the supplying of alternating current instead of direct current, as will evidently be the case, it would be the duty of the board to give this consideration in investigating the company's rates and to see to it that the public receive the benefit of the saving or such part thereof as is consistent with a reasonable return to the company.

"It is unquestionably the duty of an electric company engaged in the supplying of electricity to furnish service to all who demand, except competitors. But it is not under obligation to supply a particular and costly kind of current demanded by a proposed customer if it is capable of furnishing another kind of service involving less expense and suiting the purpose of such customer equally well.

"The complainants do not stand in the same position as a person who has been a direct-current customer and, having invested in an equipment suitable for such current, is requested to change from one kind of service to another."

#### Pennsylvania Commission

Director Cooke of the Department of Public Works of Philadelphia has complained to the Public Service Commission of Pennsylvania in regard to the rates of the Philadelphia Electric Company. The commission was asked to make an investigation covering every phase of the organization, rates and service of the company. The complaint asked that the companies in the system be required to give information regarding the organization, capitalization, management and business efficiency and to give a fair valuation of the property.

The commission has been asked to fix a hearing some time during October. The complaint was made after the rejection by Mr. Cooke of the bid of the company for the 1915 street-lighting contract at \$1,250,000.

#### New York Commissions

The New York Steam Company has been ordered by the Public Service Commission, First District, to replace its present antiquated mains gradually with mains of a more modern type designed to minimize the troubles which have been a source of numerous complaints in the past. The steam companies were placed under the jurisdiction of the commission in 1913, and since that time the commission has made an exhaustive investigation into the methods of operation of this company. It was testified at the various hearings held by Commissioner Milo R. Maltbie that the heat from the steam pipes caused thousands of dollars damage yearly. Asphalt is melted frequently and this results in injury to the waterproofing of subways. Pavements have been ruined by the heat, and it is difficult for men to work in manholes in the vicinity of the steam pipes. Temperatures of the ground were reported as high as 220 deg. The company now has 14,567 ft. of mains of the modern-style construction out of a total of 73,553 ft. The commission's order required that 58,986 ft. of the old style be replaced by the modern type at the rate of not less than 12,000 ft. a year, beginning Sept. 1, 1914.

Commissioner Maltbie stated that attention was called to the fact that the ownership of the company is now vested in a charitable institution, depending upon the earnings of the company for its support. The commissioner holds that the present ownership of the company furnishes no valid reason why it should be permitted to maintain improper mains or to injure others.

#### Indiana Commission

Plans are under consideration within the Public Service Commission of Indiana to further possible action by the 1915 Legislature to amend the utility law. The main features of the law, it is understood, will not be changed but several minor amendments, relating particularly to telephone companies, may be urged.

A member of the commission is known to favor an amendment whereby small farmers' telephone exchanges and similar telephone companies will not be able to compel physical connection of their lines with larger systems.

Any attempt that may be made to tear down the Indiana utility law will come from the officials of cities and towns, a member of the commission said. He declared that published reports to the effect that utility owners might seek to abridge or hamper the work of the commission in the coming Legislature were not true. He said that utility owners throughout the State are anxious that the law be kept on the statute books.

#### Idaho Commission

The Supreme Court has decided to rehear the application made by the Federal Mining & Smelting Company for a writ of review of the order issued by the Public Utilities Commission. This company asked the commission for an order to permit it to inspect the books of the Washington Water Power Company to acquire information to prove the allegation made by the mining company that the rates charged by the power company for energy for motor service in the mining section of north Idaho were unjust and too high. The commission refused to issue the order. The mining company appealed to the Supreme Court for a review of the commission's order. Argument was heard once on the application, and now the court asks that it be re-argued.



## Current News Notes

**ANOTHER VETERAN INCANDESCENT LAMP.**—Employees of the Franklin (Pa.) Electric Company have an incandescent lamp which they declare holds the record for longest continuous use. This lamp, they report, has burned twenty-four hours a day for nineteen years, or a total of more than 160,000 hours.

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**CANADIAN WATER-POWER EXHIBIT AT SAN FRANCISCO EXPOSITION.**—The water-powers of Canada will be illustrated at the Panama-Pacific Exposition at San Francisco next year by a series of models of typical generating plants, grouped in a semicircle about an immense map of the Dominion to be placed in the Canadian Building. Every water-power, whether developed or in the prospective stage, will be shown on the great map, which will be a bird's-eye view of the Dominion drawn on a background 75 ft. long and 9 ft. high.

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**TROPICAL INSECTS FEAST ON INSULATION.**—Insects in the Philippines show distinct appetites for insulating material, as is proved by the ravages of ants and cockroaches on insulated wire and the like. Nor are these the only pests which the electrical engineer in the Orient encounters. House lizards seeking dark, cool places in which to rest often crawl into central-station customers' meters and lay their eggs on the magnetic-drag disks. The Philippine ants, too, like to build their nests in automatic signals. Annoyance from these native pests has, however, been prevented to a great extent by sealing up all openings with pitch.

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**ILLUMINATION IN LUXES, FOOT-CANDLES AND PHOTS.**—On page 182 of our issue dated July 25 appears the statement that one lux is equal to "one lumen per square centimeter." This should have read "one lumen per square meter." The lux is equal to 0.0929 lumen per square foot, or 0.0929 foot-candle. For the c.g.s. unit of illumination, which equals one lumen per square centimeter, Blondel has proposed the name "phot." The phot is equal to 929 lumens per square foot. One foot-candle is equal to 1.0764 milliphot. The above values and ratios are based on the international candle. The Hefner unit, which is used in Germany, is 0.90 of the international candle.

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**SERVICE RESTORED TWENTY-FOUR HOURS AFTER TORNADO WRECKED PLANT.**—Within twenty-four hours after electric service in Henderson, Ky., had been entirely interrupted by a tornado which wrecked the local electric plant, steam was again raised in the boilers which stood among the ruins. Residence and office-lighting service was restored about an hour later, and energy to operate the street-railway cars was being supplied the same evening. Although the boiler house was practically demolished, a new 200-ft. smokestack was not affected by the tornado. Mr. L. P. Hite, superintendent of the plant, estimates the loss to be about \$10,000, and reports that the station will be rebuilt immediately.

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**CONVENTION AFTERMATH.**—Reference has already been made in these columns to the handsome number of *Current News* issued by the Philadelphia Electric Company's N. E. L. A. Section to signalize the recent national convention of the association in its city. Not content to rest upon that excellent pre-convention effort, however, the memorable week of June 1 to 5 is now viewed in retrospect by the editors in equally entertain-

ing fashion in their June-July "vacation" number, which contains an informal record of the 1914 convention as it impressed the hosts of that occasion. *Current News* is edited by a committee composed of Messrs. A. L. Atmore, Charles Penrose, J. M. Fultz, R. B. Heilig and W. H. Donley.

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**WATER-POWER CONSERVATION.**—The proceedings of the Fifth National Conservation Congress, held in Washington, D. C., last November have been issued in two volumes now being offered for sale by the treasurer at \$2 per copy. One of the volumes treats of water-power subjects exclusively and is an important contribution to constructive literature in this subject. The other book contains the forestry reports. The secretary of the Congress is Mr. N. C. McLoud, 1201 Swetland Building, Cleveland, Ohio.

\* \* \*

**NEW RYERSON PHYSICAL LABORATORY, UNIVERSITY OF CHICAGO.**—A large addition has been made to the Ryerson Physical Laboratory of the University of Chicago at a cost of \$200,000, which amount was provided by Mr. Martin A. Ryerson, the president of the university board of trustees. The addition consists of three stories and a basement and is connected to the original building by corridors. It contains the liquid-air and refrigerating plants, the dynamos and motors, the machine and instrument shops and the switchboard controlling electrical distribution for the entire building. It has also two large laboratories for students, a lecture room and four rooms for research work. The entire building now contains about twice the space of the old and is said to be one of the best equipped physical laboratories in the world.

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### SOCIETY MEETINGS

**CHICAGO ELECTRIC-VEHICLE OUTING.**—The second annual outing of the Chicago Section of the Electric Vehicle Association of America and the Chicago Garage Owners' Association will be held at Palos Park, Ill., Aug. 12. A special train will convey the party from Chicago.

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**INDIANAPOLIS JOVIANS.**—Mr. Homer E. Niesz, of Chicago, was the speaker at the weekly Monday luncheon of the Indianapolis (Ind.) Jovian League, July 27. Mr. Maurice Cahill, of the Hotel Severin, followed Mr. Niesz with a talk on electricity in hotels. Mr. Norman A. Perry presided at the meeting.

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**SOUTHWESTERN CONVENTION FOR 1915.**—In accordance with action taken by the executive committee of the Southwestern Electrical & Gas Association, the next annual convention of the association will be held at Galveston, Tex., May 19, 20, 21 and 22. Mr. H. S. Cooper, 405 Slaughter Building, Dallas, Tex., is secretary.

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**CENTRAL-STATION OUTING ON COOPER LAKE, KEOKUK, IA.**—The High-Tension Club, made up of central-station employees from Keokuk, Hamilton, Warsaw, Nauvoo, Fort Madison, Montrose and Dallas City, recently enjoyed its first annual outing aboard the steamer *G. W. Hill*, making a trip up Lake Cooper from Keokuk to Fort Madison and return. Approximately 575 excursionists were aboard the boat. A feature of the day was a baseball game between the power-house team and the "uptown" or office forces at the old Mormon city of Nauvoo, the game ending in a tie score of 1 to 1. Mr. C. A. Sears, Keokuk, president of the High-Tension Club, was in charge of the outing.

## Pole and Tower Transmission Lines

Clearances between conductors and earth—Crossings with other circuits and joint use of poles—Trees and other obstructions on rights-of-way. By R. D. Coombs

IN general a transmission line should be designed to give the longest service consistent with reasonable installation and construction expense. The poles or towers, on which the continuity of the service depends so vitally, should be selected with care. Steel as a structural material has an indefinitely long life if properly protected against the ravages of weather, but, on the other hand, deteriorates rapidly if exposed. There are many galvanized-steel windmill towers which remain in good condition for twenty years, and painted-steel structures have lasted even longer. The probable average life of unprotected wooden poles is about ten years, while that of treated poles is from sixteen years to twenty years, depending on the method of treating.

Not enough time has elapsed since the development of reinforced concrete poles to make the data obtained thereon representative of the durability of reinforced concrete. Some poles made of this material have been in use for ten years, showing that it is comparable with steel as regards life.

### Clearances

Clearance between conductors and the earth is another subject which should receive consideration particularly, as it affects the safety of the public. Until recent years the only general specification of clearance made by engineers, or required by law, was that electrical conductors should clear highways or railway

tracks by 25 ft. In some cases 22 ft. has been allowed as a minimum clearance. Such clearances, however, like most early requirements in electrical transmission, are based on telephone or telegraph practice.

The overhead clearance necessary to permit a trolley pole on a large modern car to swing into its upright position, in case it accidentally leaves the trolley wire, may be assumed as the minimum limit. While overhead systems for alternating-current operation of railroads or interurban lines are as yet but few in number (the largest and best-known installation being that on the New York division of the New York, New Haven & Hartford Railroad), such construction should receive consideration in establishing a standard overhead clearance above railroad tracks. In installations of this character the railroad company would probably favor having its transmission circuits, if on a separate pole line, supported above all crossing lines except possibly those of a very high-tension system. Railroad trolley-contact wires, however, cannot be elevated above other crossing wires. The average minimum height of an overhead contact system is approximately 23 ft. at the center of a span and 28 ft. at the supports.

Linemen working on foreign wires, whether on joint-pole lines or not, should be protected from contact with electric-service wires by providing a reasonable space between the two lines or sets of wires. In this con-



FIG. 1—SNOW LOADS ON WIRES PARTIALLY SHELTERED BY TREES



nection mention may be made of one reason for requiring telephone and telegraph wires to be placed below electric-service wires either at a crossing or when strung on joint poles; that is, to prevent harmless wires dropping into contact with electric-service wires during the process of stringing or from the more frequent mechanical failure of the smaller telephone wires.

It should be remembered that the stresses upon the poles increase directly with the height and, in fact, more rapidly than in a direct ratio when there is no adjoining protection from the wind. Omitting considerations of contact and malicious injury, the lower a line is the more able it is to withstand destructive forces.

Assuming that an electric-service line is, as it should be, the higher line, or, in the case of several lines of different voltages, that the voltages decrease toward the ground, there should remain below these conductors a zone for harmless wires. This feature is especially necessary over highways, railroads or where such inferior lines exist or may reasonably be expected to exist in the near future.

The proper separation of conductors to prevent swinging into contact has never been definitely determined. It has been argued that long spans swing synchronously and that experience has shown that they may safely be spaced much closer than the distance required to provide for the maximum displacement. On the other hand, short spans with relatively greater separation have been brought into contact by what appear to be purely electrical causes.

It is doubtful whether engineers and executives realize the extent to which undesirable construction is installed owing to unsuccessful efforts to obtain the necessary concessions from outside interests. The presence of isolated trees, of no particular value perhaps, often compels the use of high poles or the unnecessary grading up of pole lines. Without wishing to appear an advocate of some of the common methods of "tree trimming," the writer believes that one large scraggly tree, more or less decayed, remaining along a curb line where



FIG. 2—STEEL POLES FOR 11,000-VOLT AND OTHER CONDUCTORS



FIG. 3—CONDUCTORS DEFLECTED BY HIGH WIND DURING STORM

the other trees are of recent regular growth should not be allowed to interfere with the proper location of all the wires in that street.

Everywhere throughout the country there are towns in which telephone and electric-service lines occupy all sorts of zones, gradually getting higher and higher, until the line last built is driven to pole heights extremely difficult to obtain. It will also be found that many telephone lines occupy the zone which should be used by future electric-service wires of higher voltage. Telephone or telegraph wires should be placed underneath electric-service wires, as it is impracticable to give the former a reasonable factor of safety against mechanical failure.

#### Tree Trimming

In order to provide and maintain sufficient separation between the conductors and neighboring timber, a rather indefinite amount of tree cutting and trimming must be done. The actual amount of such work will vary widely for different lines even in the same locality. For lines installed on streets the problem is, first, to select the most accessible and least-shaded street, and, second, to adjust the height of poles and the amount and character of trimming so as to obtain the maximum protection with the minimum of offense. In cross-country lines, however, particularly those on private rights-of-way, the problem is somewhat different. In this case there is usually some freedom of movement, permitting the installation of the line so as to avoid close contact and still retain the benefit of distant shelter. The latter advantage seems to be generally disregarded, and yet, provided sufficient separation is maintained to prevent falling contacts, the presence of timber land to the windward is to the writer's mind a considerable asset in the strength of the ordinary line.

Cutting down trees, while generally undesirable, cannot always be avoided, and its justification must necessarily depend upon the quality of the tree and the importance and position of the line. Some trees may outrank the ordinary transmission line, both in their real and their popular value, in so far as to compel a change in the route. Other trees are past their prime and of merely sentimental value to a limited number of persons. In still other cases permission for indiscriminate cutting may be obtained readily. A broad-minded liberal policy on the part of the electric-service company, coupled with considerable tact, will ultimately justify the cutting and trimming of trees.

Unpruned trees with long scraggy limbs, instead of being injured, will generally be improved by proper

In removing large limbs they should first be undercut to prevent slivering and then sawed through a short distance from the trunk. The entire stump should then be removed down to the trunk, even slightly inside the trunk, leaving a smooth surface, which may be painted when it has dried off. Otherwise, the stump will decay, and the rot will spread to the trunk, or else will start on the rough splintered surface of the cut at the trunk. Small limbs may be cut beyond any forks, or close to the trunk; upright limbs should be cut on a slant, and should be finished smooth and painted.

When an entire tree is to be cut down, only a short stump should be left and the top should be shaped into a smooth ridge or roof similar to that on a pole top.



FIG. 4—HIGH STEEL TOWERS PROVIDING CLEARANCE OVER RIVER

trimming. Dead or dying branches are of no benefit to the trees, but are serious menaces to the electric-service company's circuits and therefore should be removed from the immediate neighborhood of the line. The methods used in trimming trees need to be improved considerably. Apart from the occasional serious loss of popularity and prestige caused by the wanton cutting of trees, it is nothing short of criminal waste to injure grown timber unnecessarily. Where this country was once blessed with enormous forests, only a pitiful remnant remains and cultivation is almost unknown in pole timber land. It is no exaggeration to claim that every tree unnecessarily cut down or killed adds its mite to the future maintenance expenditures of the local electric-service company.

By exercising some care and skill it is possible to trim so that killed trees or non-permanent clearances should be rare. The season during which the trimming is done has considerable influence on the successful sealing of the cuts, and the best season for one particular tree may not necessarily be the best for all species. Birch, maple, apple, pear, etc., should be trimmed about June or at the beginning of the summer growth; that is, when the leaves are grown or the blossoms are in full bloom. These trees may also be trimmed without hurt in late fall and early winter. Oaks and sycamores may be trimmed from early summer to early spring.

Second-growth trees will usually sprout from the stumps so treated and will thus be available for lumber in the future. In protecting or patching large cuts or excavated rotten spots the wood should be smoothly cut away in the form of a pocket with undercut edges (as in dental work), and the cavity painted and filled with cement mortar. If guys are attached to trees without first inclosing them in shields, the trees will usually die or lose their value as guy stubs and may even become menaces to the line owing to their unstable condition. On private rights-of-way all trees, brushwood, sagebrush, etc., should be cut down and cleared out.

### A Microscopic Motor

Mr. I. T. Nedland, a jeweler of Hillsboro, N. D., recently exhibited at the University of North Dakota, Grand Forks, a working electric motor weighing 34 grains, the construction of which occupied his spare time for a month. The dimensions of the motor are as follows: Length, 0.563 in.; height, 0.291 in.; width, 0.336 in.; diameter of armature, 0.071 in.; diameter of commutator, 0.0106 in. The armature, which weighs 4 grains, has six slots and six commutator segments. A 2.5-volt battery supplies the energy for operating this tiny power unit.



## Municipal Street-Lighting Plant at Kalamazoo, Mich.

**Two-unit, 1200-kw station erected to replace obsolete equipment—Arc-lighting circuits rehabilitated and ornamental standards erected in downtown district**

**F**OR many years the arc-lighting service for the streets of Kalamazoo, Mich., was furnished by the old municipal station, which was equipped with arc generators which supplied energy to about 400 lamps. In the fall of 1912, however, the city issued \$140,000 worth of bonds for the erection of a new plant, the rehabilitation of its arc circuits and the installation of a system of ornamental incandescent standards in the business district. The new equipment was inaugurated on Feb. 12 of the present year, the ceremony serving as a fitting climax to the first civic rally held in Kalamazoo.

Situated in the outskirts of the city about 100 ft. from the Kalamazoo River, the station site has the advantage of being near a water supply and also on a spur track of the Michigan Central Railroad. The plot measures 540 ft. by 264 ft. Concrete foundations, a steel frame, and brick superstructure have been combined to produce a station building which is both modern and fireproof.

### The Turbo-Generators and Their Auxiliaries

The present generating equipment of the station consists of two General Electric 2300/4000-volt, three-phase, sixty-cycle, four-wire generators operating at 3600 r.p.m. and each capable of delivering 600 kw at 70 per cent power-factor. These machines are direct-connected to Curtis turbines which operate condensing. The turbine units take steam from the boilers at 200 lb. pressure and 150 deg. superheat and exhaust into Wheeler condensers. These condensing units are of the three-pass surface type and with circulating water at 75 deg. Fahr. are capable of handling 8500 lb. of steam

per hour while maintaining a 28-in. vacuum. In order to supply circulating water for the condensers, the concrete intake and discharge tunnels provided measure 3 ft. by 4 ft. in cross-section. The intake enters the station from the upstream side, opening into the river 7 ft. below the level of the water. The discharge tunnel conveys the water to a point several hundred feet below the station, where it is again returned to the river. Circulating pumps driven by 25-hp, 440-volt motors and capable of delivering 1200 gal. per minute lift the water from the intake tunnel and force it through the condensers. The motor-service circuit leading to these circulating pumps has been permanently connected through 2300/440-volt transformers so that the action of the circulating water is started as soon as the turbine is placed in operation. The vacuum pumps serving these two condensers are of the water-piston type manufactured by the Allgemeine Elektrizitäts Gesellschaft. Each pump is provided with two discharge openings, air being delivered through an opening at the bottom of the pump and water being taken off through a side opening. Each of these two pumps is driven by a direct-connected, 15-hp Terry turbine. Excitation for the main machines is furnished by 7-kw, 125-volt exciters mounted on the same shaft with the main machines. Either exciter has sufficient rating to supply direct current for the fields of both generators.

Standing 14 ft. from the north wall of the building, the seventeen-panel switchboard is divided into two sections, one made up of eleven black slate panels and the other of four double blue Vermont marble panels.

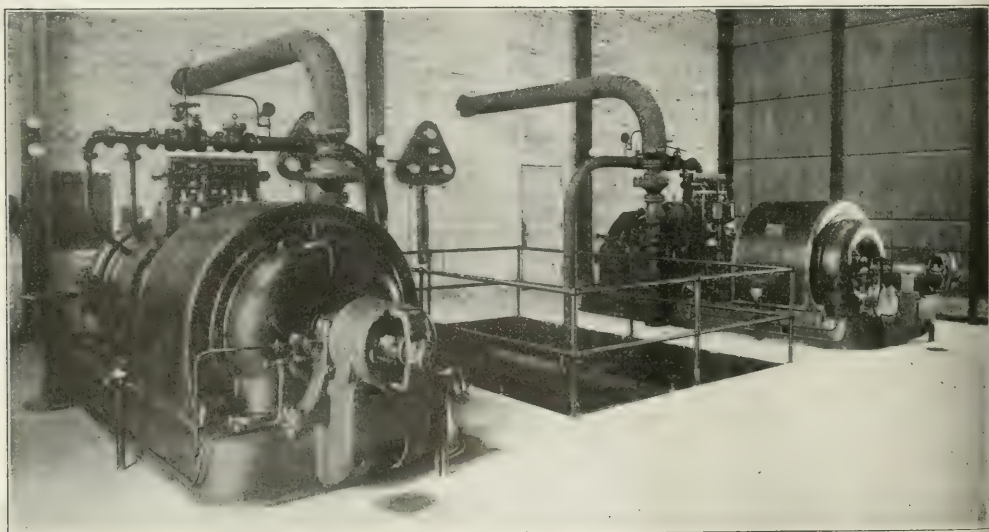


FIG. 1—TURBINE-GENERATORS WITH BRACKET-SUPPORTED EXCITERS IN NEW STREET-LIGHTING STATION, KALAMAZOO

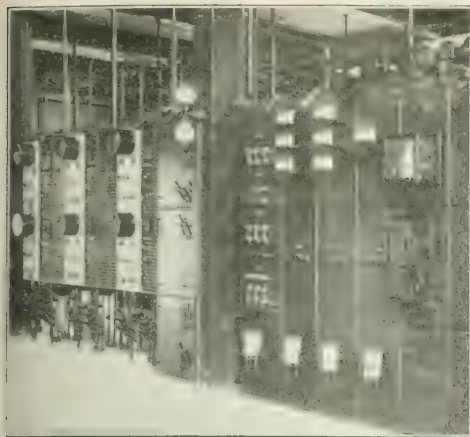


FIG. 2—ARC-LIGHTING PANELS AND SWITCHBOARD INSTALLATION

A cable duct provides passageway for the main leads across the station premises and an intervening roadway to a terminal tower erected about 75 yd. from the station. Reaching this tower, the cables are taken through iron-pipe risers to a height of about 25 ft., where flexible jumpers connect them to the pole-line leads. The tower itself is constructed of four 40-ft. cedar poles set on the corners of a square, with the convex side of each pole facing the center of the square. At a point about 10 ft. from the top of the structure a wooden platform has been constructed for the convenience of the linemen. Pine timbers of about the same size as the standard ten-pin cross-arm are used as braces at the top of the tower and also serve as supports for strain insulators and fuse switches.

Two 300-hp Wickes boilers in steel-jacket settings deliver steam at 200 lb. pressure. These units are equipped with Foster superheaters so that the steam is delivered to the turbines at 150 deg. superheat.

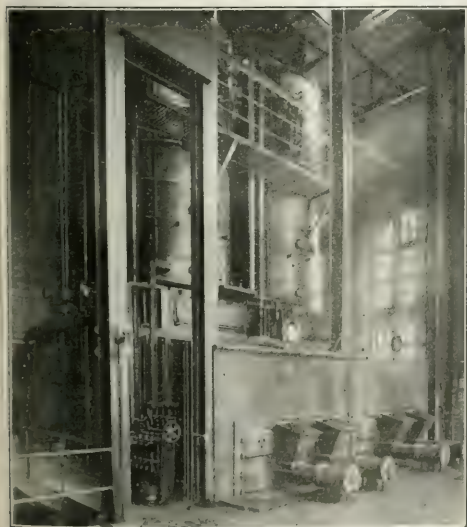


FIG. 3—VERTICAL STEEL-SHELL BOILERS



FIGS. 4 AND 5—LIGHTING STANDARD AND CABLE TERMINAL TOWER

Pending the installation of the gantry crane, the grab-bucket and the overhead coal bunkers, coal is being wheeled in from an adjoining shed and shoveled into the Jones underfeed stokers, which were manufactured at the plant of the Clarage Company, of Kalamazoo.

A 5.5-ft. by 170-ft. concrete stack and a steam-engine-driven fan supply both natural and induced draft for the boilers. The 6-ft. induced-draft fan has been placed in the basement beneath the firing floor with a vertical steam engine on either side. Flexible connections between the engines and the fan allow the latter to be driven by either engine unit, thus contributing to the reliability of the arrangement. Worthington duplex boiler-feed pumps equipped with feed-water regulators furnish water to the boilers. The supply passes through a 1500-boiler-hp Warren-Webster feed-water heater which raises the temperature of the water to 212 deg. Fahr.

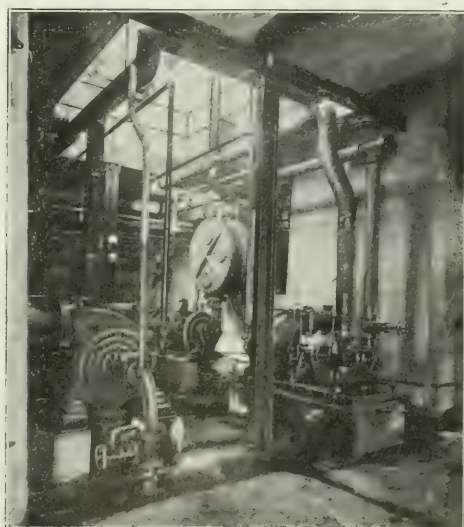


FIG. 6—TURBINE AUXILIARIES IN PIT





other a 21-kw, 6-volt, 3500-amp machine. These generators comprise the greater part of the load, but in addition there are saws, presses, etc., which bring the demand up to 42 kw. At night these machines are operated at a reduced capacity by a 40-hp motor. In addition there are fifty-five 40-watt lamps, making the necessary allowance for this floor 45 kw.

#### Individual Drive in Print Shop

The seventh floor contains a number of job presses operated by individual motors. This tenant had already secured service from the central-station company and had installed a private power feeder to the seventh floor to supply 50 kw, so provision was made in the electrical installation for furnishing this quota to the seventh floor. The lighting load was estimated at 3 kw, making the total motor and lighting requirements 53 kw.

The eighth floor is used by the sixth-floor tenant as a stock room, so that it has no need for power at present and requires very little light.

In order to make adequate provision for tenants' electric service at any future time, the average lighting and motor demand per floor for the six floors equipped with power was taken as a fair estimate for each of the seven floors. With an 80 per cent power-factor, this made necessary an installation to supply 18 kw per floor, or 126 kw, for tenants' service. From this it will be seen that a conservative average for the power required by the printing, bookbinding and electroplating tenants is 2 kw per 1000 ft. of floor space, the motors representing 92 per cent of this load.

In addition to the foregoing load, provision was made for supplying power to three elevators and an ash lift, and light for the engine room, boiler room and two stairways. The motors totaled 46 hp and 4 kw for lighting, or a total of 40 kw. With a power-factor of 80 per cent, this made the total load 162 kw.

#### Adaptation of Former Equipment

As shown by the plan of the engine room reproduced herewith, the old installation consisted of a 200-hp engine belted to a 4.5-in. counter shaft which in turn drove the vertical shaft running up through the building and was directly connected to a 3-in. shaft operating the two belted elevator machines. To adapt these old conditions to the new generating plant and to change the elevator machines to electric drive without stopping the operation of any part of the building was the problem that first presented itself. For driving the generator the 4.5-in. shaft was extended by substituting this size of shaft for a part of the 3-in. shaft as shown on the plan. This substitution was made and reconnected in the smaller shaft on Sunday, in order not to interfere with the operation of the freight elevators. The smaller shaft is only temporary and is to be removed entirely as soon as one of the electric elevators is got into operation. In this way the change will be made with each of the elevators out of operation for a short period at different times. After electric drive is substituted for the belt-driven elevator machines, the engine-driven passenger elevator will be taken out and a higher-speed electric elevator installed.

#### Installation of Generator

For supplying electricity in the building a 150-kw, 25/250-volt C. & C. generator has been installed at the point shown. With a 10 per cent overload it will be seen that this generator has sufficient capacity to supply the estimated maximum demand given above. The generator is driven by a 70-in. pulley at 600 r.p.m. The driving pulley was made as large as space would permit in order to increase the arc of contact on the generator pulley, because, as may be seen, the floor

space permits a very short drive. In addition, a pulley of "parapneumatic" construction was employed on the generator to insure against slippage.

Considerable trouble was experienced in digging for the 3-ft. concrete generator foundation, as it was found after a little excavating that the dry, loose, sandy soil was slipping from under the elevator-engine foundation, which is shown near the generator foundation. This danger was obviated by driving piles along this side and planking in as the excavation progressed.

The switchboard consists of three marbledized slate panels, one generator panel and two distributing panels. Each of the outside legs of the generator feeder is metered and protected by a circuit-breaker. The generator panel has in addition to these instruments a voltmeter with ground detector and a main three-pole knife switch. Each of the feeders shown has a knife switch on the distributing panels, all motor circuits being controlled by a main double-pole knife switch and all lighting circuits by a three-pole double-pole switch so connected that they may be fed either from the generator or from the Edison "break-down" service. A 25-kw break-down service has been secured to take care of all small night loads and any possible break-down.

#### Feeder Layout for Motors and Lighting

Feeders of the sizes shown have been run in heavily galvanized-iron conduit exposed on the basement ceiling. One three-wire feeder supplies all tenants with lighting energy, while two feeders have been run for the motor service. It will be noted that the two motor feeders have a greater rating than is actually required, as the load which they will be required to supply will not be equally divided between them. A two-pole, 200-amp motor switch and a three-pole, 25-amp lighting switch have been provided on each floor, and from these the tenants are to make all connections.

Before this installation was contemplated the seventh-floor tenant put in a private 300,000-circ. mil. feeder with a No. 8 B. & S. neutral from the service entrance to the seventh floor for supplying lighting and motor service for its own use. This feeder was utilized by dropping it down from the seventh floor and running it to the switchboard to supply the break-down service. In order that this floor should not be disconnected and in order that all feeders might be run before the generator was in operation, the 500,000-circ. mil. feeder was carried from the switchboard to the seventh floor and connected to the tenant's switch. During the night the tenant's feeder was dropped and run to the switchboard, where it was connected to the new motor feeder, thus feeding back through the feeder until connection could be made at the switchboard. A special pull-box adapted to this particular building construction served to change the direction of the conduit and to drop under the girder at this point while also answering the purpose of a pull-box.

A 200-amp "power" meter and a 25-amp lighting meter have been installed on each of the floors. It was necessary to over-meter most of the floors in order to take care of any load that may be required in the future. Watt-hour meters were also mounted on the switchboard for metering the total load. Many engineers do not require tests of watt-hour meters after erection, but the tests made in the case of this installation emphasize very forcibly the necessity of such tests. None of the meters was found to be within 2 per cent of correct, and a variation of 34 per cent was found between the lowest and highest reading meters.

The work of installation above described was done under the supervision of Mr. William H. Gompert, architect, and Mr. J. F. Musselman, engineer.



# Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods and Current Practice Among Successful Utilities

## Eliminating the Sadiron in Chicago

During the months of June, July and August the Commonwealth Edison Company is allowing to its customers \$1 for each old flatiron returned, provided the \$1 is applied on the purchase price of a new electric iron. Any one of eight styles of electric iron is available at regular prices less the \$1 for the old iron returned. The company has made no stipulation as to the type of old irons to be turned in and takes anything from the most dejected sadiron to a worn-out self-heated iron. The campaign was started by newspaper advertising and is being brought to the customer's attention each month by means of a small poster inclosed in the envelope with the electric-light bill. With this plan the company expects to be able to sell about 5000 irons during the summer months.

## Electric Cooking for Chicago Baseball Men

On account of the time required for ball players to travel from Comiskey Park, Chicago, to the downtown hotels or restaurants on busy days when the club is at home, Mr. Harry Grabener, secretary of the Chicago American League Baseball Club, has installed an electric range at the ball park. The range is of the Hughes type and is equipped with three top-heating units besides two additional units in the 12-in. by 12-in. by 18-in. oven. The upper unit in the oven can be utilized as a broiler when desirable. Of course, no elaborate meals are prepared in the electrical kitchen at the ball park, but with this range and a well-stocked larder Miss Mary McIlvaine, of the ball-park office, who acts



ELECTRIC RANGE AT CHICAGO BASEBALL GROUNDS

as chef, is able to prepare excellent hot lunches for the hungry athletes.

Electric service for this range is supplied from the mains of the Commonwealth Edison Company, and it is said that with all units operating at "high heat" the range supplies a load of about 4.5 kw.

## Day-by-Day Show-Window Displays

The housewife's custom of setting aside each day of the week for some special household duty has been capitalized by the New York Edison Company in its recent window displays. On Mondays motor-driven



MONDAY IN THE NEW YORK EDISON COMPANY'S DISPLAY WINDOWS

washing appliances are shown; on Tuesdays electric irons are exhibited; on Wednesday the scene shifts to a motor-operated sewing machine, and on Thursdays chafing dishes, tea samovars and coffee percolators are featured, followed by vacuum cleaners on Fridays and electric ranges on Saturdays.

## Eighty-Seven House-Wiring Contracts per Week

Contracts amounting to \$4,137 for wiring eighty-seven houses were secured during a recent week by the Louisville (Ky.) Gas & Electric Company, thereby establishing a record which has never before been reached by that company. The nearest previous approach made to this figure was seventy contracts per week. During the first six months of the house-wiring campaign, which was inaugurated Jan. 1, 1975 new consumers were added to the company's books. Of these 519 were obtained through independent contractors Mr. Robert Montgomery is manager of the commercial department of the company.

## Data on Electric Deep-Well Pumping

The municipal water-works of Waterloo, Ia., recently compiled some data comparing the cost of electric with steam pumping. The city operates three deep-well pumps, two of which are electrically operated and are in small brick pump houses remote from the station of the Citizens' Gas & Electric Company. The third pump is operated by steam and is in the central station.

Each pump lifts water from an artesian well and delivers it to a reservoir under the water-works office

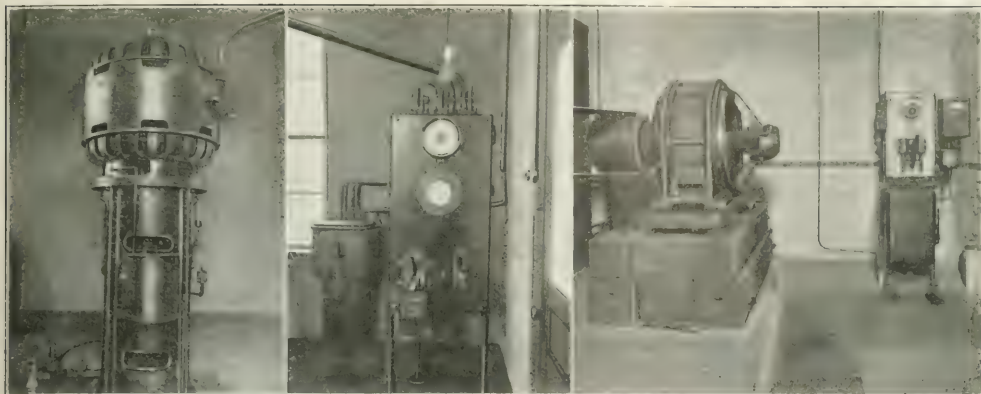


FIG. 1—SPECIALLY DESIGNED ELECTRIC PUMP

FIG. 2—SWITCHBOARD CONTROL-  
LING DEEP-WELL PUMPFIG. 3—ELECTRIC BELT-DRIVEN PUMP AT  
WATERLOO, IA.

building. From this reservoir the water is taken by a steam pump which supplies the pressure for the city mains. In the accompanying table wells Nos. 1, 2 and 3 represent the steam pump, the electric belt-driven pump and the electric direct-connected pump respectively.

## TEST ON DEEP-WELL PUMPS AT WATERLOO, IA.

## Well No. 1:

Head, in feet.....	100
Number of gallons in three hours.....	106,947
Total pounds coal in three hours.....	615
Cost of 615 lb. coal, at \$3.30 per ton.....	\$1.015
Cost of labor, three hours per ton.....	\$0.780
Total cost of pumping 106,947 gal.....	\$1.795
Cost of pumping 1000 gal.....	\$0.016

## Well No. 2:

Head, in feet.....	72
Number of gallons in three hours.....	125,329
Total kilowatt-hours consumed.....	1.02
Cost of electricity, at 2 cents per kw-hr.....	\$2.040
Cost of pumping 125,329 gal.....	\$2.040
Cost of pumping 1000 gal.....	\$0.016

## Well No. 3:

Head, in feet.....	150
Number of gallons in three hours.....	108,940
Total kilowatt-hours consumed.....	.80
Cost of electricity, at 2 cents per kw-hr.....	\$1.600
Cost of pumping 1000 gal.....	\$0.0147

In this compilation no allowance was made for depreciation and maintenance charges, which are generally conceded to be much higher on steam pumps than on electric pumps. No labor was charged against the electric pumps as they require practically no supervision.

Fig. 1 is a view of the No. 3 electrically driven pump. A Byron-Jackson five-stage 17-in. centrifugal pump is installed 212 ft. below the surface in the well casing and is directly connected by a vertical shaft to a Westinghouse three-phase squirrel-cage motor. The pump is capable of delivering from 1000 gal. to 1250 gal. of water per minute against a head of 250 ft. The motor operates on 2300 volts and, being designed for two speeds, can develop 50 hp at 850 r.p.m. and 75 hp at 1150 r.p.m. A normal pressure of 80 lb. can be maintained at 850 r.p.m., and in case of fire 120 lb. will be exerted at 1150 r.p.m.

Fig. 2 is a view of the switchboard at well No. 3. Electricity is delivered to the station from an overhead line through disconnect switches and fuses to an oil switch shown on the lower left-hand corner of the

board. This switch is provided with no-voltage and overload release. From the oil switch the circuit passes through the compensator and then to a double-throw oil switch on the lower right-hand side of the board. High or low speed is obtained by throwing this switch in one of two extreme positions. The belt-driven electric pump at well No. 2 is shown in Fig. 3.

## Speeding Up a Machine Shop with Electric Drive

The city of Chicago has a machine shop in which repair work is done for the pumping stations, water department and, in fact, practically every department of the city government. Formerly this shop was driven by a slide-valve steam engine through intricate line shafting. No-load tests made on this apparatus some time ago showed that 53 per cent of the power generated by the engine was required to drive the line shafting and idle pulleys. During the year 1913 operation of the steam engine was discontinued and a 75-kw motor-generator set was installed in the West Twenty-second Street pumping station next door to supply direct current over a three-wire system for the shop motors. The induction motor driving this set is rated at 110 hp, 440 volts, three-phase and fifty cycles, and takes energy from

TABLE I—NO-LOAD TEST ON MOTORS NOW OPERATING

	Rating in Hp	Speed R P M	Voltage	Ampere No-Load Test
Group No. 1	10	994	230	3.55
South-line shaft—machine shop	15	1010	230	1.25
West end—first floor	5	972	230	1.67
36-in. lathe	10	1250	230	1.15
72-in. boring mill	10	1250	230	1.15
North line shaft—machine shop	15	1050	230	1.15
Blacksmith shop	2	1184	230	1.12
Brass foundry	2	1000	115	1.15
Pattern shop	7.5	840	230	2.12
Brass machining shop—second floor	10	1016	230	3.08
Brass-finishing shop—second floor	5	990	230	1.78
Elevator	3	1220	230	2.02
Total rating	94.5			

the lines of the Sanitary District of Chicago. Installation of the motors and the rearrangement of the line shafting was accomplished between one Saturday noon and the following Monday morning so that no working time was lost in the shop. Recent no-load tests on the motor installation, computed from data given in an ac-



companying table, show that the line-shaft losses have been reduced from 53 per cent to 10.8 per cent.

In addition to this increase in operating efficiency, the change has allowed Mr. W. A. Saunders, shop foreman, to increase the speed of the line shafting and the machines by 33.3 per cent. After being convinced that the machines would withstand this higher speed, employees who have worked in the shops for years have unconsciously increased their own working speed to to keep pace with the machines. The direct-current motors have been so arranged that there is still an available increase of 15 per cent in speed if it is found desirable. That the increased speed has increased the efficiency of the shop is evident by the fact that on April 1 the shop-work list was 400 jobs ahead of its record of last year.

TABLE II—DATA ON GROUP DRIVE

Application	Motor Hp
North line shaft—machine shop	15
One small slotter	Three 28-in. drill presses.
One 18-in. lathe	One 60-in. radial drill.
One 22-in. lathe	One 24-in. vertical boring mill
One 26-in. lathe	One emery wheel.
Two small turret lathes	
South line shaft—machine shop	10
One milling machine	One 20-in. x 72-in. planer.
One hack saw	One 16-in. lathe.
One shaper	Two 26-in. lathes
Two drill presses	
Group No. 1	10
One turret lathe	One 24-in. lathe
One 36-in. lathe	
One 72-in. boring mill	
West end—first floor	5
One 18-in. lathe	One emery wheel
One drill press	
Brass finishing shop—second floor	10
Four 16-in. lathes	Two emery wheels.
One bolt threader	Two turret lathes.
Brass-finishing shop—second floor	5
One 18-in. lathe	One emery wheel.
One shaper	
Elevator	3
Pattern shop—second floor	7.5
One 24-in. x 24-in. buzz planer	One tool grinder.
One 36-in. band saw	One core-box machine.
Blacksmith shop	2
One 16-in. blower	
Brass foundry	2
One tumbler	One sand shaker
Total	94.5

Data presented herewith (Table II) show how the machines in the various departments of the shop have been grouped and also give an idea of what line shafting was operating on the no-load test for which the data are presented in Table I. Designs for the rearranged shop were laid out by Mr. J. F. Chinlund, electrical engineer working in the department of Mr. John Ericson, the city engineer. All of the direct-current motors were furnished by the Mechanical Appliance Company, Milwaukee.

### District Heating Plants for Small Cities

One paper presented at the recent Rochester convention of the National District Heating Association which contained some figures of considerable interest was that of Mr. L. T. Mason, of Hornell, N. Y., whose subject was "District Heating for Towns and Cities of 10,000 Population and Under." Mr. Mason expressed the belief that the majority of small electric-service plants that are now receiving small returns on their investments could probably add the selling of exhaust steam by meter so that good dividends might be paid on the

total investment. The steam-heating business should not be condemned owing to the failure of some plant that was installed twenty-five years ago. Proportionately fewer heating companies have failed than electric companies. With proper construction, management and rates there should be no question of a reasonable profit, provided the territory served is suitable to a district-heating system.

The author concluded his paper by giving the following statistical statements of three small combined electric and steam heating plants:

#### PLANT A

Cost of coal and boiler-room labor for generation of both electricity and steam	\$9,466.75
Steam receipts	12,497.85
Electric receipts	28,500.00
Steam investment	45,000.00
Average rate	40 cents per 1000 lb.
Population	10,000

#### PLANT B

Coal, water, oil, waste, engine and boiler-room labor for generation of both electricity and steam	\$27,049.16
Steam receipts	35,053.45
Electric receipts	43,359.64
Steam investment	45,000.00
Average rate	60 cents per 1000 lb.
Population	10,000


#### PLANT C

Cost of coal, water and boiler-room labor for generation of both electricity and steam	\$24,069.57
Steam receipts	25,372.57
Electric receipts	48,098.57
Steam investment	100,000.00
Steam rate	44 cents per 1000 lb.
Population	15,000

### Meter Reader's Picture on Identification Card

To furnish its consumers with a means of knowing what men are officially appointed to read, test, inspect, install or remove its meters, the Scranton (Pa.) Electric Company supplies each meter-man with an identification card similar to the one illustrated herewith. On the left-hand end of the card is pasted the picture of the meter reader, and in a space at the right is his signature certified to in writing by the company's general manager. The card is not valid unless the company's seal is stamped over part of the photograph.

Each employee is required to return his card on demand, and also to show it each pay day. If the card is lost or mislaid, the owner must immediately send a



For identification, customer should ask bearer to sign his name for comparison with signature on card.

Date \_\_\_\_\_

1914

SCRANTON ELECTRIC CO.

This card becomes void after December 31, 1914

#### METER READER'S IDENTIFICATION CARD

written report of the fact to the head of his department. In such cases an affidavit must be made before a duplicate card is issued or before an employee leaving the service is paid.

The plan described prevents sneak thieves from pretending to be meter readers and serves to allay the fears of timid housewives.

# Illumination and Wiring

## White City Illuminated at Sydney, Australia

In the accompanying illustration is shown the dazzling effect obtained with electric lighting in the "White City" recently erected at Rushcutter's Bay, Sydney,



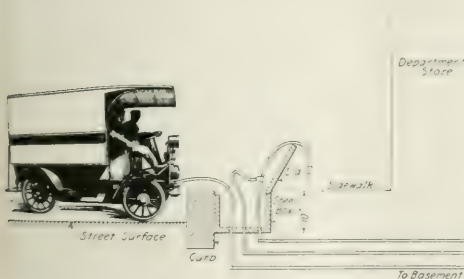
THE "WHITE CITY" AT SYDNEY, AUSTRALIA

New South Wales, Australia. This far-away amusement park contains various attractions such as one is accustomed to see in similar amusement resorts in this country, including switchback railways, an "underground river," captive aeroplanes, "joy wheels," a haunted castle, crystal tangle, a Japanese village, merry-go-round, shooting galleries, side shows, etc. The grounds are beautifully laid out. The idea seems to have taken hold of the Australian public and large crowds are visiting the resort nightly.

All of the electric apparatus used in this "White City" was purchased and installed by W. G. Watson & Company, Ltd., Sydney, Australia. Ready-wired material such as was used at the Hudson-Fulton celebration in New York was supplied by Pass & Seymour, Inc., Solvay, N. Y., U. S. A. With this installation one of the first uses of the screw-base socket was made in Australia.

## Merchant's Sidewalk Booster Charging Station

Operating three Detroit Electric vehicles in its delivery service, a department store at Peoria, Ill., has adopted a scheme of boosting which gives the trucks consid-



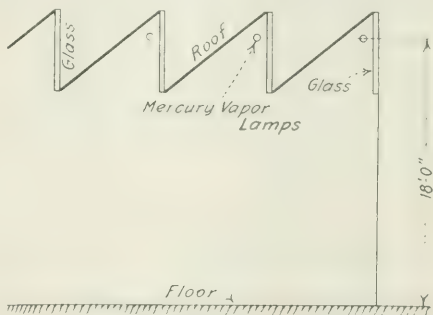
PRIVATE BOOSTER CHARGING STATION AT THE CURB

erably more mileage than would be afforded by a single charge a day. At the curb line where vehicles are loaded with packages for delivery there is placed a steel box having its top surface flush with the sidewalk level. Entering this box from a charging panel in the basement of the store are flexible copper leads equipped with charging plugs.

When a driver returns after a morning's trip of 20 to 30 miles he lifts the cover on the steel box, inserts one of the convenient charging plugs and then, going to the basement, starts the charging set. During his loading-up period, the sixty Edison cells of the vehicle are thus boosted at a rate about 30 amp. When no vehicles are at the curb the steel lid of the charging-plug box is closed flush with the surface of the walk. Operators of the vehicles say that, although the battery equipment will give 58 miles a day on good roads, the boost three times a day allows them to make better records over roads in the outskirts of the city which are quite hilly and sometimes muddy.

## Mercury-Arc Lighting in Factory with Saw-Tooth Roof

The lighting of the factory of the Flour City Ornamental Iron Works, Minneapolis, Minn., is accomplished by means of mercury-vapor lamps suspended near the vertices of the "saw-teeth" forming the roof. The advantages gained by so placing the lamps are twofold: first, the light from the lamps in this position strikes the working plane at approximately the same



ARRANGEMENT OF LAMPS

angle as would ordinary daylight, and, second, the lamps, being well up in the teeth, do not interfere with the operation of cranes used for handling the castings of ornamental lighting standards and other heavy products of the company. Each lamp unit consists of a 50-in. tube suspended 19 ft. above the floor and lights approximately 1200 sq. ft. of floor surface.

## Bowling-Alley Illumination at Montreal

At the Windsor Bowling Alleys, Montreal, P. Q., a carefully planned lighting installation has been made by the proprietors, who purchase energy from the local mains of the Montreal Light, Heat & Power Company. The seventeen alleys are of the regulation 60-ft. length, the width being 3 ft. 6 in., the walls being light pink in finish, with white ceiling. At the head of each alley general illumination is provided by tungsten lamps in the ceiling bays. Seven and one-half feet beyond the head and about 7 ft. above each alley surface is mounted a 60-watt lamp in a reflector 8 in. high and 18 in. in diameter, the reflector being parabolic in shape and painted gray on the inside, which is turned toward the pins. The backs are finished in dull bronze. Seventeen feet beyond the first reflector another is installed, and a third is placed 17 ft. beyond the second. Two feet above the alley and 20 in. behind the king pin at the foot of each alley a 60-watt lamp is suspended in front



of an opaque reflector turned toward the pins. The total equipment per alley is thus four 60-watt lamps, and the service is of the long-hour kind desirable from the central-station standpoint. There is entire absence of glare, the reflectors being sufficiently curved to cut off all disturbing light from the players on the parallel alleys.

### Difference in Character of Sign-Lamp Loads

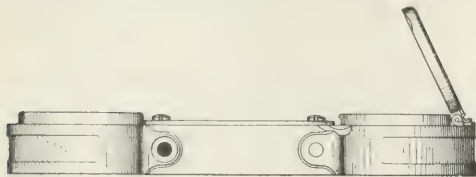
Speaking extemporaneously on electric-sign topics before the recent convention of the Missouri Public Utilities Association, Mr. F. A. Kehl, of the Brilliant Sign Company, St. Louis, Mo., stated that he had found some unaccountable differences in the character of the load due to tungsten lamps and carbon lamps in electric signs. For instance, thermostatic flashers working perfectly upon a direct-current carbon-lamp sign will soon fail to give satisfaction, he said, when the same load in tungsten lamps is placed in the sign. In most of these cases motor-driven flashers must be substituted. It has also been noted, he added, that the trouble is somewhat less apparent on alternating-current circuits.

Like troubles in lesser degree have also been experienced where signs are installed with motor-driven flashers. When installations are changed from carbon lamps to tungsten lamps (the connected load remaining the same) it has sometimes been found that a heavier flasher is necessary. Mr. Kehl said he had thus far been unable to discover the cause of this discrepancy, but he insisted that the trouble exists and expressed belief that users will profit by taking these facts into consideration when changing sign installations from carbon lamps to tungsten lamps.

## RECENT TELEPHONE PATENTS

### Improved Telephone Instruments

At times there is a demand for a telephone instrument which may be transported from place to place and connected to the wires as required. Such a condition arises with the so-called "wayside" system, where the instruments may be carried by the operator and attached to the wires as occasion demands. The hand microphone is well adapted for this use, and such an instrument in a convenient form has been patented by



PORTABLE TELEPHONE SET

Mr. R. H. Manson, of Elyria, Ohio. This device is shown in the illustration. The transmitter is placed with its diaphragm parallel to the line of speech, and it is provided with a sound deflector consisting of a hinged cover. A cord and plug are employed to connect the instrument with the line, and a flashing button serves for signaling the operator. The patent has been assigned to the Dean Electric Company.

Mr. G. Swope, of New Brunswick, N. J., has obtained a patent for a switching set for use with portable apparatus. The hand microphone has a cord with a twin plug which fits jacks attached to a wall plate. A sig-

naling push-button is mounted in the wall plate. This patent has been assigned to the Western Electric Company.

Mr. A. Marr, of Manchester, England, has designed a telephone receiver to overcome the compression effects upon the outer part of the diaphragm. A shallow circular depression is cut into the casing or cup to receive the diaphragm. This is slightly deeper than the thickness of the diaphragm. Under the pull of the magnet the diaphragm is forced into the depression in the casing. When the ear cap is screwed home it binds by contact with the edge of the depression alone, the diaphragm being held between two concentric contacts.

A second patent granted to Mr. Marr covers improvements in the assembly of the receiver. An insulating block lies between the legs of the permanent magnet and the cup piece is secured by screws engaging this block.

Where a telephone is to be used on shipboard during a naval engagement it must be screened from vibration. Mr. M. R. Hutchison, of Summit, N. J., is the inventor of an instrument for this purpose. The transmitter is provided with a mouthpiece which admits both the mouth and the nose of the user and has a special sound-seal air vent. The mouthpiece fits the face securely. The transmitter is supported from a head band or cap, and the receivers are also adjustably supported so that there may be tight contact with the ears.

In a locomotive cab similar conditions exist. Mr. M. Lutenberger, of Blocton, Ala., is the inventor of a hood for such use. The hood contains the telephone instruments, and it is arranged so as to receive the head of the user. A flexible neck-piece with draw string serves to close up the hood.

A receiving device of great sensitiveness has been patented by Messrs. F. L. Jensen and E. S. Pridham. A rectangular coil is supported by a rigid link from the middle of the diaphragm. The coil is put in the field of a magnet as in a D'Arsonval galvanometer.

A patent has been issued to Mr. E. Goldschmidt, of Berlin, Germany, for a system of working transmitters in parallel. He includes a retardation-ballast coil in series with each transmitter and associates these coils inductively so that the mutual reactions damp out dissimilarities in the waves.

### Switchboard Circuit Systems

One of the difficulties frequently encountered with the usual central-energy system lies in the flashing of the operator after a connection is once completed. It is with a view to overcoming this difficulty that Mr. H. P. Clausen, of Rochester, N. Y., has arranged a system whereby, at the completion of a connection, the lines involved are immediately cleared. This is accomplished by cut-off relays in the cord circuits, which sever the strands but maintain the supervising lamps lighted. As this latter is a locking circuit, a periodic interrupter is provided to break the lock after the connection has been taken down. This patent has been assigned to the Stromberg-Carlson Telephone Manufacturing Company.

Another circuit system for a two-wire switchboard has been patented by Mr. H. G. Webster, of Chicago. This patent has also been assigned to the Stromberg-Carlson Company. The cut-off relay is of the differential type and is in balance before the operator answers. The insertion of a plug upsets the balance and the operation of the relay severs one of the differential windings, thus locking the cut-off relay while the plug remains.

Mr. F. R. Parker, of Chicago, has patented a system wherein the two windings of the cut-off relay are included permanently in the talking circuit.

## Letters to the Editors

### The Flux Inside a Tubular Conductor

*To the Editors of the Electrical World:*

SIRS:—The "electromagnetic puzzle" referred to on page 1442 of your issue of June 20 is a puzzle only on account of a wrong assumption, namely, that the magnetic flux inside a tubular conductor carrying a current is everywhere zero.

On the contrary, the current in such a conducting tube sets up a circular flux inside as well as outside of the tube, the inside flux being opposite in direction to the outside flux.

Therefore, when the flow of current in the tube is interrupted or restored the collapse or growth of this inside circular flux around the galvanometer conductor is ample reason for the existence of the induced emf noted by Professor Rogers.

Ogontz, Pa.

FARLEY C. RALSTON.

### The Traveling Public and Its Purse

*To the Editors of the Electrical World:*

SIRS:—Central stations, the numerous electrical associations and societies, and the electrical press may continue to tell the general public about the inexpensiveness of electric service and electrical appliances. But as long as hotels rent electric fans to patrons for 50 cents a night and placard the fact, much of the good work of those in the industry must go for naught.

A glaring example of this practice exists in a Lafayette (Ind.) hotel, where under the present rate for electricity a fan could not possibly use more than 5 cents' worth of energy in a night. Such misdirected attempts at service to the public should be discouraged by local electric-service companies, for without doubt the modern commercial traveler is a mighty molder of public opinion. Many hotel managers are firm believers in the value of free electric-fan service and the remainder ought to be converted to this belief.

Chicago, Ill.

THOMAS MAC TAVISH.

### Feed-Water Purification

*To the Editors of the Electrical World:*

SIRS:—I should like to amplify your reply to the question by "H. L. B." on feed-water purification by heating as given on page 1456 of the June 20 issue.

Pre-heating is beneficial in purifying boiler-feed water in two ways. In the first place it drives out of solution air and other gases, and as the presence of air has been shown to be essential to corrosion by boiler-feed water, this is a strong argument for heating the water by spraying it through a steam bath, which allows free escape of the dissolved gases. At the same time, if there are present any bicarbonates which produce the condition known as "temporary hardness," they are broken up with the liberation of carbon-dioxide gas, resulting in the formation of the insoluble monocarbonates, which can then be precipitated or filtered out of the water. This action is quite effective in throwing down the carbonate of lime, and where the latter is the only or chief impurity an open feed-water heater of sufficient capacity will make an efficient water softener or purifier. The heat also has the effect of coagulating mud and organic matter, hence assisting in their removal by settlement and filtration.

The most important effect of heat, however, results from its use in connection with chemicals for the reduction of the permanent hardness. Heat hastens chemical reaction, and wherever possible is utilized in chemical

processes carried out on a large scale, as, for instance, in causticizing pulp, straw and rags for paper-making, saponifying fats, refining sugar and oil, making caustic soda from lime and soda, etc. It is equally effective in hastening and completing the chemical reactions involved in transforming into sludge sulphates, chlorides and other scale-forming and corrosive substances found in boiler-feed water. The chemical reactions are more rapid and complete, and the resulting precipitates are larger and settle more rapidly, so that less time and settling capacity are required in a hot-process water-softening system than in a cold-process system using the same reagents.

Just what chemicals should be used in a given plant depends upon the nature of the scale-forming matter and can only be determined after an analysis of the water. Beyond this, however, the problem of softening water for boiler-feed purposes is not so much a chemical problem as it is an engineering problem. The next step is to remove from the water such an amount of the resulting insoluble particles that the boilers will not give trouble from sludge. To attempt to eliminate sludge entirely in many cases costs more than it is worth, for boilers which are not heavily loaded, particularly horizontal return tubular boilers, can take care of much sludge. Water-tube boilers, especially those with vertical tubes, on the other hand, require more care, and the sludge must be kept down to the amount which the boilers can handle.

The selection of a softening system should be based on guaranteed performance rather than price, as an equipment which is too small for the load contemplated is almost worthless. One hour's storage, which is all that is frequently found in cold-process softeners, is inadequate; in fact, many such systems leave as much as six or seven degrees of hardness in the water. The fact that the boiler-feed water must be heated in any case and that heat is an effective accelerator of chemical reactions, besides reducing the solubility of scale-forming salts in an alkaline solution, enables the hot-process system to give superior results at less cost. The control of the softening is also more accurate, and tests to determine the proper amount of chemical are more easily carried out.

Where the intermittent cold-process system is used, and each charge is "dosed" by itself, the lime and soda ash must be tested for separately. In doing this a sample is heated to the boiling point for fifteen minutes to complete the reactions, which would otherwise take several hours. Water from continuous cold-process systems is generally tested cold, as the reactions have in general been only partly completed, and high alkalinity readings may be obtained even though insufficient chemicals have been fed. For this reason the manufacturers of such cold-process systems usually recommend that the alkalinity as shown by the test be carried several points, or grains per gallon, higher than is required to counteract the actual hardness. This determination is usually performed by the soap test. The result is that many continuous cold-process systems are turning out water incompletely softened—that is, water containing an amount of scale-forming matter which will be deposited on the boiler tubes.

With the hot-process system, on the other hand, the test can be made as soon as the sample can be cooled, since the reactions have been completed in the system itself, and the alkalinity need only be carried to the proper point to insure that the water is completely softened. The time consumed for testing water from a hot-process system is not over one-quarter of that required to complete the determination with an intermittent softener.

Philadelphia, Pa.

WM. B. CAMPBELL.



# Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

## Placing Responsibility on One Man

To assure its men protection while working on electrical equipment, the Rumford Falls Power Company, Rumford, Maine, requires that hold-off signs and cards bearing the name of the man asking protection be attached to all switches energizing the particular apparatus. No one is allowed to restore to service apparatus so labeled unless permission is granted by the man whose name appears on the card attached thereto.

## Restoring Operation of Damper Regulator

A damper regulator in a certain boiler room failed to work satisfactorily at all times. The water pressure upon which the operation of the regulator depended seldom exceeded 40 ft. static head (17.4 lb.) as the water was obtained from a 50,000-gal. tank, the top of which was at a height of 40 ft. above grade. When the water in this tank was low, usually only 16 ft. of static head, or 6 lb. to 7 lb., water pressure was available for operating the damper regulator, but this amount was not sufficient.

In order to avoid such a condition, a pipe coil containing 150 linear feet of 1-in. pipe was installed, as shown in the sketch, and connected by a 1-in. steam pipe to the main steam line. The steam is condensed in the coil for use in the regulator and at least 70 lb. pressure is always available. A drop leg at the end of the coil, or a line to the sewer closed by a valve, allows the sediment to settle at that point, thus preventing it from being carried to the damper regulator.

The valve on the line to the sewer may be opened when it is desired that the coil be blown out. If after flushing out the coil these pipes are cold at the time steam is turned in, the steam should be slowly admitted

water against the regulator with great force or shock. Water hammer is peculiarly violent when steam is admitted suddenly to a cold vacuum pipe because there is no air to cushion the blow, but even air will not ordinarily eliminate its destructive force.

## Preventive Measures for Avoiding Spontaneous Combustion of Coal

Spontaneous combustion is the bugbear that has frightened and discouraged the storage-coal enthusiast more, perhaps, than any other one thing. Where coal is stored in small quantities there is very little danger, but when stored in large amounts great care is required to avoid spontaneous heating.

A recent bulletin of the University of Illinois contains an extensive and complete report, prepared by Prof. S. W. Parr and Mr. F. W. Kressman, of the results of their experiments and investigation of the question of spontaneous combustion of coal. Their enumeration of preventive or precautionary measures to be considered when storing coal covers the situation very fully and is given in the following paragraphs.

The avoidance of an external source of heat which may in any way contribute toward increasing the temperature of the mass is a first and prime essential.

There must be an elimination of coaldust or finely divided material. This will reduce to a minimum the initial oxidation processes of both the carbonaceous matter and the iron pyrites. These lower forms of oxidation are to be looked upon as forces without which it would be impossible for the more active and destructive activities to become operative.

Dryness in storage and a continuation of the dry state, together with an absence of finely divided material, would practically eliminate the oxidation of the iron pyrites.

Artificial treatment with specific chemicals or solutions intended to act as deterrents does not offer great encouragement, though some results seem to warrant further trial in this direction.

By means of a preliminary heating the low or initial stages of oxidation are effected. These sources of contributory heat being removed, the forms of destructive oxidation are without the essential of a high starting temperature and are therefore inoperative. Whether such preliminary treatment is within the realm of practical or industrial possibility could not, of course, be determined within the scope of these experiments.

The submerging of coal, it is very evident, will eliminate all of the elements which contribute toward the initial temperatures.

## Artificial Cooling of the Coal Pile

Other processes may be suggested by the formulation of the principles involved. Such, for example, would be the distribution throughout the coal of cooling pipes through which a liquid having a lower temperature than the mass would circulate. This would serve to carry away any accumulation of heat and confine the oxidation to the lower stages only. On the contrary, the

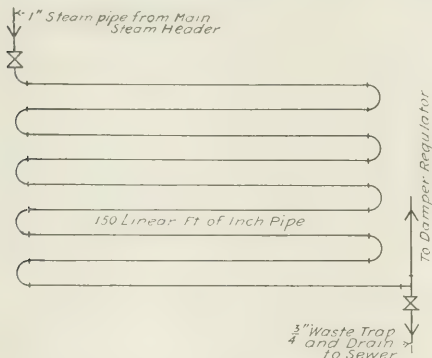


DIAGRAM OF DAMPER REGULATOR

through the supply valve until all the pipes are brought to an even temperature. The condensed steam (water) is forced ahead by the steam rushing into the cold empty pipe with such high velocity that it rams the

proposition, sometimes made, to provide circulating passages for the transmission of air currents is of questionable value, since it may result in the contribution of more heat by the added accessibility of oxygen than will be carried away from the coal by the movement of the air.

Atmospheric temperature at time of stocking is also a factor which should not be overlooked. With summer temperatures of 100 deg. Fahr. or greater prevailing for six weeks or more during the time coal is being stored (especially if the weather is dry during this period), followed by a shower and then further dry, hot weather, it has been the experience of one large coal user that coal will fire spontaneously within a period of six weeks, even though it be large 6-in. lump and piled only 4 ft. and 5 ft. high.

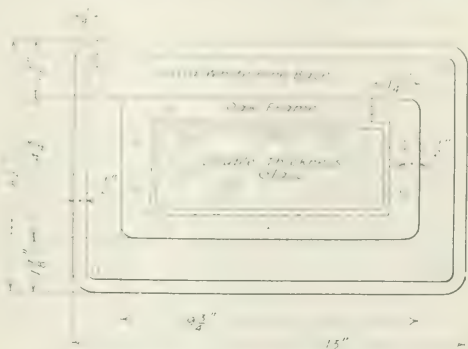
It follows, therefore, that it is preferable to store coal in cold weather rather than to store it during the hot periods in June, July and August.

### Auxiliary Cooling for Transformers

Several banks of transformers occupying a corner in the power house of the Danville (Ill.) Street Railway & Light Company do not receive much natural ventilation, as they are out of the direct line of air flowing through

work covered by the contract up to the date specified on the sign.

The operating engineer at the power house, or wherever the sign is installed, can tell at any time by glance



CONTRACTOR'S MAINTENANCE SIGN

ing at this date whether such objections as he may make to the operation or durability of the machine, piping system, etc., will result to the owner's advantage, for the contractor is held responsible for all defects up to the date of the sign. The sign is a constant reminder to the engineer that he must register his objections before the expiration of the guarantee. It also serves the purpose of an effective and comparatively inexpensive advertisement for the contractor.

### Reversed-Polarity Correction

How may one correct reversed polarity in a compound-wound and a shunt-wound generator? E. A. K.

A fair indication of reversed polarity of a generator, while it is running, is the attempt of the voltmeter to register a negative voltage. The method for correction will depend upon the type of generator and the apparatus on hand. If there are two compound-wound generators in parallel A and B, A being correct and B reversed, the following method may be employed provided B has a shunt-field switch and three main circuit switches: Disconnect B from the busbars, keeping it up to speed, open its shunt-circuit switch, close the equalizer switches and B's series-circuit switch. Part of the current is now shunted through the series circuit of B, the amount being inversely as the resistance of the equalizer contacts and series coil of B to the resistance of the series coil of A. Now close the shunt-circuit switch of B and the field magnetism should at once build up. When the full voltage has been obtained the third switch may be closed. If this current is not sufficient to reverse the magnetism in B, open the series switch of A and all the series current of A will now flow through the series coil of B. Under ordinary working conditions this will be sufficient. This method has been found to require only a short time. If the shunt coil of B is not provided with a switch, stop the machine and open its shunt circuit by insulating the sliding brush of the rheostat from the contact points. To re-reverse the magnetism of a shunt-wound generator stop the machine and extend wires to it from the switchboard, if there be other generators in the station, or from storage batteries, and, raising the brushes from the commutator, send current through the shunt field coils in the same direction as the current would go for correct polarity.

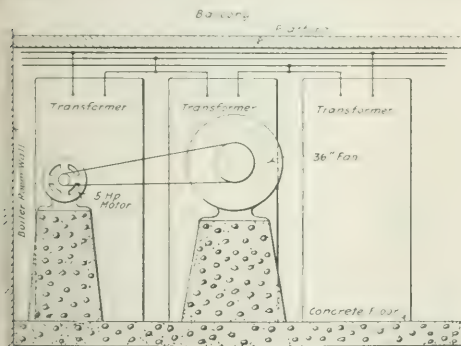


DIAGRAM OF SCHEME INTENDED FOR COOLING TRANSFORMERS

the wall openings. In order to keep these transformers operating at a sufficiently low temperature a motor-driven blower has been installed, as shown in the accompanying illustration. Both the motor and the open-faced fan are mounted on concrete bases placed on 8-ft. centers, raising them somewhat above the floor level so that the draft created strikes the transformers approximately at the center line. The distance between the transformers and the face of the fan is about 6 ft., so that the blast spreads and covers a large part of the transformer surface.

### Maintenance Sign for Contract Work Constructed Under Bond

The accompanying sketch shows a form of sign posted by the contractor in a conspicuous position adjacent to the work installed, when he has completed the installation of a compressor or other machine. It is also used in connection with the installation of piping systems, etc., and in fact may be used for any work installed under contract and constructed under bond. It forms a guarantee sign for the maintenance of the



# Digest of Current Electrical Literature

## Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

### Generators, Motors and Transformers

**Series Transformer.**—A note on a new type of series transformer which is claimed to overcome all the troubles usually met with in the switchgear of high-tension installations. The principal feature of this transformer is the special insulating material which is molded under pressure around the windings and core, thus forming both an electrical and mechanical casing. The material is extremely hard and very strong mechanically, and its dielectric strength is such that a piece of the material 1 cm thick will withstand a pressure of 60,000 volts. It is non-hygroscopic, and therefore it is possible for the transformer to be immersed in water without damage. It contains no chemicals which are liable to attack the windings, as is frequently the case with oil. In a transformer made with this material molded around the windings it is impossible for the windings to become displaced owing to the electromagnetic forces caused by short-circuits, and owing to the thorough exclusion of air, no ozonization, and consequently no decay of the windings, can take place. Test curves show that the accuracy is very satisfactory. —*London Electrician*, July 10, 1914.

### Lamps and Lighting

**Ductile Tungsten.**—A note on a recent British patent (No. 12,421, 1913) of C. Gladitz, on a method of obtaining tungsten in a form which is ductile and which has comparatively high tensile strength. The finest form of tungsten powder known, i.e., the "fluffy" form, is mixed with a certain percentage of a coarser-grained powder compressed in a mold and then gradually sintered in an atmosphere of inert gas. Precise information is given in the patent as to the method of making the coarser-grained powder from the fluffy form, as to the proportions of the two powders, and as to the exact way of carrying out the sintering process. —*London Elec. Eng'ing*, July 2, 1914.

**Spiral Lamps.**—Since the success of the nitrogen-filled tungsten lamp with a spiral filament, the use of spiral filaments has been also extended to vacuum incandescent lamps. The author points out, however,

that it is a great mistake to wind in this case the turns of the spiral coil closely together, and that it is rather important to have the turns as far away from each other as possible. The advantages of such lamps with spiral filaments are that the globes may be made smaller

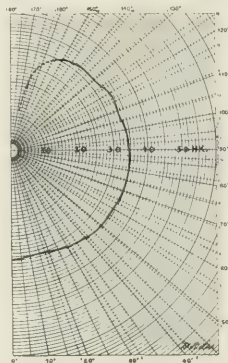


FIG. 2—PHOTOMETRIC CURVE

and the photometric curve of light distribution can be varied at will. Fig. 1 shows the "Omega" spiral lamp which has a photometric curve (Fig. 2) which is almost a circle—that is the lamp sends the same amount of light in all directions. The 220-volt, 0.236-amp, 52.05-watt lamp has a mean spherical candle-power of 32.3 hefner-candles, so that its specific consumption is 1.61 watts per mean spherical candle. —*Zeit. f. Beleucht.*, June 20, 1914.

**Theater Lighting.**—H. LUX.—The conclusion of his long and profusely illustrated serial on various recent advances made in theater lighting. —*Zeit. f. Beleucht.*, June 10 and 20, 1914.

### Generation, Transmission and Distribution

**Electrical Plant at Collieries.**—J. A. KERR.—An abstract of a paper read before the West of Scotland branch of the Association of Mining Electrical Engineers. The author would be in favor of armoring and grounding if it were properly carried out and maintained, but thinks in certain cases that this is impracticable. Indeed, the time and the money spent in efforts in this direction would be better utilized in making the insulation proof against the need of these devices, and in providing extra copper at lower pressures. In many mines in the West of Scotland much can be said for the unarmored, ungrounded system. It is, however, high time that slate switchboards were done away with for all except low pressures. —*London Electrician*, June 26, 1914.

**Propagation of Overvoltages on Transmission Lines.**—ANDRE LEAUTE.—Two French Academy papers on the propagation of electric waves over heterogeneous lines. The author considers two lines with different characteristics in series. In the first paper he criticises several points in the mathematical treatment of this



FIG. 1—VACUUM TYPE TUNGSTEN LAMP WITH SPIRAL FILAMENT

problem by former investigators. In the second paper the author begins to give a rigid theory of the propagation of traveling waves over heterogeneous lines. In the present instalment he shows that a particular simplification of the theory can be obtained if the ratio of resistance to self-induction is the same in the two lines in series.—*La Revue Elec.*, June 5, 1914.

#### Traction

*Regulation of Traction Motors by Field Variation.*—J. LISKA.—The advantages of regulating series traction motors by variation of the field have been repeatedly pointed out with respect to the improved specific watt-hour consumption of trains thus equipped. The author analyzes the reasons for this fact and investigates the conditions which influence the saving of energy. The author assumes certain normal conditions and calculates the specific energy consumption for motors with different characteristics. He determines the speed as a function of the time, and from the curves obtained he determines the work of the train and the energy consumed. The ratio of the two energies he calls the traction efficiency and calculates it for motors with different characteristics. The article is to be concluded in a subsequent issue.—*Elek. u. Masch.* (Vienna), June 28, 1914.

#### Installations, Systems and Appliances

*German Central-Station Statistics.*—A review of the recent statistics of the German association of central stations for 1912-1913. These statistics refer to 364 stations, of which 294 stations supplying electricity to districts with 30,000,000 inhabitants are in Germany and 70 stations supplying electricity to districts with 75,000,000 inhabitants are outside of Germany. The statistics, therefore, comprise less than one-twelfth of the total number of German stations, but cover notwithstanding two-thirds of the total area of Germany. The stations in question supplied 28,315 sq. kilometers in 1910, of which 7587 sq. kilometers or 26.8 per cent were in agricultural districts. Again, 34,701 sq. kilometers were supplied in 1911, of which 15,171 sq. kilometers or 43.7 per cent were in agricultural districts; while 39,255 sq. kilometers were supplied in 1912, of which 25,818 sq. kilometers or 65.8 per cent were in agricultural districts. This shows clearly the great increase of transmission systems into agricultural districts. More than two cities or towns were supplied from the same station in 1910 by 99 stations, in 1911 by 132 stations, and in 1912 by 153 stations. The number of cities or towns supplied with electricity was 4153 in 1910, 4722 in 1911, 6434 in 1912. Therefore during 1912 in the average forty towns were supplied from one station. The mean distance between generating station and furthest consumer was 10.8 kilometers in 1911 and 12.1 kilometers in 1912. The rating of the stations has also largely increased. About 59 per cent of the aggregate machine capacity in all stations was in 1910 in stations of more than 5000 kw, 80.42 per cent in 1911, and 81 per cent in 1912. More and more stations now buy electricity in bulk from larger stations. Out of the stations given in the statistics 94 stations bought 313,000,000 kw-hr. from other stations in 1911, while 111 stations bought 383,000,000 kw-hr. in 1912. The average values for the connections per 1000 inhabitants are 35.7 kw for lighting, 50 kw for motors, and 31.8 kw for lighting and motors under a combined rate. The total connections per 1000 inhabitants were about 100 kw. Some 11,500 consumers used prepayment meters in 1911, and 9800 did in 1912. On the other hand, the number of consumers using a flat rate further increased from 105,000 in 1911 to 151,000 in 1912, while the number of stations

using a flat rate increased only from 159 to 163. In the average 4.8 kw-hr. were sold per dollar of first cost invested in the total plant. The average selling prices of the kw-hours for lighting were 13.1 cents in 1900, 10.4 cents in 1905, 9.4 cents in 1910 and 9.0 cents in 1912, while the corresponding average figures for motor service were 5.2 in 1900, 4.6 in 1905, 4.0 in 1910 and 3.7 in 1912. The reduction in rates has resulted in an increase of the income of the stations. The cost of operation has also been reduced. The total operating cost per kw-hour sold was 3.9 cents in 1900, 2.9 cents in 1905, and 2.1 cents in 1910 and 1912. But these average figures are rather high compared with the results obtained in the most economical stations. For instance, the total operating cost per kw-hour was only 0.46 cent in the Upper Silesian Electricity Works, 0.95 cent in Waldenburg, 0.9 in Duisburg, and 0.8 in Dortmund. These figures show that great savings can be obtained by centralization of stations in large units, using cheap fuel.—*Elek. Zeit.*, June 25, 1914.

#### Electrochemistry and Batteries

*Representation of Power in Alternating-Current Diagrams.*—ALBERT A. NIMS.—With reference to the recent article by F. M. Denton the author calls attention to another method of representing power in alternating-current diagrams which he described in the *Electrical World* of Sept. 28, 1912.—*London Electrician*, May 22, 1914.

*Measuring the Ratio of Electric Charge to Mass for Cathode Rays.*—L. T. JONES.—A description of a method devised for the determination of  $e/m$  and  $v$  for the cathode rays from a cold cathode which is a modification of the usual electrostatic and magnetic deflection photographic method. It has two distinct advantages: First, both the electrostatic and magnetic fields are uniform over the entire path of the deflected cathode beam; second, the electrostatic deflection is kept constant for all strengths of fields employed and thus the inaccuracy in its measurement is eliminated. The mean of twenty successive photographs gave  $e/m = 1.75 \pm 0.03 \times 10^8$ . The improvements of the author's method are brought about chiefly by the position in which the photograph plate is placed.—*Phys. Rev.*, May, 1914.

*Exact Copper Voltameter.*—ALBERT G. SHRIMPTON.—A note on a (British) Physical Society paper on the determination of the atomic weight of copper by electrolysis. Four copper cells separating cathodes increased from 10 to 50 sq. cm. By plotting the weights of the copper deposits against the corresponding areas of the cathodes, and extrapolating to zero area, the weight of the deposit is corrected for the experimental conditions. The atomic weight of copper equals the ratio of the corrected weight of Cu to the mean weight of Ag multiplied by  $107.88 \times 2$ . The mean atomic weight for ten determinations = 63.563, with a mean error of  $\pm 0.003$ . To obtain a uniform coherent deposit of pure metal the following points were considered: Cylindrical cells with stationary and rotating cathodes were used. The cathode current density must be kept below a certain limiting value to prevent the formation of non-coherent deposits due to secondary deposition. This was found to depend upon the geometry of the cell, the concentration of the electrolyte, the presence of acid and other impurities, the addition of a porous pot and the rate of revolution of the cathode. Formulas are given by which the limiting cathode current density can be found for all conditions of the cell for Cu, Ag, Au and Zn. To prevent the formation of loose crystalline clusters the current density must also be kept below a certain value depending upon the weight to be deposited.—*London Electrician*, July 3, 1914.



### Units, Measurements and Instruments

**Permeameter.**—At the recent annual exhibition of the French Physical Society the Ilivici permeameter was shown, which permits measuring the permeability of samples of iron or steel as a function of the magnetic induction. When a source of direct current of 12 volts is available, the induction may be varied between 0 and 200 gauss; with a source of direct current of 24 volts the induction may be raised to 400 gauss. The samples must have a rectangular cross-section of about 1 sq. cm. (0.155 sq. in.). They may be solid or may consist of superposed sheets of identical dimensions. In Fig. 3  $AB$  is the sample to be tested. It is placed within a coil supplied with the current  $I$ . The two cores  $C_1$  and  $C_2$  make contact at  $A$  and  $B$  with the sample and each carries a coil. The coil wound around  $C_1$  is supplied with an adjustable current  $I_1$ . The coil around  $C_2$  is connected at  $m$  and  $n$  with a fluxmeter or ballistic galvanometer. The current  $I$  is regulated by means of a rheostat and measured by an ammeter cali-

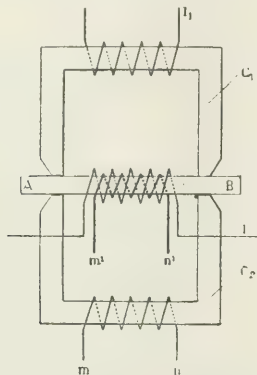


FIG. 3.—DIAGRAM OF PERMEAMETER

brated directly in gauss. The rheostat is so adjusted as to get the desired number of gauss. The magnetic potential difference  $V$  between  $A$  and  $B$  equals  $4\pi nI - R\Phi$  where  $R$  is the reluctance of the sample between  $A$  and  $B$ ,  $\Phi$  is the flux in the sample and  $n$  is the number of turns in the primary coil. The current  $I_1$  which passes through the winding of  $C_1$  is now so adjusted as to bring  $V$  to zero. This is the case when on reversal of the current by means of a simple commutator no deflection of the fluxmeter or the ballistic galvanometer is obtained. In this case  $4\pi nI = R\Phi$ . The flux  $\Phi$  is now measured by connecting the fluxmeter to the terminals  $m'n'$  of a second winding on the sample  $AB$ . The induction  $B$  is then  $\frac{1}{2}\Phi/nS$ , and the magnetizing force  $H = 4\pi nI/l$  where  $l$  is the length between  $A$  and  $B$ . It is, therefore, possible to plot the curve  $B$  as a function of  $H$  or to calculate the permeability  $\mu = B/H$ . The magnetic contacts do not interfere in the measurements. Some details are given of and construction of the instrument.—*La Lumière Elec.*, June 6, 1914.

**Ewing's Hysteresis Tester.**—J. H. MEACOCK AND H. RILEY.—An account of an investigation which was undertaken with the object of throwing further light on the cause of the peculiar shape of curve obtained with the Ewing hysteresis tester when the deflection is plotted against the number of strips rotated. The first part of the work involved obtaining examples of the curve in question. The next part of the investigation was to determine the variation of flux density throughout the length of the specimen, and this was carried out

by three methods, the Grassot fluxmeter, the ballistic galvanometer, and the Duddell oscillograph. The losses are calculated from the figures obtained and the results are discussed. Uneven flux distribution and its effect on the curve are dealt with and the use of ring-shaped samples is discussed.—*London Electrician*, June 26, 1914.

**Measuring Transformers.**—An illustrated note pointing out the ambiguity in the usual notation of positive and negative primary and secondary terminals of measuring transformers and the troubles and disadvantages resulting from such ambiguity.—*La Lumière Elec.*, June 27, 1914.

**Meters.**—W. LUBACH.—A review of recent advances made in the design and construction of electric meters and auxiliary apparatus and devices for measuring customers' service.—*Elek. Zeit.*, July 2, 1914.

**Meters.**—An official communication of the Reichsanstalt by which a direct-current motor-meter and a single-phase induction meter by Koerting and Mathiesen are admitted for calibration. Their design and operation are illustrated.—*Elek. Zeit.*, June 25, 1914.

### Telegraphy, Telephony and Signals

**Television Apparatus.**—A note of a new system of "seeing at a distance," devised by A. M. Low, selenium cells being used. The image to be transmitted is thrown onto a number of selenium cells through a lens. The resistance of each cell varies with the intensity of the light falling upon it. A roller provided with platinum contacts is driven by an alternating-current motor backward and forward over these cells, making contact with each cell in succession. At the receiving end there is a similarly driven roller moving over a number of contacts insulated from one another and arranged in the same fashion as the selenium cells. The motors at the receiving and transmitting stations are tuned to run in synchronism, so that the circuit is made between each selenium cell and the corresponding contact in the receiver in rapid succession. The current through each contact will thus be dependent upon the intensity of the light on the corresponding selenium cell. These currents are utilized to control magnetically the adjustment of a number of steel slats which admit light to squares in the same relative positions as the corresponding cells in the transmitter. The selenium cells are insulated by thin sheets of mica, and the roller and the cells over which it moves are immersed in kerosene. An induction coil is employed for supplying the transmitting current at a pressure of about 50,000 volts, as this has been found necessary on account of the thin film of kerosene which prevents complete contact between the roller and selenium cells. The total power required is about 80 watts for the sending and about 50 watts for the receiving apparatus.—*London Elec. Eng'g*, June 11, 1914.

**Order Wire Service in Large Telephone Plants.**—J. BAUMANN.—The most troublesome problem in the London telephone service is the fact that more than 90 per cent of the telephone traffic in the metropolis is transacted over junction lines connecting the various exchanges—i. e., a subscriber far more often wants a number on another exchange than on his own. The author claims that the usual procedure to handle this important part of the whole service is exceedingly primitive, costly and inefficient. He proposes to overcome these disadvantages by the employment of an order wire system, the essential feature of which is that for each group of  $A$  operators, and the corresponding  $B$  operators, a common set of pairs of continuously moving switches is provided, each pair of which may be used by an  $A$  operator to seek automatically a free  $B$  operator, and to indicate automatically a free junc-

tion line. The arrangement of the system is described in detail and illustrated.—*London Electrician*, June 26, 1914.

*Wireless Telegraphy*.—P. BRENOT.—An illustrated review, with maps, of the organization of wireless-telegraph stations in the French colonies.—*La Lumière Elec.*, June 20, 1914.

*Induction in Telephone Lines*.—KARL WILLY WAGNER.—The conclusion of his long and highly mathematical paper on the induction effects of transient traveling waves in power transmission lines upon telephone lines in the neighborhood.—*Elek. Zeit.*, June 11 and 18, 1914.

#### Miscellaneous

*Electrical Welding of Sheets*.—An illustrated description of an electrical welding process for iron sheets which is to compete with riveting. Single-phase alternating current is used at a pressure of from 3 to 5 volts. Two copper electrodes are used, one being flat and the other having a sharp point which is pressed against the sheet.—*Elek. Zeit.*, June 18, 1914.

*German Patent Office*.—E. BRITZMANN.—The total number of German patent applications in 1913 increased by 8.1 per cent over that of the year before. The increase of electrical patent applications was 557, or 19 per cent. There were in the whole 3572 electrical patent applications during 1913. Since the creation of the German patent law in 1877, 45,676 patent applications had been made and 17,088 had been granted up to the end of the year 1913. Of these 4281 were still in force at the end of 1913. The work of examination is still rather slow. There remain, for example, one electrical and four other patent applications from the year 1905 which have not yet been definitely decided.—*Elek. Zeit.*, June 18, 1914.

## Book Reviews

**DIE EISENBAHN-TECHNIK DER GEGENWART.** Compiled by Messrs. Barkhausen, Blum, Courtin and von Weiss. Vol. IV, Part E, Fahrzeuge für Elektrische Eisenbahnen. Edited by E. C. Zehme. Wiesbaden, Germany: C. W. Kreidel. 242 illus., 6 tables. Price, 10 marks.

A very complete practical treatise on modern electric vehicles, giving a large amount of detailed information concerning the various types of electric locomotives and railway motors in service, especially as employed in northern Europe. The book is the fourth volume of a work covering the whole subject of electric traction. It is divided into five sections on the following topics: vehicles for electric railways, street-railway cars, vehicles for electric city and main line roads, examples selected from such vehicles, electric locomotives for main-line railroads. The treatment is clear and has been presented by engineers for engineering students or engineers specializing in electric railways. The volume may be employed as a reference book separately from the others in the series. It will commend itself to electrical engineers generally.

**DIE FABRIKATION UND EIGENSCHAFTEN DER METALL-DRAHTLAMPE.** By Dr. N. L. Müller. Halle a. S., Germany: Wilhelm Knapp. 192 pages, 91 illus. Price 8.6 marks.

A short treatise on the manufacture and properties of metallic-filament incandescent lamps. A brief history is given of their development. Their physical properties are then outlined. The methods of manu-

facture are next discussed, including the preparation of the filaments. The chemistry of the subject receives special attention. The book is clearly written and is descriptive so far as manufacturing processes are concerned. It is precise in relation to chemistry and physics. The patents covering the various processes are detailed with some care. The work will be of interest to students of electric lamp manufacture as practised in Europe.

**THE ELEMENTARY PRINCIPLES OF ILLUMINATION AND ARTIFICIAL LIGHTING.** Vol. IX. By Arthur Blok. London, England: Scott, Greenwood & Son. 236 pages, 126 illus. Price, 3.5 shillings.

This book, which the author states is addressed to students and engineers, seems also excellently adapted by its clear style of treatment to the general reading public interested in keeping up with engineering progress; but naturally, on account of its failure to discuss fundamental theory, it is hardly adapted to classroom uses. In the opening chapter, on the nature of light, one wishes that more had been said concerning the matter of color and the laws of radiation. Likewise the important function of the eye in illumination considerations has been entirely omitted. The treatment of the conception of light flux, as well as the method of calculation, is exceptionally clear. Especially to be commended are the numerical examples with which the subject matter is enlivened. Very little of photometry and its refinements is to be found in the book, and only two or three of the more important photometric instruments are described. But the discussion of the latter is at the same time explicit and lucid. The chapter devoted to indoor lighting presents an admirable outline of the essential features of the subject, but the subject of street lighting does not appear to have received similar consideration. Likewise, the chapter on artificial illuminants treats remarkably well in so small a space the characteristics of gas and electric incandescent illuminants but appears needlessly meager in respect to arc and other types. A pleasing feature of the book is the large number of illustrations, mostly diagrams, which have been included and happily supplement the lucid style of the author. On the whole, one is surprised at the large amount of useful material that the author has managed to condense in so readable a manner within so small a space.

**ENGINEERING INDEX ANNUAL, 1913.** New York: The Engineering Magazine. 508 pages. Price, \$2.

In this book, grouped under the heads of civil, electrical, mechanical, mining, etc., and sub-classified alphabetically according to the recognized special divisions of each field, are indexed about two hundred and fifty engineering publications printed in six languages and representing seventeen nations and colonies. With this volume—the twelfth since the work was undertaken and the eighth since it assumed the annual form—a continuous index of the engineering and technical literature for the past thirty years is made available. To facilitate using this book a classification of the index proper is provided, the articles being grouped under general, division and catch-line headings with the number of the reference page on which will be found a brief description of the contents of the article. The actual index defines the scope and purport of each article, in many cases sufficiently to save the investigator the trouble of looking over the original article indexed therein. In general this index may be used as a guide to the mass of engineering information stacked on the shelves of reference libraries throughout the world.



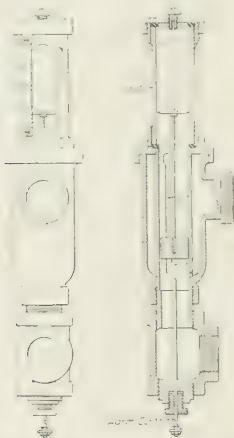
# New Apparatus and Appliances

An Illustrated Descriptive Record of Recently Developed  
Manufactured Products of Interest to Electrical Readers

## Flow Meter

To meet the demand for an accurate instrument capable of indicating the flow of liquids in pipes, the apparatus illustrated herewith has been designed and patented by Mr. John F. Vaughan, hydraulic engineer, Stone & Webster Engineering Corporation, Boston, Mass. The device, which is made in three standard sizes of 20-gal., 50-gal. and 100-gal. ratings, is being manufactured by W. & L. E. Gurley, Troy, N. Y., and Seattle, Wash.

The instrument consists of a cylindrical chamber with suitable pipe connections inclosing a slotted tube through which the liquid passes. Inclosed in the slotted tube is a piston which, as the liquid is turned on, is carried upward until the exposed area of the slots is sufficient to allow the flow of the liquid up to the capacity of the indicator. An index is attached to the

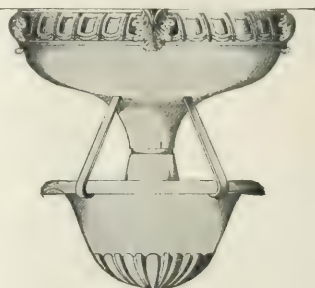


ELEVATION AND SECTION OF FLOW METER

upper end of the piston rod, which extends into a glass tube at the top of the cylindrical chamber, the tube being incased in a protecting cover cut away to allow the movement of the index, corresponding to the rise and fall of the indicator, to be noted. A scale on the side of the case is graduated in gallons per minute. An electric contact consisting of a brass rod set through a stuffing box at the bottom of the chamber can be connected to a lamp or bell, calling attention to the fact that the flow has fallen below a fixed minimum. The rod may be adjusted to project any length inside the chamber and the desired flow may be secured within the capacity of the instrument. Under test the instrument has practically a straight-line calibration over a large range, and the loss of head has been found to be negligible, the maximum being 0.04 lb. per square inch with a flow of 15 gal. per minute. The indicator may be used with screens for dirty water and may easily be taken apart for cleaning. It is adapted to a large number of commercial uses, such as cooling, heating, lubricating, boiler supply and other applications.

## Semi-Indirect-Lighting Fixture

The semi-indirect lighting unit shown in the accompanying illustration is equipped with its own reflector, which consists of a concave porcelain-enamel surface. The bowl is of translucent glass, in either plain or satin finish, and can be removed for cleaning by lift-



SEMI-INDIRECT-LIGHTING FIXTURE

ing one of the straps by which it is suspended. This "ease-eye-light" fixture, as it is called, is being placed on the market by the Shiras-Chassaing Electric & Manufacturing Company, St. Louis, Mo.

## Breast Telephone-Testing Set

A telephone-testing set which can be fastened on the breast, thus enabling the operator to keep both hands free, is being placed on the market by the Holtzer-Cabot Electric Company, Brookline, Mass. The set illustrated herewith was designed for use in the United States Navy and by corporations building battleships. The



TELEPHONE TESTING SET

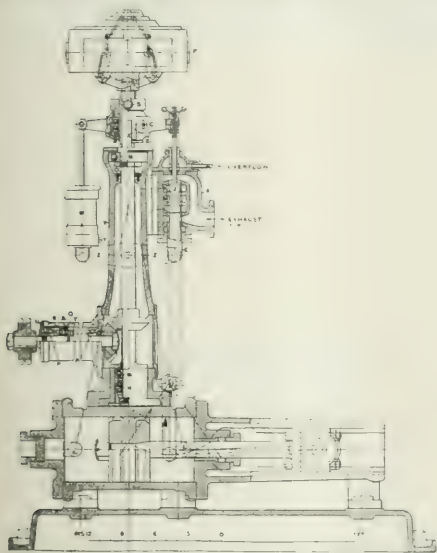
breastplate, battery holder and transmitter are made of sheet brass. The battery holder is arranged to take a flashlight battery. The receiver is of the standard head-band type with outer shell of hard rubber and inner shell of metal. Provision is made for taking the strain off the connections on the receiver cord and test-

ing leads. A pair of rubber-covered test clips are provided at the ends of the 4-ft. leads as shown in the illustration. The transmitter, receiver, battery and testing leads are all connected in series.

### Hydraulic Relay Governor

A sectional view is shown herewith of a hydraulic governor for controlling the speed of water turbines, impulse wheels, etc. On the governor sleeve is mounted an aluminum cross-head *C*, which rises and falls with the sleeve *S*. This crosshead can be adjusted to take up wear and is prevented from revolving by means of the stops *X* and *X'*. One end of the crosshead is directly connected to the piston-valve *J* and the other end to the plunger of the oil brake *W*.

The compensating or readjusting mechanism consists of a bronze tube or sleeve *E*, which slides in the valve body *A*, inside which the plunger *J* works freely. The sleeve is connected to the piston of the servomotor



HYDRAULIC GOVERNOR

as shown, or to some portion of the gate-regulating mechanism, and every movement of the piston-valve is duplicated by this sleeve. These movements are said to be almost simultaneous. A few ounces in weight are quite sufficient to move the plunger *J*. The exhaust from valve *A* is throttled instead of the supply, thereby removing some of the strain from the piston valve and making it easier to move the relay piston.

Ball bearings are used throughout in this governor, which is being manufactured by Percy Pitman, 3 Willcott Road, Acton, London, W., England.

### Single-Unit Lighting Standards

The lighting standards shown in the accompanying illustrations are designed for use with single high-candle-power tungsten lamps operating on either multiple or series circuits. The column is deep-fluted and is 6.875 in. in diameter at the top and 8 in. at the bottom. The base is 17 in. in diameter and 18 in. high. Four foundation-bolt lugs are provided on the inside.

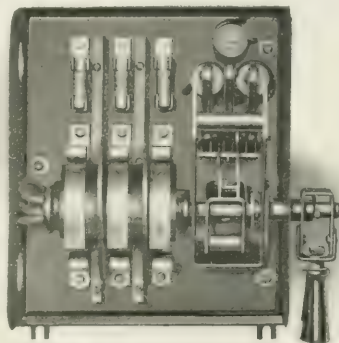


FIGS. 1, 2 AND 3—ORNAMENTAL SINGLE-UNIT LIGHTING STANDARDS

The base door is 4.5 in. by 8 in. The height to the center of the lamp is 12 ft. The over-all height of the column shown in Fig. 2 is 13 ft. 10 in. The weight is 450 lb. These standards are being made by the King Foundry Company, St. Joseph, Mo.

### Starting Switch for Small Alternating-Current Motors

An inclosed starting switch for alternating-current motors with ratings of 10 hp or under is being placed on the market by the Allen-Bradley Company, Milwaukee, Wis. These switches are not equipped with resistance but are provided with protective features which, the manufacturers claim, insure the motor against the possibility of operating with an overload or running single-phase. In the illustration herewith is shown a starting switch with no-voltage and fuse protection on the running side. To the operating lever shaft are attached levers which in the running position are held in an upright position by magnet coils, each phase being equipped with an individual coil. When an interruption occurs to the line, these coils are demagnetized and the weighted levers swing down, thereby releasing a spring latch which returns the starter to the "off" position and accordingly stops the motor. These starting switches are inclosed in steel cabinets.

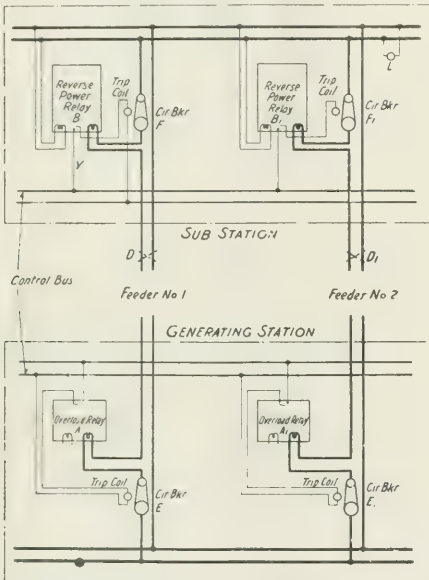


STARTING SWITCH FOR ALTERNATING-CURRENT MOTORS



### Selective Reverse-Power Relay

Reverse-power relays for the protection of parallel feeders, which will not operate on overload, are being made by the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa. In the diagram are shown two feeders running from a generating station to a substation. At the generating station are plain overload relays, set for a comparatively long time element, and at the substation two sets of selective reverse-power relays, one set for each feeder. When the direction of energy flow is normal, that is, both feeders supplying energy to the substation, the reverse-power relays cannot trip their breakers no matter how heavy the load may be. Now if a ground or short-circuit occurs at *D* on feeder No. 1 there will be a heavy flow of energy on both feeders, for feeder No. 2 will supply energy through the substation and back on feeder No. 1 to the point of the short-circuit. Thus the direction of energy flow is reversed at relay *B* in the substation. This



RELAYS FOR PROTECTING PARALLEL FEEDERS

reversal of direction of energy flow is the only thing that can cause relay *B* to operate. As soon as circuit-breaker *F* is opened, the load on No. 2 feeder falls back to normal, and it continues to operate the substation. If the short-circuit continues, the overload relay *A* in the generating station will trip its breaker and the line will then be clear.

### Front-Drive Tilting Tractor

An electric tractor operated by means of so-called "couple-gear" wheels, which have electric motors inside driving with a 25-to-1 reduction at the periphery of the wheels, is shown in the accompanying illustration. The frame extends back of the battery box about 5 ft., and the two ends of the frame are beveled upward. The trailer wagons used with this tractor are provided with metal pockets underneath the floor which engage with the beveled ends of the tractor. An ordi-

nary hook coupling with turn-buckle is used on each side to couple the tractor and trailer together. When coupled, the small auxiliary rear wheels are about 6 in. above the ground. The battery can be used as a single



TRACTOR WITH FRONT-WHEEL DRIVE

unit by means of an overhead chain hoist and rail. In the lumber business, for which this tractor is well adapted, the hauls are usually long, and it is often convenient to change the batteries once a day. This tractor is being placed on the market by the Eldridge Manufacturing Company, Boston, Mass.

### Portable Motor-Driven Saw

In attempting to develop an electrically operated device for bucking and felling trees, the C. A. Smith Lumber & Manufacturing Company, Marshfield, Ore., constructed the portable motor-driven chain saw shown herewith. It operates very satisfactorily, but being in the development stage will probably require some changes before it will meet the requirements obtaining in a lumber camp. The saw weighs only 80 lb. and is capable of cutting through a 2-ft. log in less than a minute. The cutting element consists of a motor-driven



PORTABLE MOTOR-DRIVEN LOG SAW

saw-toothed chain traveling around the peripheries of two pulleys, one at each end of the frame. The motor is directly connected to one of the pulleys and is concealed by the guard covering the saw chain.

### Cutout Switch

The "absolute" cutout switch shown herewith is designed for use in ornamental poles carrying General Electric or Westinghouse series arc lamps. Extra-



CUTOUT SWITCH FOR USE IN ORNAMENTAL POLES

heavy material is used at the contact points to give the switch the longest possible life. The handle or knob is reinforced by a metal bushing which prevents the porcelain wearing or chipping off when the switch is used. This switch is being made by the Elmer P. Morris Iron Works, 136 Liberty Street, New York.

### Horn-Gap Lightning Arrester

A series horn-gap lightning arrester with a resistance in the ground circuit of each phase is being placed on the market by the Railway & Industrial Engineering Company, Pittsburgh, Pa. The arrester consists of a triangular choke coil wound with strap copper and a ground horn mounted on a post-type insulator which supports and insulates the resistance units from each other and from the ground. A surge meets its first obstruction at the first sharp turn of the choke coil, opposite which point is mounted the ground horn. The resistance is of such value as to limit the current to approximately 10 amp should two or more phases



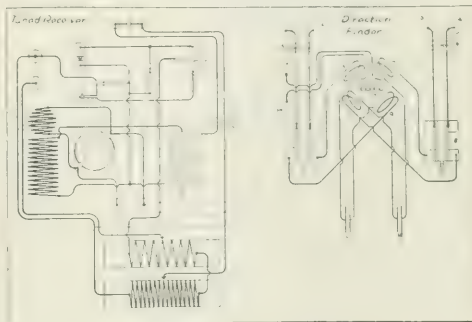
SERIES HORN-GAP LIGHTNING ARRESTER

discharge simultaneously. The resistance material in the ground circuit of each phase is made of a composition material called "koppat," which is very strong mechanically. The resistance columns are so con-

structed that they may be used with so-called Burke arresters now in service, operating with horns connected directly to the ground.

### Wireless Direction Finder

Wireless apparatus has been developed by the Marconi Wireless Telegraph Company, Ltd., New York City, which enables the navigating officer of a ship to take bearings of wireless-telegraph stations with a view to finding the position of his ship or to avoiding collisions with other ships. It is especially adapted to use when fog or other weather conditions prevent employing the usual direct-bearing method. Under reasonably good conditions bearings may be obtained within two or three degrees of the correct value, and under the worst conditions within five degrees. The error due to the instrument itself does not exceed one degree. Iron-work in the ship has practically little effect on the results obtained, and if any deviation does exist, it may be compensated for. One advantage of this apparatus is that a ship equipped therewith does not have to be swung around while bearings are being taken. The range of the installation is from about 10 miles to 50 miles or more, depending on the power of the wireless



ARRANGEMENT OF APPARATUS

stations from which the signals are being received, and in the case of small ships, on the size of aerial which can be erected.

The operation of the apparatus is based on the principle that wireless antennas will receive Hertzian waves best when the plane of the aerial is in the direction of the station propagating the waves which are being received. If the plane of the aerial is at right angles to the direction from which the signals are coming it receives no impulses. In intermediate positions the current induced in the aerial due to the Hertzian waves varies as the cosine of the angle between the plane of the aerial loop and the direction of the sending station.

The installation necessary for wireless direction-finding consists of two parts—the aerial circuit and the detecting circuits. The aerial comprises two triangular loops of equal size similarly supported in vertical planes crossing each other at right angles. The loops are usually supported by one corner and are installed with their planes at 45 deg. with the center line of the ship.

The base-line of each loop is divided into two sections by an insulator inserted at the point where the two conductors cross. Wires connect the insulator-joined ends of the two aerials with terminals 1, 2 and 3, 4 respectively on the direction-finding instrument case. The connections inside the direction finder are shown in the accompanying diagram, where coils 9 and condenser 11



are connected in series across the gap of one aerial and coils 10 and condenser 12 are connected similarly across the gap in the other aerial. The axis of the coils connected to one aerial is at right angles to that of the coils bridged across the other aerial.

Inside the crossed coils is a third coil called the "exploring coil" mounted on a vertical spindle carrying a pointer which shows the position of this coil with respect to the fixed coils. As mentioned before, the current induced in the aerials is proportional to the cosine of the angle between the plane of the aerial loop and the direction of the sending station, therefore the current in the cross coils will correspond with these values and produce a resultant field, the direction of which can be determined by the exploring coil.

Terminals 14 and 15 are connected to wave-detecting apparatus similar to that used in receiving radio communications. By varying the position of the exploring coil and at the same time listening to the intensity of the signals in the receivers of the detecting set, it is possible to find one position of the exploring-coil pointer for which the signals will sound louder than when the pointer is in any other position. This condition will exist when the plane of the exploring coil is at right angles to that of the resultant field of the crossed coils, or in other words, when its plane is in the direction of the station from which the signals are coming.

A small testing instrument is also employed in connection with the apparatus for the purpose of adjusting the instrument and of detecting any defect in the installation which might cause an error in the bearings obtained. It consists of an ordinary wireless sending set, the aerial of which is located at equal distances from the two direction-finding aerials so that the latter are equally excited thereby. If the direction-finding aerials are in every way identical, as they should be, the direction finder will indicate that the test aerial is on the center line of the ship.

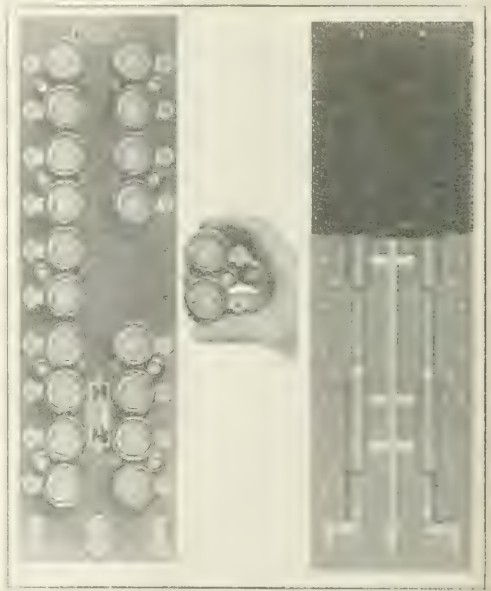
When bearings are to be taken the ship's wireless operator signals the station whose bearing is desired and asks the operator to send messages for two minutes at the wave-length to which the ship's apparatus is tuned. This direction-finding apparatus will indicate the line on which a wireless transmitting station is located but will not show in which direction the station is along that line. There will seldom be any doubt, however, as to whether the ship is approaching or receding from a station as by the wrong interpretation the ship would have to be presumed to be somewhere inland instead of at sea. When locating another ship in a fog the direction finder will indicate by the intensity of its signal if the other ship is approaching, but may leave a doubt as to whether it is bearing toward the port bow or overhauling on the starboard quarter. The doubt can be removed at once, however, by addressing a wireless query to the other ship as to her course.

### Improved Panel Board

Panel boards recently brought out by the Starrett Electric Company, 217 West Superior Street, Chicago, include several improvements in construction, yet are said to be no more expensive than porcelain cut-out panels constructed on the job. One of these new panel boards for a ten-circuit installation measures 5.125 in. by 17.625 in. by 2 in., and weighs but 7 lb.

Illustrations herewith show the front and rear of such a ten-circuit board with a fuse receptacle removed in Fig. 1, and with the busbars exposed in Fig. 2. The fuse receptacle for each circuit is a unit part and can be quickly removed and replaced without dis-

turbing other circuits. It is held in place by two screws in the center of the fuse sockets. The base and the back of the panel board in which the busbars are



FIGS. 1 AND 2—FRONT AND REAR OF PANEL BOARD

concealed consist of 0.735-in. and 0.25-in. pieces of black molded insulation.

Type A panel boards, as they are called by the manufacturer, are now being made in four-circuit, six-circuit, eight-circuit and ten-circuit sizes. Since these units are to be placed in cardboard boxes and corrugated cartons, jobbers will be able to carry panel boards in stock, an arrangement heretofore deemed impracticable on account of the great bulk of the boards.

The chief advantages of these boards from the contractor's standpoint, aside from the question of first cost, lie in their flexibility and convenience and in the fact that the cost per circuit will be maintained the same throughout all sizes of boards. These panel boards have been approved by the Underwriters' Laboratories, Inc.

### Bench Washer

A bench washer which can be operated by electric motor or other source of power is being placed on the



BENCH WASHING MACHINE

market by the H. F. Brammer Manufacturing Company, Davenport, Ia. The frame of the bench is made of hard-wood lumber 1.5 in. thick. The bottom and sides of the tub are corrugated. The outlet for drain-

ing is at the bottom of the tub and is threaded so that when desired an ordinary garden hose may be attached and the water led to a drain. The wringer is equipped with 12-in. rolls and can be moved from tub to tub. The extension for holding the clothes basket slides out of the way when not in use. The platform is raised where the rinse tubs are placed for the convenience of the operator when using the wringer.

### Three-in-One Automobile Signal Lamp

A combined signal lamp, tail-lamp and license bracket is shown in the accompanying illustration. The signal lamp is semi-cylindrical in shape and is divided into three compartments each of which is lighted by a small tungsten lamp. Each compartment can be lighted independently of the others or in combination with them. The first compartment contains the word "Left," meaning that a turn is about to be made toward that side. On the glass of the next compartment is printed the word "Stop," and the third compartment is labeled "Right." The glass of the first compartment is red, the next black and the third green. The license number is



ILLUSTRATION OF SIGNAL LAMP WITH LICENSE BRACKET

lighted through a clear-glass opening below the tail-lamp.

This combination set is being placed on the market by the Standard Signal Lamp Company, Bridgeport, Conn.

### High-Speed Blueprinting Machine

The blueprinting machine illustrated herewith is designed for high-speed operation. Six arc lamps are used outside a glass cylinder, and the light passing through the cylinder affects the sensitized paper placed on the surface of the cylinder opposite. The paper, with the tracing right side up on top of it, is fed across a table into the machine, where it passes to the surface of the revolving glass cylinder, the tracings to be printed lying between the cylinder and the paper as the cylinder turns through half a revolution. Tracing and print then leave the cylinder and drop into a chute in front of the operator below the feeding table. If the printing is done from continuous rolls, the roll is automatically wound up again as it is printed, or it may be arranged to deliver the paper direct to a continuous washer and drier, the tracing remaining in the chute, which in this case is placed at the back of the machine. The machine is equipped with differential speed gears and may be instantly stopped by pressing a treadle, without stopping the motor. Two machines may be

placed in duplex, using one set of lamps between them; the output can thus be increased about 75 per cent without materially increasing the cost of energy.



ILLUSTRATION OF BLUEPRINTING MACHINE

This blueprinting machine is being placed on the market by the Revolute Machine Company, 417 East Ninety-third Street, New York.

### Motor Commutator with Molded Insulation

In a test recently carried on by the United States Light & Heating Company, Niagara Falls, N. Y., with an automobile starting motor having its commutator built up with "bakelite" molded insulation, a speed of 9060 r.p.m. was attained before the commutator failed. As the maximum speed at which such a commutator is operated in actual service is usually about 3500 r.p.m., the factor of safety indicated in the above test was approximately 6.7. The type of commutator tested is shown in the accompanying illustration. This commutator has a total weight of 8.46 lb. and an outside diameter over the tangs of 13.375 in. When tested the tangs were removed so that the commutator then weighed 7.06 lb. and had an outside diameter of 10.375 in. This is the diameter at the commutator face. In order that the commutator, while being tested, should approach service conditions as to temperature, it was heated to 265 deg. Fahr., this temperature being somewhat higher



than that which would occur in actual service. Calculations show that the disrupting force—that is, the force tending to pull the commutator apart—was 15,230 lb. per sq. in.



## Jobber, Dealer and Contractor

### Salt Lake Electrical Contractors Lunch Together

In order to promote a freer and closer business relationship locally, the electrical contractors of Salt Lake City have for several months been eating luncheon together three times a week at the Commercial Club. When matters affecting the electrical industry require attention discussion ensues. Only recently the commission of Salt Lake City had proposed a revision of the present electric-sign ordinance, and after a discussion it was found that while the proposed ordinance was a decided improvement over the old one, there were yet certain features which would work to the disadvantage of sign users and, consequently, of the electrical industry. A committee was therefore appointed to wait on the city commission and to explain the situation with the view of having the necessary remedy made. Thus business and pleasure are combined by the diners.

### Aiding Fixture Sales by Descriptive Booklet

The sale of electric-lighting fixtures of distinctive design is much facilitated, according to the experience of McDonald & Willson, Ltd., Montreal, Quebec, by the use of a sixty-page booklet illustrating many buildings which have been equipped by this house throughout Canada and emphasizing some of the notable features of modern illumination. The booklet, a 7-in. by 9-in. pamphlet of artistic make-up, points out that the man who puts up a fine residence makes a mistake if he installs only ordinary lighting fixtures, and it goes on to show the advantages of a well-designed installation in the production of "home atmosphere." The evils of glare and wasted light are set forth in popular terms, and a contrast is drawn between the ugly and inefficient fixtures of the last century and the beautiful and effective products of modern manufacture. A few sentences from the booklet follow:

"The question of light distribution was formerly little studied and not at all understood. Fixtures were located according to the fancy of the workman, and the worst lighted interiors were often those where most money had been spent. In lighting the twentieth-century home the problem is not one of quantity, it is one of quality; not how to secure enough light, but how to secure the right kind of light in the right place.

"In large rooms there should be several sources of light, for the corner that is more than 10 ft. from a source is seldom well lighted. This is because the strength of the light diminishes inversely as the square of the distance—the direct illumination 15 ft. away being only one two-hundred-and-twenty-fifth as much as 1 ft. away. It is interesting and of great practical value to study the ways in which light and shade affect the proportions of a room. In a light environment dark surfaces and objects seem to advance toward the eye, while the light ones recede. A dark ceiling appears much lower than a light one. So, if a room is small and high, the fixtures should light the ceiling dimly and the walls brightly, thus increasing the apparent width and lessening the apparent height. If the ceiling is too low, the walls should be left dim in order to pull them together and the ceiling made bright in order to push it up."

The firm maintains offices at Winnipeg, Man., and Toronto, Ont., as well as at Montreal, and the Toronto showrooms are standardized as to window and interior displays, being arranged to represent the rooms in an average house of the better class.

### Merchandising Electric Irons at Worcester, Mass

An exceptionally well-arranged display of electric flat irons is illustrated in the accompanying photograph of the window of the Duncan & Goodell Company, Worcester, Mass. This house conducts an annual flatiron campaign, selling electric irons on the basis of a full cash payment with the privilege of refund of money after thirty days' trial. Ninety-five per cent of the irons remain in service. The window display, combined with advertising in the local press, has enabled the company to market nearly ten irons per day.

The details of the window arrangement are such as to give the passer-by a sense of perspective leading to a climax in the center of the exhibit. At this point the terms of the company's proposition are set forth in front of a pyramid of standards carrying irons in both horizontal and vertical positions. The irons are displayed at nine different levels in the window, eighteen units being shown on ends and bottoms, alternately, in a row around the front of the exhibit, with a dozen more in the middle foreground. The irons are placed on bands of blue and white paper 10 in. wide to give a greater contrast between the body of each iron



ELECTRIC-IRON WINDOW DISPLAY AT WORCESTER, MASS

and the window shelf, with its inlaid wooden surface. From front to back, ascending tables of irons are provided, with a central display of a single iron on a separate shelf, this iron being entirely disassembled to show the convenience with which spare parts may be replaced. By bringing the shell, body, handle, flexible cord, plugs, heating element, etc., to the front of the window in this central position, the practicability of the equipment is well emphasized.

At the rear are shown a dozen or more irons boxed for shipment by parcel post or express. The neat packages exert a psychological effect on the prospective purchaser, who thus sees that no time need be lost in buying one of these products if he is in a hurry. One of the most compelling features of the window, however, is the arrangement of a group of half a dozen irons at the sides of the window on Goodwin brackets which are adjustable to various angles in both horizontal and vertical planes. These brackets support the irons at heights conforming somewhat with the various levels of the displays at the rear. Flexible cords, run from outlets in the upper center of the window, complete the equipment and indicate the ease with which the iron may be supplied with energy in service. The window is about 6 ft. deep, 8 ft. long and 8 ft. high, and is illuminated at night by fifteen 25-watt tungsten lamps in prismatic reflectors.

# Industrial and Financial News

## Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

**Transformers for English Railway.**—The General Electric Company was recently awarded the contract for twenty-seven large transformers for the City Railway Company of London, England. The total cost of the units, it is said, will be in the neighborhood of \$110,000.

**New Factory for Instrument Company.**—The Brown Instrument Company, Philadelphia, Pa., will, about Oct. 1, move into its new factory at Wayne Avenue and Windrim Avenue, within half a block of the Wayne Junction station, Philadelphia. The building is two stories high and is of modern construction throughout.

**Electric-Bell Workers Cheerful.**—The P R Manufacturing Company, of Detroit, avers that it knows nothing about a so-called business depression. Apparently the goose hangs high in this establishment, for which the claim is made that it possesses the largest factory in the country devoted exclusively to the manufacture of electric bells.

**Oil Engines for Government Service.**—Orders for the following oil-engine sets were recently placed by the United States government with August Mietz, 128 Mott Street, New York: Seven 45-hp compressor sets; two 18-hp compressor units; one 7-hp unit; one 150-hp marine engine, and two 12-hp compressor units. A number of Mietz & Weiss oil engines are being used in the various departments of the United States government. During the past three years twenty-five vertical oil engines for driving generators have been purchased by the government for its radiotelegraph operations.

**Electric Equipment for Automobiles and Fire Trucks.**—The Singer Motor Company, Inc., Long Island City, N. Y., will use the Westinghouse electric starting and lighting system on its 1915-model cars. This equipment includes the starting motor and lighting generator with complete equipment of switches, fuse blocks and voltmeters. The American-La France Fire Engine Company, Elmira, N. Y., has also adopted the Westinghouse electric automobile equipment for fire trucks of its manufacture. The outfits consist of starting, lighting and ignition apparatus for motor trucks used in connection with fire-department work.

**Slogan Sign for Wausau, Wis.**—A slogan sign recently installed in Wausau, Wis., consists of a single-faced galvanized-iron and steel structure, with the words "Work for Wausau" in 48-in. and 60-in. grooved-block letters. This sign is surmounted by an eagle holding in its talons the United States coat-of-arms, from which red, white and blue ribbons trail in a waving motion from the center to both extremities of the display. At the ends of the sign are banners with flaming torches in colors. The display contains 976 5-watt tungsten lamps and is 40 ft. long and 33 ft. high. It was presented to the city by the Wausau Street Railroad Company and was made by the Thos. Cusack Company, of Milwaukee, Wis.

**Largest American Diesel Engine.**—What is said to be the largest Diesel oil engine constructed in America has been ordered by the Lyons Atlas Company, Indianapolis, Ind., to the Hawaiian Commercial & Sugar Company, through the company's New York agents, Alexander & Baldwin. The engine is of the four-cylinder, four-stroke-cycle type rated at 600 bhp-horsepower, with an overload range of 15 per cent. The conditions covering the acceptance of the engine were severe. The purchaser insisted that the engine should operate continuously 710 hours out of each 720 hours per month at its rated load, using the ordinary 14 deg. to 18 deg. asphaltum base California fuel oil, similar to that used in the purchaser's steam plant, and which is the only grade available on the islands. At the completion of the tests the engine was accepted and it is now en route to the islands, to be

erected by the engineers of the sugar company without any assistance from the manufacturer.

**Electric-Truck Company Reorganized.**—The Lansden Company, Ltd., of Brooklyn, N. Y., which was recently formed with a capital stock of \$250,000, has purchased the rights, patents and equipment of the former Lansden Company of Newark, N. J., manufacturer of electric trucks. The plant has been moved to the property in Brooklyn between Flatbush Avenue and Nostrand Avenue, bordering the Long Island Railroad, which was formerly occupied by the John R. Corbin Company. The new company will build trucks of from 1000 lb. to 5 tons capacity. It also purposes to conduct a general repair business in both gas and electric trucks. The plant will be arranged so that six trucks can be charged at one time. About 1000 Lansden trucks are said to be now in use.

**Electric-Vehicle Run from Philadelphia to Boston and Return.**—To demonstrate the adaptability of electric vehicles to touring a Detroit Electric roadster, equipped with a 44-cell Philadelphia thin-plate battery and Goodrich Silvertown Cord tires, recently made the trip from Philadelphia to Boston and return. The run one way occupied 33 hours and 50 minutes, the actual average running speed being 25.4 miles per hour. The car's battery was charged at several points along the route, the "boosts" ranging in duration from several minutes to 1.5 hours or more. Some very long, steep grades were encountered near Worcester, Mass., but these were passed over at speeds between 8 miles and 10 miles per hour. The fastest time was made between Springfield, Mass., and Hartford, Conn., over a lap of 27.5 miles at a rate of 30 miles per hour. Several delays occurred along the route, among the causes for which were a collision, heavy fog, and a three-hour rest at Newark, N. J. Mr. R. L. Heberling, of the Philadelphia Storage Battery Company, Philadelphia, Pa., drove the automobile and was accompanied on the trip from Boston to Philadelphia by Mr. Ralph Sadler of the *Boston Transcript*.

**New Company Formed to Manufacture Small Motors.**—Brief mention was made in the *Electrical World* of June 13 of the incorporation of the Marathon Electric Manufacturing Company, of Wausau, Wis. Some further details relating to this newcomer in the electrical field may be of interest. The officers of the company are as follows: President, Mr. J. S. Alexander; vice-president, Mr. A. P. Woodson; secretary and treasurer, Mr. E. M. Bischoff. These gentlemen, with Messrs. Cyrus C. Yawkey, D. C. Everest and O. Bache-Wiig, constitute the board of directors. Most of the directors are men well known in the lumbering and paper-mill industries in and near Wausau and are men of wealth and prominence. The manager of the company is Mr. E. M. Bischoff, who is also the secretary and treasurer. For many years Mr. Bischoff was in charge of the small-motors sales in the Chicago office of the Westinghouse Electric & Manufacturing Company. For the last two years he has had charge of the manufacture and sale of small motors for the Crocker-Wheeler Company of Ampere, N. J. He is thoroughly familiar with all details of the small-motor business. The designer for the Marathon company is Mr. Justin Lebovici, until recently designing engineer for the Crocker-Wheeler Company and who formerly held a similar position with the Westinghouse Electric & Manufacturing Company. The company will manufacture both alternating-current and direct-current motors ranging in size from 0.01 hp to 5 hp. It has secured a factory in Marathon, which is being fitted up with modern equipment. It is expected that this factory will be in operation by the end of the present year.



Central-Station Business in the Central States.—The accompanying data regarding the May income and output of the lighting and motor-service companies in the Central States may be compared with the returns for April and March, published in the *Electrical World* of June 27 and May 30 respectively. Table I presents a comparison for the three months of the operating data of eleven companies in the East North Central belt, which includes Ohio, Indiana, Illinois, Michigan and Wisconsin. It will be seen

TABLE I—EAST NORTH CENTRAL STATES—COMPARATIVE INCOME AND OUTPUT FOR MARCH, APRIL AND MAY, 1914 AND 1913, OF ELEVEN CENTRAL-STATION COMPANIES

	1914	1913	% In- crease	1914	1913	Per Cent In- crease
Income	\$1,619,641	\$1,441,852	12.2	\$3,359,216	\$3,475,692	11.9
Output	1,637,150	1,413,257		81,628,929	72,064,995	13.3
May	1,556,998	1,390,800	11.9	79,670,974	73,452,193	

that the increase over 1913, as given by the May returns, is lower than that in either April or March on both the income and the output, the energy increase being noticeably below the previous values. Confirmation of this condition seems to be provided by the returns from twenty-one additional (and smaller) utilities in the East North Central States. For the most these additional companies operate in communities of 50,000 population and less and handle a monthly output of 200,000 kw-hr. and up. In the aggregate their gross income is seen to stand at \$481,650 for May, 1914, against \$462,778 for May, 1913, an increase of only 4.1 per cent; while the energy output figures are 20,067,324 kw-hr. against 18,649,831 kw-hr., an increase of 7.6 per cent. Combining these figures with those of the eleven companies shown in Table I, it is found that, for the thirty-two utilities, gross income increased from \$1,853,668 in May, 1913, to \$2,038,648 in May, 1914, or at a rate of 10 per cent; while energy output grew in the same time from 92,102,734 kw-hr. to 99,738,298 kw-hr., or at a rate of 8.3 per cent. The values may probably be regarded as typical for this section of the country, since, with the exception of Illinois, all of the five states are fairly well represented in the reports from the thirty-two companies. On the basis of output these utilities represent between them about 65 per cent of all the lighting and motor-service business in Ohio, Michigan, Indiana and Wisconsin. A rather more satisfactory condition is indicated by the returns from the West North Central States. Comparable returns for March, April and May are available from five big utilities in that area, and the data are shown in Table

TABLE II—WEST NORTH CENTRAL STATES—COMPARATIVE INCOME AND OUTPUT FOR MARCH, APRIL AND MAY, 1914 AND 1913, OF FIVE CENTRAL-STATION COMPANIES

	1914	1913	Per Cent In- crease	1914	1913	Per Cent In- crease
Income	\$2,215,457	\$215,457	9.3	6,516,087	5,880,666	10.9
Output	222,446	222,446	13.0	7,598,351	6,387,714	
May	219,184	219,184	10.9	6,387,714		

II. It will be seen that the rate of increase of 1914 over 1913, as shown by the May returns, is somewhat less than that given by the April figures, although distinctly better than March. In addition to these five companies, further May figures for the West North Central States are available for another eight or ten companies. In the aggregate these additional figures show that gross income grew from

\$264,911 in May, 1913, to \$392,384 in May, 1914, or at a rate of 48 per cent; while energy output in the same time increased from 32,566,111 kw-hr. to 52,413,462 kw-hr., or at a rate of 61 per cent. The totals are given as received, but practically no general conclusions may safely be drawn therefrom. It would be the height of folly to assume upon this basis that the electric-service business in the West Central States is increasing uniformly at a rate of anything like 50 per cent per year, although indeed a representative census of all the utilities in that area might actually show an entirely satisfactory rate of growth. So far as these particular returns are concerned, however, it must be specifically pointed out that the extraordinary high rate of increase is due very largely to the operations of the St. Louis companies. The subsidiaries of the North American Companies in the State of Missouri are handling a greatly increased business this year as compared with 1913; and if it is desired to obtain an average for the State the figures for this group of properties should be regarded as slightly abnormal and eliminated from the calculation. The difficulty of arriving at a true average, however, will be realized when it is stated that with St. Louis eliminated the average is swung down to an unduly low value owing to the poor showing made by the next largest unit among these additional eight companies. This circumstance goes to show nevertheless that at the present time the electric utilities in the Middle West and elsewhere are experiencing ups and downs, and that the run of satisfactory increases, while certainly the general rule,

TABLE III—EAST SOUTH CENTRAL AND WEST SOUTH CENTRAL STATES—COMPARATIVE INCOME AND OUTPUT FOR APRIL AND MAY, 1914 AND 1913, OF FIVE COMPANIES

	1914	1913	Per Cent In- crease	1914	1913	Per Cent In- crease
Income	\$238,542	\$218,014	9.4	10,219,886	9,160,563	11.7
Output	229,479	214,560	7.0	11,923,578	10,741,178	11.0

is not unbroken by occasional heavy decreases. For the whole of the West North Central group, the *Electrical World* aggregate shows that, for thirteen companies, gross income increased from \$633,432 in May, 1913, to \$778,029 in May, 1914, or at a rate of 22.9 per cent; while energy output in the same time grew from 55,015,511 kw-hr. to 76,302,296 kw-hr., or at a rate of 39 per cent. Take away the St. Louis figures and the result will bear a distinctly closer resemblance to the average rates which are being derived for the other sections of the country. Available returns from the East South Central States, which include Kentucky, Tennessee, Alabama and Mississippi, seem to indicate a fairly slack season for the utilities. In all, the *Electrical World* has received May figures from six companies in this section, representing between them somewhat less than 40 per cent of the entire central-station business. These returns show that gross income has increased from \$141,556 in May, 1913, to \$151,168 in May, 1914, or at a rate of 6.9 per cent; while energy output has grown in the same time from 9,458,815 kw-hr. to 9,602,442 kw-hr., or at a rate of only 1.6 per cent. On the basis of energy output, Kentucky and Tennessee are the two most important states in this group. It is possible that if the figures for the Nashville and Memphis companies were available they would exert a favorable result upon the average for the group. As it is, the values derived above seem to confirm all the verbal advice coming from this section of the country. Birmingham, Ala., is showing a good gain over 1913 on income, but is not generating appreciably more energy than last year; while several Tennessee properties are this year registering decreases on both earnings and output. Any uplift in the general industrial situation would, of course, be quickly reflected in a substantial increase in the energy demand upon many of the metropolitan companies in this area. The returns from the West South Central belt lead to a more favor-

able conclusion, and here it is found that good gains are being made over 1913. In this belt are the states of Arkansas, Louisiana, Oklahoma and Texas; and, in all, the *Electrical World* has received May figures from thirteen companies in the territory, representing between them about one-quarter of all the industry there. These reports show that the gross income has increased from \$271,494

TABLE IV.—CENTRAL STATES—INCOME AND OUTPUT FOR MAY, 1914 AND 1913, OF SIXTY-FOUR COMPANIES (BY GROUPS OF STATES)

	Income Received in May, 1914	Income Received in May, 1913	Per Cent Increase	Output in May, 1914	Output in May, 1913	Per Cent Increase
East South Central (13 companies).....	\$7,088,648	\$7,857,008	10.0	99,738,298	92,102,734	8.3
West North Central (13 companies).....	778,800	614,432	22.9	76,302,296	55,015,511	37.8
East North Central (13 companies).....	151,168	141,556	6.9	9,602,442	9,458,815	1.6
West South Central (13 companies).....	266,000	271,494	9.2	8,642,856	7,597,097	13.8
Total for whole territory.....	\$8,284,616	\$9,084,590	12.7	194,283,892	164,174,157	18.3

in March, 1913, to \$296,333 in March, 1914, or at a rate of 9.2 per cent; while energy output has grown in the same time from 7,597,097 kw-hr. to 8,642,856 kw-hr., or at a rate of 13.8 per cent. Only one instance of decreasing revenue is to be found in these returns and that one is due to a cut in rates, the energy demand on the station showing a satisfactory increase over last year. Considering the figures of the East South Central and the West South Central States together, a comparison is presented in Table III of the combined data from five central-station companies in the eight states for the month of March, April and May, 1914, and 1913. The percentage increase of 1914 over last year as shown by May is little less than the April figure. It is interesting to note that the output for May is greater than in April. Table IV presents all the May returns received by the *Electrical World* from some sixty-four utilities operating in the four groups of Central States. In all there is an expansion of 12.7 per cent on income and 18.3 on output; but, in order to arrive at a representative average for the typical central-station utility of the Middle West, both values should be slightly discounted. Probably 11 per cent for income and 14 per cent for output come somewhat nearer the mark.

#### NEW YORK METAL MARKET PRICES

	July 21	July 28
Copper	Bid Asked	Bid Asked
Standard spot*	12.25 12.35	12.25 12.35
	Selling Prices	Selling Prices
London, standard spot*	61 10 6 1/2	58 5 1/2 6 1/2
Prime Lake	13.95 14.15	13.25 13.45
Electrolytic	13.70 13.90	13.00 13.20
Casting	13.35 13.45	12.87 12.97
Copper wire base	14.87 15.00	14.37 14.50
Lead	3.90	3.90
Nickel	40.00 45.00	40.00 45.00
Sheet zinc, f.o.b. smelter	7.00	7.00
Sheet, spot	1.45 1.47	5.95 6.15
T. spot*	21.60 21.75	20.60 20.75
Aluminum		
Prompt delivery	17.50 17.75	17.37 17.62 1/2
Future	17.37 17.62 1/2	17.37 17.50

#### \*OLD METALS

Heavy copper and wire.....	12.00	12.25
Brass, heavy.....	8.25	8.50
Brass, light.....	7.00	7.25
Iron, scrap.....	3.75	3.85

#### \*COPPER EXPORTS

Total tons to July 28.....	31,424
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\*From daily transactions in the New York Metal Exchange.

## Corporate and Financial

Since taken out of the American Power & Light Company of New York which matured on July 13 have been extended for one year at the same rate.

**J. G. White & Company, Inc., Preferred Stock.**—Mr. Cassius B. Barnes, of New Haven, Conn., is offering at par the 6 per cent cumulative preferred stock of J. G. White & Company, Inc., with a 30 per cent bonus in common stock.

**Capital Light & Power Company Troubles.**—The Capital Light & Power Company, Jackson, Miss., has filed a petition in bankruptcy with the commissioner of the federal court. Liabilities are placed at \$52,434 and assets at \$64,000, being the estimated value of the property of the company. Mr. R. L. Benson, of Chicago, holds first-mortgage bonds for \$34,000, and the taxes for the past year, amounting to \$150, remain unpaid.

**Northern California Power Company Stock Increase.**—The stockholders recently authorized an issue of \$2,000,000 of 6 per cent cumulative, non-assessable preferred stock, of which it is intended to issue at present only \$500,000. The preferred stock will be offered to holders of common stock at 80 in the ratio of one share of preferred stock for each twenty shares of common stock now held. The new money is required to develop other markets for the additional energy from apparatus now installed.

**New Stock Issue of the Cleveland Electric Illuminating Company.**—The stockholders have been given the privilege of subscribing for \$960,320 of new common stock on or before Aug. 10, at the rate of one share of new stock for each ten shares of their holdings of record July 6. With the new stock outstanding the capitalization will be \$9,763,520 common stock, \$800,000 preferred stock and \$6,500,000 first mortgage 5 per cent bonds. The company is controlled by the Central States Electric Corporation.

**Annual Report of the Montreal Water & Power Company.**—In the company's annual report for the year ended April 30, 1914, the gross profits are set down as \$783,690. Operation, maintenance and other expenses amount to \$324,340, leaving \$459,350 for net profits. From these are deducted interest, depreciation reserves and provision for bad debts, leaving \$92,161 as a surplus. President Edwin Hanson stated that the dividends had not been declared, although the earnings for the past three years would have justified it. However, with the pending action of the city of Montreal in regard to the purchase of the company the directors thought it best to withhold any dividend declaration for the present.

**Nevada-California Power Company's Annual Report.**—The annual report of the company for the year ended Dec. 31, 1913, shows gross earnings of \$995,064. Expenses amounted to \$365,197, leaving \$629,867 for operating profits. To these are added earnings from securities of \$3,393, making the total net earnings \$633,260. After deducting for dividends, profit and loss, adjustments and other corporate charges the balance left for surplus was \$109,316. President Delos A. Chappell said that the decrease in net earnings was due to a large increase in the depreciation reserve account and also to the purchase of energy from the Southern Sierras Power Company. Mr. Chappell further stated that he believed eventually the energy consumption for irrigation pumping in Nevada will exceed the present consumption for mines.

**Western Union Telegraph Company's Income.**—Through its comptroller, Mr. E. Y. Gallaher, the Western Union Telegraph Company has issued its report for the six months ended June 30, 1913, and 1914. The total income for 1913 was \$22,111,180, and for 1914, \$22,222,900. Maintenance, repairs and reserve for depreciation were \$15,328,010 in 1913 and \$4,015,900 in 1914. Other operating expenses, including rent of leased lines and taxes, brought the total expenses up to \$19,917,189 for 1913 and \$19,533,900 for 1914. This left a balance for 1913 of \$2,193,991 and for 1914 of \$2,689,000. From this is deducted interest on bonded debt, leaving a net income of \$1,525,366 for 1913 and \$2,020,375 for 1914. The decrease in the amount charged, Mr. Gallaher declared, for maintenance and depreciation in the 1914 period, as against the 1913 period, is attributable, in part, to the classification of accounts of the Interstate Commerce Commission.



**Maryland Consolidation Contemplated.**—It is proposed to consolidate the heating, gas and electric service companies of the principal towns on the Eastern Shore section of Maryland. The name of the consolidated company is the Public Utilities Company. It is to be financed by Pennsylvania capitalists, the capital stock to be in excess of \$1,000,000. The companies under consideration for the merger are: The Salisbury Heat & Power Company, the Home Gas Company, the Salisbury Water Company, the Sussex Light & Power Company, the South Delaware Gas Company, the Cambridge Light & Gas Company, the Georgetown Light & Fuel Company and the Easton Gas, Light & Fuel Company. Although the local companies are now doing a good business, it is believed that a large system will make for greater efficiency and, also, it is expected that by tying some of the lines together it will be possible to effect a large saving by shutting down some of the generating stations that are now in operation.

**Canadian Supreme Court Tax Decision.**—By a judgment recently handed down by the Supreme Court of Canada the Ontario Power Company, the Electrical Development Company, the Canadian Niagara Power Company and the Toronto & Niagara Power Company must pay school taxes on the full assessment. When the companies established their plants in Stamford Township, district of Niagara, the township council by special legislation exempted the companies from a large portion of the assessment. Under the municipal act the township council has not the right to grant exemption of school taxes. In 1913 the school board sought to collect taxes on the full values of the properties with the result that the companies took the matter to court. As a consequence of the Supreme Court's decision the Ontario Power Company, which was assessed for \$100,000, the Electrical Development Company, which was assessed for \$225,000, the Canadian Niagara Power Company, which was assessed for \$160,000, and the Toronto & Niagara Power Company, which was assessed for \$25,000, must now pay taxes on assessments which are placed at \$600,000, \$650,000, \$900,000 and \$125,000 respectively.

**Swedish Electrical Manufacturing Company's Annual Report.**—The annual report of the Allmänna Svenska Elektriska Aktiebolaget for 1913 has been published. The gross profits were £90,556 and expenses were £42,611, leaving £47,945 as net profits. The capital has been increased by the issue of a new series of shares from £100,000 to £666,667. The new issue, however, will not be entitled to any dividends before next year. A dividend of 8 per cent was distributed. The reserve fund, which at the end of 1912 was increased from £19,444 to £23,667, was used in connection with the financial reconstruction. Under this plan of reconstruction all founder and preference shares were withdrawn and all the stock was placed on the same dividend basis. The new capital was subscribed at 20 per cent above par, and the amount of the premium enabled the company to establish a new reserve fund of £53,333, which has now been increased to £58,889. During 1913 the turnover was £955,600, £242,500 being the value of goods exported; 10,816 electrical machines were delivered, the total rating of which was 340,000 kw. Among the company's large orders was one for six 20,000-hp generators. During the last year the company took up the manufacture of electrical cooking and heating apparatus, and these appliances are expected to become competitors of the German goods that have hitherto been dominating the Swedish market.

**International Power Company.**—Argument on the application for the appointment of a receiver for the International Power Company was heard on July 28 before Chancellor Walker in the New Jersey Court of Chancery. Decision was reserved. The stockholders' committee, composed of Messrs. Henry W. Bull, chairman; Frederick L. Eldridge and Marsden J. Perry, through their counsel, Messrs. Satterlee, Canfield & Stone, charged the company with constructive fraud and waste of its assets. It is stated that no dividends have been declared on the stock since 1906 and that attempts to learn the assets of the company have resulted in failure. Counsel for the company denied the allegation of fraud and waste of its assets and declared that the company had been conservatively and economically managed and its assets preserved. The order of the court restraining the company

from disposing of its assets pending the present application was continued in force. The International Power Company was incorporated in New Jersey in 1899 with a capital of \$8,000,000. The company controls the British & American Manufacturing Company, the Alabama Consolidated Coal Company, the American Oil Engine & Shipbuilding Company, the Trinity Lead, Zinc & Smelting Company and the Amoskeag Fire Engine Company.

**New England Company Bond Offering.**—Baker, Ayling & Company, of Boston, Mass., are offering at 93½ and interest \$1,800,000 New England Company first and refunding 5 per cent bonds dated May 1, 1914, and due May 1, 1954. These bonds are guaranteed by the New England Power Company, of Maine. The sinking fund provides for the retirement annually of 1 per cent of all bonds which have been outstanding three years at a price of 105 unless they can be purchased by the trustee for less. The company was formed under the laws of Massachusetts as an association, and controls the entire distribution system in Massachusetts of the New England Power Company and the Connecticut River Power Company. Included among the large customers are many electric light companies, street railway companies and manufacturers. In addition a contract has been signed with the Blackstone Valley Gas & Electric Company. President George S. Smith says that "the system comprises the largest hydroelectric development in the United States east of Niagara Falls," and adds: "The contracts for power have been carefully selected with a view to their adaptability, and consideration has been given to diversity of manufacturing so that any serious depression in one class of business would not materially affect the earnings."

**Annual Report of the American Cities Company.**—The company's annual report for the year ended Dec. 31, 1913, shows an increase of 5.8 per cent in gross earnings. The net corporate income, however, shows a decrease of 14.3 per cent, owing to greatly increased operating expenses, taxes, deductions and interest charges. The Little Rock Railway & Electric Company on June 1, 1913, reduced its rate for electric energy and on Dec. 1, 1913, the Birmingham Railway, Light & Power Company reduced its gas rates. In addition the first quarter of 1913 was at a disadvantage compared with the same period in 1912, owing to the reduction in electric rates on March 1, 1912, of the Birmingham Railway, Light & Power Company and the New Orleans Railway & Light Company, and also owing to the reduction of gas rates on April 1, 1912, by the New Orleans Railway & Light Company. The increase in operating expenses and taxes over 1912 was due largely to the increased percentage of operating revenue allowed for maintenance of the constituent companies in addition to the sum which would have been derived from the increase in operating revenue. This aggregated \$130,000, or approximately 1.6 per cent of the total operating expenses of the constituent companies. In February, 1913, the Board of Taxation of New Orleans increased the assessment of the New Orleans property 37.3 per cent, which, upon appeal, was reduced to 20.5 per cent. The additional cost due to the increase in assessment was approximately \$160,000, or 1.7 per cent of the total operating expenses and taxes. Owing to the increased cost in fuel oil the Houston Lighting & Power Company 1905 showed an increase in operating expenses of \$60,000, or 0.75 per cent of the total operating expenses. Total receipts from dividends, interest and service amounted to \$1,850,310. Deducting \$57,624 for operating expenses and taxes left \$1,792,686 as net earnings. Interest on collateral trust gold bonds amounted to \$500,000, leaving \$1,292,686 as net income. Dividends amounted to \$1,233,210, leaving \$59,476 to be carried to surplus, making the surplus to Jan. 1, 1914, \$194,994. The surplus for the year did not include the company's interest in the undivided surplus earnings of the constituent companies, which amounted to \$196,718. The constituent companies showed for 1913 gross earnings, from all sources, of \$14,680,302. Operating expenses and taxes were \$9,117,986, leaving \$5,562,316 as net earnings. Amortization, bond discount, interest and miscellaneous expenses totaling \$3,347,799, left \$2,214,517 as applicable to dividends on stocks. The report also shows that the gross earnings of the local companies from all sources were 122.5 per cent more in 1913 than in 1902.

## Business Notes

**The Gould Storage Battery Company.**—The address of the Chicago office of the Gould Storage Battery Company has been changed from The Rookery to 225 East Twenty-second Street.

**The Naugle Pole & Tie Company,** of Chicago, Ill., has opened a new branch office at 21 South High Street, Columbus, Ohio. L. E. Morier, who has been connected with the Naugle company for the last nine years, will be in charge of this office.

**The H. W. Johns-Manville Company,** of New York, has organized a new division of its electrical department to take care of the lighting-fixture business. E. L. Cox, formerly with the Enos & Watkins Company, will be manager of this division. G. E. Villaret will have charge of designs.

**The United States Insulator Company** has recently purchased a 15-acre tract in Warren, Ohio, and will build a factory on the site. It is said that the company has a new process for making small porcelain insulators and can produce them at prices comparing favorably with glass insulators.

## New Industrial Companies

**The Electric Engraving Company,** of Seattle, Wash., has been chartered with a capital stock of \$7,500 by P. Heppenthal, H. M. Cave and W. C. McNulty.

**The Goshen Stamping & Brass Company,** of Goshen, Ind., has been incorporated with a capital stock of \$15,000 by Arthur E. Ernest, C. E. Miller and others. The company proposes to manufacture electrical heating devices.

**The Stribling Wave Power Company,** of Jacksonville, Fla., has been incorporated with a capital stock of \$10,000 to manufacture and deal in motors, machinery, etc., and to deal in electrical generating machinery, etc. The officers are: S. L. Stribling, president and general manager; Paul C. Marion, vice-president; A. N. Dobbins, secretary, and N. W. Marion, treasurer.

## Trade Publications

**Conduit Benders and Tool Holders.**—M. B. Austin & Company, 700 Jackson Boulevard, Chicago, Ill., have issued a folder referring to conduit hickys, benders, pipe vises and tool holders.

**Domestic Refrigerating Apparatus.**—Fred W. Wolf, consulting engineer, 1740 Greenleaf Avenue, Chicago, Ill., has sent out pamphlets and price lists relating to domestic electric refrigerating apparatus.

**Electric Vehicles.**—The Fritchle Automobile & Battery Company, Denver, Col., has prepared a catalog describing its electric vehicles and a device for indicating the condition of charge of the storage battery.

**Printing Press and Linotype Motors.**—Motors for operating printing presses and linotype machines together with their control devices are described in Bulletin No. 119, issued by the Robbins & Myers Company, Springfield, Ohio.

**Curves for Laying Out Wiring Installations.**—A pamphlet issued by the Manhattan Electrical Supply Company, 14 South Fifth Avenue, Chicago, contains curves for laying out wiring circuits in accordance with the Chicago Electrical Code.

**Electrically Recording Weighing Machine.**—An automatic continuous-weighing device for recording the weight of loaded conveyor buckets is described in a catalog issued by the Electric Weighing Company, 180 Thirteenth Avenue, New York City.

**Bed Lamps and Semi-Indirect Fixtures.**—Semi-indirect lighting fixtures and lamps which may be attached to the bed for night reading are described in leaflets distributed by the Shiras-Chassaing Electric & Manufacturing Company, St. Louis, Mo.

## Personal Mention

**Mr. Bert Hendricks** has succeeded Mr. R. T. St. John as vice-president of the Riceville (Iowa) Electric Light & Power Company.

**Mr. George H. Holman** has been elected president of the Toms River (N. J.) & Island Heights Electric Light & Power Company.

**Mr. J. J. Woodard** has been appointed superintendent of the Darien (Ga.) Ice & Light Company as successor to Mr. A. H. Jones.

**Mr. W. J. Murphy** has been elected vice-president of the Greenville (Ky.) Light & Water Company as successor to Mr. L. W. Irwin.

**Mr. John Hadley** has been appointed general manager of the Van Wert (Ohio) Public Service Company as successor to Mr. F. L. Wise.

**Mr. William H. Redman** has succeeded Mr. H. H. Wilson as manager of the municipal electric light and water plant at Greenport, N. Y.

**Mr. F. E. Kruesi** has been appointed superintendent of the Freeport (Ill.) Railway & Light Company as successor to Mr. M. H. Pengra.

**Mr. W. S. Jessop** has succeeded Mr. William A. Snipes as superintendent and manager of the municipal electric-light plant at McRae, Ga.

**Mr. H. R. Kadel** has succeeded Mr. A. W. Harper as manager, treasurer and secretary of the Martinsville (Ind.) Gas & Electric Company.

**Mr. Sam Gibson** has been elected vice-president of the Atkins (Ark.) Electric Light & Power Company as successor to Mr. J. M. Branson.

**Mr. A. M. Huffman** has been appointed to succeed Mr. E. L. Kennedy as vice-president of the Rockport (Ind.) Water Works Company.

**Mr. L. W. Turner** has been appointed superintendent of overhead construction for the Indiana Railways & Light Company, Kokomo, Ind.

**Mr. M. H. Hall** has succeeded Mr. W. C. Welsh as manager and superintendent of the municipal electric and water works at Poplarville, Miss.

**Mr. Lester Boring**, formerly chief plant engineer, has been appointed superintendent of the municipal electric and water plant at Tipton, Ind.

**Mr. H. Armstrong** has succeeded Mr. E. C. Mercer as purchasing agent of the Steubenville (Ohio) & East Liverpool Railway & Light Company.

**Mr. Joseph Stuart** has been appointed to succeed Mr. Frederick Kingman as superintendent of the Plymouth (Ind.) Electric Light Plant.

**Mr. C. A. Kleinknecht** has been appointed superintendent of the municipal electric plant at Richmond, Ind., as successor to Mr. N. H. Johnson.

**Mr. H. J. Mathews** has been appointed manager of the Light, Heat & Power Company, Connersville, Ind., as successor to Mr. J. A. Johnson.

**Mr. J. H. Rennick** has been acting president of the Toulon (Ill.) Light & Power Company since the death of V. G. Fuller, the former president.

**Mr. J. M. Sheehan** has been elected vice-president of the Suffolk Light, Heat & Power Company, Southampton, N. Y., as successor to Mr. C. P. Fitz.

**Mr. William W. Dake**, formerly vice-president of the Avon (N. Y.) Electric Company, has succeeded Mr. Q. W. Hershey as president of the company.

**Mr. Edward W. Swisher** has been elected vice-president of the Columbus (Ohio) Light, Heat & Power Company as successor to Mr. F. T. Stewart.

**Mr. Robert Spofford**, formerly general superintendent of the Augusta (Ga.)-Aiken Railway & Electric Corporation, has been appointed general manager of that company.

**Mr. W. G. Souders** has been appointed vice-president and general manager of the Southern Illinois Railway & Power Company, Harrisburg, Ill., as successor to Mr. W. H. Schott.



Mr. F. W. Van Sise has been appointed superintendent of the Gary (Ind.) Heat, Light & Water Company to relieve Mr. Fitzgerald, who has been promoted to be vice-president.

Mr. H. D. Fitch, formerly manager of the Kentucky Public Service Company at Bowling Green, has succeeded Mr. H. C. Moore as general manager of that company at Frankfort.

Mr. E. L. Kennedy, formerly vice-president of the Rockport (Ind.) Water Works Company, has been promoted to the position of president as successor to Mr. Salem Crowden.

Mr. B. G. Campbell, formerly with the Jackson (Mich.) Gas Company, has been appointed assistant to the general manager of the Springfield (Ill.) Railway & Light Company.

Mr. C. W. Roselle has been appointed local superintendent of the Tri-County Light & Power Company's system at Woodhull, Ill., where he becomes successor to Mr. John N. Lindell.

Mr. George W. Cornish has resigned as assistant superintendent of the Bay City (Mich.) electric plant. He was superintendent of the West Bay City electric plant prior to the consolidation of the two cities.

Mr. Charles Walsh, formerly employed in the New York office of the Union Railway, Gas & Electric Company, has been appointed secretary of the Springfield (Ill.) Railway & Light Company as successor to Mr. H. T. Willett, resigned.

Mr. Paul Simons has been appointed manager of the Constantine Hydraulic Company, Three Rivers, Mich., to succeed Mr. H. B. Sterling, whose resignation becomes effective Aug. 1. Mr. Simons was formerly superintendent.

Mr. B. R. Ells has been appointed vice-president and purchasing agent of the Williams (Ariz.) Water & Electric Company, which has superseded the Grand Canyon Electric Light & Power Company, formerly operating in Williams, Ariz.

Prof. F. E. Austin, for six years head of the department of electrical engineering at Norwich University, Northfield, Vt., has resigned to engage in engineering-education extension work and the publication of several engineering textbooks.

Mr. James T. Boustead, of Minneapolis, Minn., who recently resigned as president of the Electric Machinery Company, has organized the Boustead Electric & Manufacturing Company, with offices at 215 First Avenue, North, Minneapolis.

Mr. Samuel S. Webber has resigned as chief engineer of the American Steel & Wire Company, Trenton, N. J. Mr. Webber was connected for many years with the Trenton Iron Company, later a subsidiary of the American Steel & Wire Company.

Mr. J. O. Montignani has resigned as electrical engineer of the Rochester (N. Y.) Railway & Light Company to become inspecting engineer for the newly organized Utilities Mutual Insurance Company of New York, with headquarters at Rochester.

Mr. Lloyd S. Purall, who was incorrectly referred to in our July 11 issue as manager of the Leavenworth (Kan.) Light, Heat & Power Company, is assistant secretary and treasurer of that organization. Mr. W. H. Fellows is vice-president and manager of the company.

Dr. William Marconi has had the honorary knighthood of the Grand Cross of the Royal Victorian Order conferred on him by the King of England. This is the newest order of knighthood, dating from 1896, and contains five classes, of which the one conferred on Dr. Marconi is the highest.

Mr. Benjamin Smith has been appointed electrical engineer of the Canadian Vickers, Limited, Montreal, Quebec, and has charge of the electrical department of the dry dock and ship-building works at Maisonneuve, Quebec. Mr. Smith was formerly associated with Vickers, Limited, Barrow-in-Furness, England.

Mr. Edward Schildhauer, who resigned, effective July 13, as electrical and mechanical engineer of the Isthmian Canal Commission, arrived in New York, July 23, aboard the United Fruit Company's ship *Almirante*. Before leaving

the Canal Zone farewell receptions were given to him by the Tivoli Club and the University Club.

Dr. Michael I. Pupin, professor of electro-mechanics in Columbia University, New York City, and inventor of the Pupin loading-coil for long-distance telephone lines, is one of the leading Servians of America, and is the president of the Pan-Servian Alliance of this country, as well as the honorary Servian Consul-General to the United States in the absence of a Servian minister. Dr. Pupin has expressed vigorous opinions to the daily press on the causes and events leading to the present controversy of his native country with Austria, a contention which he fears may involve the long-expected struggle between the great nations of Europe.

Mr. John A. Britton, who has been appointed chairman of the general convention committee of the National Electric Light Association, which will meet at San Francisco in June, 1915, is first vice-president and general manager of



JOHN A. BRITTON

the Pacific Gas & Electric Company, which operates the largest generating and transmission system in the world. The company's eleven hydro-electric plants and four steam stations, aggregating 519,884 hp, serve thirty of California's fifty-eight counties, or an area of 37,775 sq. miles, and the system employs 5770 people. Mr. Britton was born at Boston, Mass., in 1855 and went to San Francisco with his parents in 1868. There he received a public-school education and later studied law. When nineteen years old he entered the employ of the Oakland (Cal.) Gas Light & Heat Company, and was promoted successively to the positions of secretary, engineer and finally president. While holding the latter position Mr. Britton inaugurated the first electric service at Oakland by installing a 125-hp electric generating plant, operation of which was started in 1882. In 1903, when the Oakland Gas Light & Heat Company was absorbed by the California Gas & Electric Corporation, Mr. Britton was appointed general manager of the combined property. Three years later this company was taken over by the Pacific Gas & Electric Company, and in 1907 he was elected first vice-president and general manager thereof. Mr. Britton is a member of the American Society of Mechanical Engineers, the American Institute of Electrical Engineers and the American Gas Institute. Recently he was reappointed a member of the board of regents of the University of California for a term of six years. Mr. Britton is also a director of the Panama-Pacific International Exposition Company.

## Obituary

Lewis T. Nolker, president of the Commercial Electrical Supply Company, St. Louis, died of tuberculosis, July 17, after an illness lasting more than a year. He was thirty-seven years of age and a bachelor, and is survived by two brothers, Mr. Robert Nolker and Mr. William H. Nolker, both members of the firm of which he was president. Mr. Lewis T. Nolker was prominent in club, business and civic affairs in St. Louis.

James W. Benham, secretary and treasurer of the Naugle Pole & Tie Company, Chicago, and president of the Northern White Cedar Association, was killed in an automobile accident near Chicago, July 27, when the car in which he was riding with a party of friends was struck by a railroad train. Mrs. Benham and two others were also killed and four others in the party were severely injured. Mr. Benham was born in 1866, and as a youth went to Arizona, where he took an active part in territorial affairs. In 1901 he came to New York, and in 1906 entered the business in Chicago, becoming secretary-treasurer of the Naugle Pole & Tie Company in 1910.





**WASHINGTON, D. C.**—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Aug. 15, 1925, for the following items: Schedule 7053—One electrically driven flange and expanding pipe machine, complete with motor, 10-hp. 770 cartridge type and inclosed plug fluges, 150 lb. grade A-1 inclosed, 1,000 ft. rubber-insulated, 800-20,000 ft. conductor wire, Schedule 7054—One electrically driven, single, rubber-insulated lighting and power wire for 600 volts. Newport, R. I. Schedule 7102—3,000 lb. aluminum single conductor, lead-covered, varnished, 22-gauge, Schedule 7084—1,050 lb. of round, tin, sheet copper, Applications for proposals should designate the schedule desired by number.

### North Central

**FLINT, MICH.**—The contract for the erection of the new power plant for Hurley Hospital has been awarded to Taylor & Maliskey. The power plant and laundry will be in the same building.

**GRAND RAPIDS, MICH.**—Steps have been taken by the Division Avenue Improvement Association to install ornamental lamps on Division Avenue from Westby tracks. The present plans provide for 142 lamps, to cost about \$18,000.

**LAKE LINDEN, MICH.**—The village clerk has been authorized to secure estimates for the installation of electrically driven pumps to be installed in connection with the proposed new fire system.

**SAULT STE. MARIE, MICH.**—Work will soon begin on improvements to the power plant of the Edison Sault Electric Co., which plan of an addition to power house and installation of three new turbines, increasing the output by 1,000 hp. The cost of the work is estimated at \$7,000. The work has been awarded to Marshall N. Hunt.

**AKRON, OHIO.**—The City Council is considering the installation of an ornamental street-lighting system on North Howard Street from Federal Street to the Baltimore & Ohio railroad station.

**BOWERSVILLE, OHIO.**—The Dayton Pwr. & Lt. Co. is reported, will extend its transmission lines to Bowersville to furnish electrical service here.

**CANTON, OHIO.**—Under an agreement entered into between the Northern Ohio Trac. Co. and the city of Canton, the company will erect a number of return feeders from the principal lines and other points to the power plant, this plan having been decided upon to do away with the electrolysis of the city's water pipes.

**CANTON, OHIO.**—We are informed that the contract for vacuum cleaning systems in the 19 school buildings not now equipped has not yet been awarded. Through error an item was published in issue of July 14 stating that the contract had been awarded to the Kuehn-Wilson El. Co., of Canton, representing the Palm Sutton Sweeping Co., of Detroit, Mich.

**CINCINNATI, OHIO.**—A twelve-story building, equipped with power plant and transmission equipment for the purpose of supplying energy to manufacturing establishments in the building, will be constructed by Edward Wilburn, work to be begun soon. A fully equipped garage will occupy the first floor and basement.

**COLUMBUS, OHIO.**—Owing to a change in the method of payment for mining considerable new equipment will be purchased by coal mines throughout the Hocking Valley, Portsmouth, Crooksville and Jackson districts of Ohio, which will

involve an expenditure of upward of \$300,000. To meet this change the mine owners will install electric picking tables, new weighing apparatus and make other additions to tipple facilities. The standard system, it is understood, will expend about \$150,000, and the New Pittsburgh Co., \$50,000. Headquarters of both companies are located in Columbus.

**CRESTLINE, OHIO.**—The electric-light committee of the Council has indorsed the action of the Commercial Club recommending that H. Whitford Jones, of Cleveland, be engaged to make a survey of the existing system in Crestline. In view of advising the Council in regard to making a new contract for lighting the city.

**DE GRAFF, OHIO.**—The municipal electric-light plant, it is reported, was destroyed by fire on July 24.

**GIRARD, OHIO.**—The business men are contemplating the installation of an ornamental street-lighting system in the business section of the town.

**GLOUSTER, OHIO.**—The Board of Public Works expects to purchase a few meters within a month.

**HAMILTON, OHIO.**—Steps will be taken by the City Council to hasten the construction of the railway of the Hamilton & Richmond Trac. Co., of Richmond, Ind., recently organized to build a railway connecting Hamilton and Richmond. The locations of the power stations have not been determined.

**LIMA, OHIO.**—The Ohio El. Ry. Co. has refused to grant the Ohio El. Ry. Co. six months' extension for placing its wires in underground conduits.

**MINGO, OHIO.**—The West Penn El. Co., which controls the Mingo electric light plant, has submitted a proposal to the Village Council offering to replace the present street lamps with incandescent lamps.

**NOTTINGHAM, OHIO.**—Plans are being prepared for the installation of a power plant in the Ursuline Convent.

**WEST UNION, OHIO.**—The controlling interest in the West Union Pwr. & Lt. Co. has been purchased by Miller Brothers. It is understood that improvements are contemplated to the plant and that a day service will be established.

**CLARKSVILLE, KY.**—The City Council has entered into a contract with the Kentucky Pub. Ser. Co., of Hopkinsville, to supply electricity for street-lighting. Under the terms of the contract the local plant is to be kept in readiness for use at any time.

**FULTON, KY.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Sept. 2, 1925, for the construction, complete, of mechanical equipment, interior lighting fixtures and approaches, of the United States post office at Fulton. Drawings and specifications for the work are on file at the office of the custodian of site at Fulton, Ky. O. Wenderoth is supervising architect.

**HAZARD, KY.**—Plans are being considered by the Perry County Collieries Co. for the installation of an electric plant at its mines. W. J. Borries, 110 South Seventh Street, Louisville, is interested.

**HAZEL, KY.**—The electric-light and water-works franchise, recently sold at auction, was purchased by Claude Orr and A. E. Hays. The franchise is for a period of 99 years.

**HENDERSON, KY.**—The boiler house of the municipal electric-light plant, which was badly damaged recently by a cyclone, will be replaced once. The loss is estimated at \$10,000.

**SCOTTSVILLE, KY.**—The Scottsville El. Co. is planning to install a series of circuit and may establish a day service during the winter season. The company expects to build a two-ton ice plant this fall and will purchase machinery for same. The plant is leased and controlled by Schlenker & Mays. G. L. Mays is treasurer.

**WILMORE, KY.**—Upon the completion of the installation of the new power plant of the Glass Milling Co., of Wilmore, a day service will be made available.

**ELKHART, IND.**—The City Council is considering the question of installing a new street-lighting system. The Indiana & Michigan El. Co. furnishes the street-lighting service in Elkhart.

**HUNTSVILLE, IND.**—The City Council has refused to issue bonds not to exceed \$50,000 for rebuilding the municipal electric-light plant.

**NEW ALBANY, IND.**—Articles of agreement between the Interstate Pub. Ser. Co. of New Albany, Ind., and the Cordon Plank Road Co., which operates the New Albany & Cordon tollpike, granting the former a right-of-way for transmission lines to supply electricity for lamps and

motors along the pike, has been filed with the county clerk in New Albany. Extension of the lines of the Interstate company (an Insull property) will begin at once.

**VEEDERSBURG, IND.**—The Board of Public Works is planning to enlarge the municipal electric-light plant for the purpose of supplying electricity in Stone Bluff, Melott, New Albany, Hillsboro, and possibly to farmers residing along the route.

**BLOOMINGTON, ILL.**—The Bloomington & Normal Ry. & Lt. Co., it is reported, contemplates improvements to its system, involving an expenditure of \$10,000.

**JACKSONVILLE, ILL.**—Plans for the proposed ornamental street-lighting system have been prepared by G. A. Seller, engineer. As yet no definite steps have been taken.

**EL DORADO, WIS.**—Work has started on the construction of the new power house of the Wisconsin Pwr., Lt. & Milling Co. in Eldorado. The plant will be operated by water-power and will supply electricity in Eldorado and Mendota. A steam auxiliary plant will be installed for use in emergencies. Oscar A. Hueselman, of Eldorado, is interested.

**PORTAGE, WIS.**—The business men, it is reported, have voted to purchase 39 single-lamp standards for the business section of the city.

**PRAIRIE FARM, WIS.**—The installation of a new electric-lighting system in Prairie Farm is reported to be under consideration.

**BAGLEY, MINN.**—Bids will be received until Aug. 5 at the office of Oscar F. Stenwick, water and light commissioner, for the construction of a new power house, and equipment for same, consisting of 25-hp and 60-hp fuel oil, motor spirits or kerosene engines, together with generators for same, 300-volt, 300-hp, 300-kw. board.

Plans and specifications are on file in the above office and at the office of J. F. Druar, consulting engineer, Commercial Building, St. Paul. Additional copies may be secured from the engineer at \$2.50 per set to cover cost of reproduction of same.

**BARNESVILLE, MINN.**—Bids will be received at the office of the board of education in Barnesville, until Aug. 5, 1925, for the installation of all heating, plumbing, ventilation and electrical work, including labor and materials, for a new public school building in Barnesville. Plans and specifications prepared by E. F. Broomhall, architect, 710 Alworth Building, Duluth. Copies of plans may be obtained from the architect upon deposit of \$2.50, which will be refunded upon return of same. Plans and specifications are on file in the office of the board of education, Barnesville, and in the office of the architect.

**CHISHOLM, MINN.**—The Chisholm El. Co. has secured contracts to furnish electricity for lighting the villages of Spina, Kinney and Lucknow.

**ELK RIVER, MINN.**—Plans, it is reported, are being considered by J. F. D. Waterman for the installation of an electric-light and power plant in Elk City.

**ELYSIAN, MINN.**—The Consumers' Pwr. Co., of Faribault, is building a pole-top substation of 75-kw capacity and a distributing station in Elysian. Electricity to maintain the system will be obtained from the 33,000-volt transmission line extending from Faribault to Mankato, which passes through Elysian. B. B. Cowperthwait is manager.

**LANSFORD, MINN.**—The Commercial Club is considering plans for the installation of an electric-light plant in Lansford.

**RED WING, MINN.**—Bids will be received at the office of the city engineer, until Aug. 7, for complete installation of curb lighting system (exclusive of furnishing and laying of conduits and manholes). The height of the poles is to be 11 ft. 6 in. The size of the poles is not less than 6 in. Copies of specifications are on file in the above office. L. C. Meyer is city clerk.

**WORTHINGTON, MINN.**—Preparations have been made by the city of Worthington for the construction of a transmission line to Round Lake, Bigelow and Rushmore; also for the installation of a 200-kw generating unit complete with manholes and electric-light plant, bids for which have been received. W. H. Buchan is superintendent.

**ALVORD, IA.**—The city of Alvord has voted to issue bonds for the installation of an electric-light plant.

**ATREIA, IA.**—The proposal to issue \$7,000 in bonds for the installation of a municipal electric-light plant will be submitted to the voters on Aug. 17. J. C. Nelson is city clerk.

**BUFFALO, IA.**—The City Council is considering the question of establishing an electric-light plant in Buffalo.

**CHARITON, IA.**—The city of Chariton contemplates the sale of its municipal electric-light plant and bids for same will be filed with W. A. Eikenberry, chairman, or E. A. Anderson, secretary of commission, before August 3. A satisfactory franchise will be given to parties purchasing the plant.

**CLINTON, IA.**—The capital stock of the Clinton Gas & El. Co. has been increased by \$50,000.

**ESTHERVILLE, IA.**—Bids will be received by the city of Estherville until Aug. 1, for extension of electric-light plant and water-works system. Electric-plant work will include addition and improvements to brick power station, radial brick or reinforced concrete stack 150 ft. high by 5 ft. inside diameter, industrial rotary coal car, 300-hp boiler installation, furnishing and setting mechanical stokers, 400-hp engine, generators, switchboard, remodeling the pole line and wiring system. Alternate bids will also be called for an oil engine installation of the Diesel type. Work in connection with water-works system will consist of distribution pipe for system, 1,000-gal. steel standpipe, furnishing 900-gal. centrifugal fire pump and 75-hp motor, the removal and resetting of a 280-gal. pump. The cost of the work is estimated at \$60,000. J. E. Drury, Commercial Building, St. Paul, Minn., is consulting engineer. N. B. Egbert is city clerk.

**ROCK RAPIDS, IA.**—The city of Rock Rapids is contemplating the installation of an electric-lighting system.

**EXCELSIOR SPRINGS, MO.**—The Excelsior Springs Wtr. Gas & El. Co. has applied to the Public Service Commission for permission to issue \$52,000 in bonds, the proceeds to be used for general improvements to its system. W. H. Peterson is vice-president and general manager.

**HAMILTON, MO.**—A 20-year franchise and a 10-year contract for lighting the streets of the city have been awarded to C. A. Martin, of St. Louis, Mo., and Carr and associates. Under the terms of the franchise the plant must be in operation by Dec. 18, 1914. A site for the plant, it is understood, has been purchased.

**KIRKSVILLE, MO.**—The committee appointed to confer with the city commissioners has decided to ask the commissioners to call a special election to submit the proposition to issue \$25,000 in bonds to install an electric-light plant in connection with the city pumping station (that station to be moved from its present location to the reservoir). It is proposed to install a plant with sufficient output to maintain 500 street lamps, besides an ornamental lighting system around the square and at least on one block each way therefrom.

**MEADVILLE, MO.**—The city of Meadville is contemplating erecting a transmission line to connect in connection with the installation of a municipal electric-lighting system. The proposition will probably be submitted to the voters soon.

**MONTROSE, MO.**—At an election held July 21 the proposal to issue bonds for the installation of a municipal electric-light plant was carried.

**ARMOUR, S. D.**—Within the next four months the Interstate Pwr. Co. expects to furnish electric to operate its systems in Wagner, Armour, Pierre, Lake, Hot-spring, and Geddes, S. D., for which material has been purchased and construction work will begin at once. The company has also purchased two 225-hp Diesel oil engines and will install same within the next few months. J. F. Cameron is division manager.

**SIOUX FALLS, S. D.**—Within the next six months the Sioux Falls L. & Pwr. Co. expects to purchase material for 10 miles of extensions for service connections, meters, etc. The city will install within the next 30 days 140 incandescent-luminous-arc lamps. N. C. Draper is manager.

**SUMMIT, S. D.**—The town of Summit is contemplating granting a franchise for the installation of an electric-light plant. For details see proposal columns.

**ADAMS, NEB.**—Bonds to the amount of \$12,500 have been voted for the installation of a municipal electric-light plant in Adams.

**SIDNEY, NEB.**—Preparations are being made for the installation of a municipal electric-light plant, and district steam-heating plant, for which, it is reported, bids are now being received.

**BELLEVILLE, KAN.**—The Commercial Club is interested in a project to install an ornamental lighting system on the principal business streets.

**TOPEKA, KAN.**—The City Commissioners are contemplating installing a municipal electric-light plant to furnish electricity for residential and commercial lighting.

## Southern States

**OAK RIDGE, N. C.**—An electric-light plant, it is reported, will be installed at the Oak Ridge institute, which will furnish electricity not only for the institution but for lighting the residences and business houses of Oak Ridge.

**SALISBURY, N. C.**—The installation of an ornamental street-lighting system in the business section is under consideration.

**FLORENCE, S. C.**—Within the next two months the Florence El. & Utility Co. expects to purchase a barometric or low-level-head jet condenser for a 500-hp General Electric turbine and cooling tower. F. G. Godfrey is manager.

**WINNSBORO, S. C.**—The Council is considering issuing \$10,000 in bonds for extensions to the electric-lighting system.

**ATLANTA, GA.**—The United Electric Construction Co. of Philadelphia, Pa., has been awarded the contract for the installation of entire electrical equipment, including wiring for lamps and motors, in the building to be erected for the Ford Motor Car Co. of Detroit, Mich., in Atlanta.

**GRIFFIN, GA.**—The contract for the installation of an ornamental lighting system on Hill, Taylor and Solomon Streets has been awarded to the Stembbridge El. Co., of Milledgeville.

**MIAMI, FLA.**—The City Council has entered into a contract with the Miami L. & Pwr. Co. for a new lighting system for the city. J. M. Keeler is superintendent of the Miami company.

**OCALA, FLA.**—The proposal to issue \$75,000 in bonds for construction of a new municipal electric-light plant will be submitted to the voters.

**CHATTANOOGA, TENN.**—The City Commission has awarded the street-lighting contract to the Chattanooga Ry. & L. Co. for a period of five years. Under the terms of the contract the present arc lamps, it is understood, will be replaced with the new nitrogen lamps.

**MARYVILLE, TENN.**—The Aluminum Co. of America is planning the construction of a large hydroelectric power plant on the Little River, which probably will not be completed for the next three years. The company now consumes about 35,000 hp, of which 25,000 hp is obtained from the No. 2 development of the Tennessee Pwr. Co. at Parkville, Tenn., and 10,000 hp from the Chattanooga & Tennessee River Pwr. Co.'s plant at Hales Bar, near Chattanooga.

**HARRISON, ARK.**—The Harrison Gas & El. Co., successor to the Harrison El. & Ice Co., is installing two generators, one 100-kw and one 175-kw (each three-phase, 60-cycle, 2300-volt) and switchboard for same. The work is being done by the company. J. C. Grimes is superintendent.

**RISON, ARK.**—Albert C. Moore, Bartlett Building, Joplin, Mo., it is reported, has been engaged to prepare plans and supervise the installation of an electric-light plant and water-works system, to cost about \$10,000.

**HOLDENVILLE, OKLA.**—Within the next 12 months the Holdenville Ice & El. Co. expects to purchase a 75-kw or 100-kw, three-phase, 60-cycle, alternator, switchboard and a carload of poles. W. M. Dunn is president and manager.

**CANYON, TEX.**—The Canyon Pwr. Co. is installing an additional generating unit and would like to receive prices on a double line, 20 in. wire and 53 ft. long. William Sydow is manager.

**DALLAS, TEX.**—The Eastern Texas Trac. Co. has awarded the contract for the remainder of the construction work on the interurban electric railway line to run between Dallas and Greenville, a distance of 45 miles, to the Stone & Webster Engineering Corp., of Boston, Mass. The contractor is to construct the line, to run through stations and depots, laying of track upon completed grade and erection of trolley lines.

**HENDERSON, TEX.**—The Henderson Cotton Oil & Gin Co. expects to purchase four lightning arresters for a 2300-volt primary line. O. E. Morris is superintendent.

**HEREFORD, TEX.**—Within the next three months the Hereford El. & Pwr. Co. expects to purchase a small generating unit, consisting of a small engine and generator. F. H. Oberthier is proprietor.

**LONGVIEW, TEX.**—The Longview L. & Ice Co. expects to erect within the next two months 3 miles of three-phase, 2300-volt transmission line. F. A. Matthes is manager.

**PLANO, TEX.**—The Wilcox L. & Pwr. Co. of Plano, expects to increase its transformer capacity within the next 30 days from 50-kva, single-phase, 1100 volts, 25 cycles, to 200-kva, three-phase, 1100 volts, 25 cycles; also to increase the transformer

capacity of its plant at Vickery from 20 kw to 100 kw, and to install a lighting system in Vickery. C. W. Potts is manager.

**SEGUIN, TEX.**—The Seguin El. L. & Pwr. Co. will soon ask for bids on two 150-hp vertical waterwheels, head turbines, transmission equipment and one 17-kva, three-phase, 60-cycle, 2300-volt waterwheel type generator (directly connected) and switchboard. Owen A. Garford is manager.

## Pacific States

**OROVILLE, WASH.**—The Similkameen Pwr. Co. has transferred its interest in the Similkameen River to the Oroville Valley El. Pwr. Co., recently organized. The new company will make extensive improvements to the plant and will increase the output by 2000 hp.

**RIDGEFIELD, WASH.**—J. H. Cunningham, of Portland, Ore., who was recently granted a franchise to operate an electric-light plant and water-works system in Ridgefield, will begin work at once on construction of power plant and reservoir.

**SEQUIM, WASH.**—Work will begin immediately on the installation of an electric-light and steam heating plant to furnish business houses and residences in Sequim with electric light and heat. J. L. Keeler is interested in the project.

**CANBY, ORE.**—The City Council has granted a franchise to M. J. Lee to construct and operate an electric-light plant in Canby for a period of 25 years.

**HILLSBORO, ORE.**—The power house of the Hillsboro Pwr. & Investment Co. was recently destroyed by fire, causing a loss of between \$20,000 and \$25,000. The engines, boilers and generators, it is said, were completely destroyed. H. B. Gates is president.

**NEHALEM, ORE.**—Bonds to the amount of \$12,500 have been voted, the proceeds to be used for the purchase of the present water plant, to be substituted and install an electric-light plant.

**LOS ANGELES, CAL.**—The Pacific L. & Pwr. Co., of Los Angeles, is planning extensions to its present system in Southern California involving an expenditure of more than \$1,000,000, to provide for the distribution of energy generated at the Big Creek power plant. In addition other construction work and betterments to cost another million dollars are contemplated.

**LOS ANGELES, CAL.**—Locations for \$6 additional arc lamps on the East Side and the Garvanza and Highland Park sections have been recommended to the Public Utility City Electrician Manahan. These are to be part of the 500 new arc lamps to be installed by the Los Angeles Gas & El. Corp. during its 18 months contract for lighting the city.

**POMONA, CAL.**—Steps have been taken by the Chamber of Commerce for the installation of an ornamental street-lighting system in the business district in Pomona.

**REDLANDS, CAL.**—The City Trustees are considering the installation of a municipal distribution system for street-lighting. Electricity for maintaining the system is to be purchased from a private company.

**SAN BERNARDINO, CAL.**—The Pacific L. & Pwr. Corp. of Los Angeles is planning to erect a large substation in San Bernardino, to cost about \$60,000.

**SAN BERNARDINO, CAL.**—The Board of Supervisors has granted C. H. L. Gheist and C. H. L. Gheist, Jr., of Los Angeles, the right to erect transmission lines on the streets and highways of San Bernardino County for a period of fifty years.

**SAN FRANCISCO, CAL.**—The stockholders of the Northern California Electric San Francisco have voted to increase the capital stock by \$2,000,000, of which it is proposed to issue \$500,000 at once, the proceeds to be used for extensions to its distribution system.

**SANTA ANA, CAL.**—Preliminary plans are now being arranged by the Board of Supervisors of Orange County for a boulevard lighting project by which all the boulevard highways in the Orange County, running from sea to mountains and from Los Angeles County to San Diego County, will be lighted.

**HAILEY, IDAHO.**—The Hailey El. Co. is contemplating the construction of transmission lines to Ketchum to furnish electricity in that town and other points along the line.

**SALMON, IDAHO.**—Plans are being considered for the installation of a new power plant on the Salmon River. The proposed plant will furnish electricity to the Gilmore Mines and also to operate a large saw dredge to be built and operated on Gerston Creek.



**WALLACE, IDAHO.**—The light committee has approved a plan for the business district and using 400-cp tungsten lamps to light the residential section, while the hillsides will be lighted by 250-cp tungsten lamps.

**TUCSON, ARIZ.**—Extensive improvements will be made to the properties of the Tucson Gas, El. Lt. & Pwr. Co. and the Tucson Rapid Transit Co. as follows: Extension to power house, to cost \$100,000; traction system, \$10,000; gas plant, \$10,000; and extensions to transmission lines for irrigation pumping, \$20,000.

**WICKENBURG, ARIZ.**—The local electric plant has been purchased by M. P. Jewett, of Phoenix. The new owner, it is said, proposes to remove the plant and furnish electricity to the mining districts in the lower Bradshaw Mountains, including the Octave, Fool's Gulch, Yarnell, as well as those in Congress and others.

**HAYRE, MONT.**—The City Council has decided to install an ornamental lighting system on Third Street, bids for which will soon be received by the city clerk.

**MILES CITY, MONT.**—The City Council is contemplating the installation of a heating plant in connection with the municipal electric-light plant. The cost of the plant is estimated at from \$12,000 to \$15,000.

**WHITE-TAIL, MONT.**—The installation of an electric-light plant in White-tail is under consideration. W. S. Davis, of Assiniboine, Sask., Can., is reported interested in the project.

**GREEN RIVER, WYO.**—The proposal to issue \$20,000 in bonds for the installation of a municipal electric-light plant will soon be submitted to the voters.

**DE BEQUE, COL.**—Steps have been taken to organize a company to be known as the De Beque El. Gas & Pwr. Co. The company will be capitalized at \$375,000 and proposes to furnish electricity in this city. J. T. Walsh, of Grand Junction, is interested in the company.

**DENVER, COL.**—As a result of the consolidation of the number of Colorado companies, it is reported, that the western slope from Durango north to Grand Junction is to be gridironed with hydroelectric transmission lines for the development of that section of the State. The Western Colorado Pwr. Co., the Colorado division of the Utah Pwr. & Lt. Co., has taken over the Montrose El. Lt. & Pwr. Co., and the companies operating at Ridgway and Delta. These are to be connected with the plants

Co., the San Juan Wtr. & Pwr. Co., the Durango Gas & El. Co. and the Telluride El. Lt. Co., all of which are owned by the Western Colorado Pwr. Co.

**JOHNSTOWN, COL.**—A franchise has been granted to William C. Stevens, of Denver, to install an electric-lighting system here. It is proposed to make a connection with the transmission line of the Northern Colorado Pwr. Co., about 2½ miles from Johnstown.

## Canada

**EDMONTON, ALTA.**—A proposal has been submitted to the city of Edmonton by Sanders & Porter, consulting engineers, 52 William Street, New York, N. Y., offering to furnish the city energy from a plant to be erected at Moose River, B. C., in the Yellowstone Pass of the Rocky Mountains, 250 miles west of here. The plant to be installed on a branch of the Fraser River will cost about \$3,000,000.

**CORNWALL, ONT.**—The Conservation Commission has directed the chief engineer to make a survey and profile of the St. Regis River from its headwaters to its mouth at the St. Lawrence River, including such lakes, ponds and streams as are tributary to the river; also to make preliminary plans of dams and possible water-storage basins with estimates of cost of same, together with a description of existing developments.

**DRESDEN, ONT.**—The by-law providing for the installation of hydroelectric power in Dresden has been approved by the ratepayers.

**NEW TORONTO, ONT.**—A petition will be presented to the Village Council asking that the hydroelectric service be extended between Fourth Avenue and Long Branch.

**OTTAWA, CAN.**—The Canadian government has voted to appropriate \$84,000 for the installation of telephones in connection with train dispatching on the Intercolonial Railway. This amount, it is understood, is sufficient to equip the road between St. John, N. B., and Truro, N. S. Contract for the installation between Moncton and St. John has been awarded to the Hall Switch & Signal Co. and tenders are under consideration for the extension from Moncton to Truro.

**QUEBEC, QUE.**—Work has been resumed on the hydroelectric power project of the St. Charles Hydraulic Co., of Quebec. It is proposed to develop the Seven Falls on the Ste. Anne River, 27 miles below Quebec. Electricity generated at the plant

will be transmitted to Quebec and neighboring places. A. R. Henry is engineer, 101 E. Wellington, Montreal, Que., Can.

## Miscellaneous

**PEARL HARBOR, HAWAII.**—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Aug. 29 for building and equipping an ice-making and cold storage plant at the United States Naval Station at Pearl Harbor, for which \$25,000 has been appropriated. Plans and specifications may be obtained by application to the bureau. H. R. Stanford is chief of bureau.

## New Incorporations

**DOVER, DEL.**—The Iowa Gas & El. Co. has been granted a charter under the laws of the State of Delaware with a capital stock of \$500,000, to establish electric and gas plants, to furnish gas and electrical service in towns and villages in Iowa. The incorporators are J. M. Satterfield, W. P. Carrow and M. M. Hiron.

**DOVER, DEL.**—The Nebraska Gas & El. Co. has filed articles of incorporation under the laws of the State of Delaware, with a capital stock of \$1,000,000, to establish electric and gas plants, to furnish gas and electrical service in towns and villages in Nebraska. The incorporators are J. M. Satterfield, W. P. Carrow and M. M. Hiron, of Dover.

**JAMESTOWN, N. D.**—The Ellendale El. Co. has been granted a charter with a capital stock of \$20,000. The incorporators are John H. Canham, Clarence Alm and George F. Phillips.

**BOYNTON, OKLA.**—The Boynton Gas & El. Co. has been incorporated with a capital stock of \$5,000 by John R. Harris, of Fayetteville, Ark.; J. H. Ogle, of Boynton, and Uri D. Harris, of Muskogee.

**HOUSTON, TEX.**—The Texas Southern El. Pwr. Co. has been chartered with a capital stock of \$1,000. The incorporators are Edwin B. Parker, Raymond Neilson and C. L. Carter.

**KIMBALL, W. VA.**—The Kimball Lt. & Wtr. Co. has been incorporated with a capital stock of \$20,000 by C. H. Bowman, of Vivien; T. King, of N. Proctor, J. W. Davy and D. King, of Boston, Mass.

# Directory of Electrical Associations

**TYN.** Secretary-treasurer, H. O. Hanson, Mobile Gas Co., Mobile, Ala.

**MENT OF SCIENCE.** Permanent secretary, L. O. Howard, Smithsonian Institution, Washington, D. C.

**ANTS' ASSOCIATION.** Secretary-treasurer, E. B. Burritt, 29 West 39th St., New York.

**TYN.** Secretary, E. B. Burritt, 29 West 39th St., New York. Annual convention, Atlantic City, N. J., Oct. 12-16.

**INC ASSOCIATION.** Secretary, E. B. Burritt, 29 West 39th St., New York. Annual convention, Atlantic City, N. J., Oct. 12-16.

**AMERICAN ELECTROCHEMICAL SOCIETY.** Secretary, Prof. J. W. Richards, Lehigh University, South Bethlehem, Pa. Fall meeting, Niagara Falls, N. Y., Oct. 1-3.

**AMERICAN ELECTRO-THERAPEUTIC ASSOCIATION.** East 11th St., New York.

**AMERICAN INSTITUTE OF CONSULTING ENGINEERS.** Secretary, Eugene W. Stern, 101 Park Ave., New York City.

West 39th St., New York. Board of directors meets monthly. Sections and branches in the principal electrical centers throughout the country.

**AMERICAN PHYSICAL SOCIETY.** Secretary, Prof. A. D. Cole, Ohio State University, Columbus, Ohio.

**AMERICAN SOCIETY OF REFRIGERATING ENGINEERS.** Secretary, William H. Ross, 154 Nassau St., New York City.

University of Pennsylvania, Philadelphia.

**AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS.** Secretary, Edwin A. Scott, 29 West 39th St., New York.

Secretary, J. M. Diven, 47 State St., Troy, N. Y.

**TY OPERATORS.** Secretary, W. J. Tharp, Little Rock, Ark.

**ASSOCIATION OF EDISON ILLUMINATING COMPANIES.** Secretary, Geo. C. Holberton, Pacific Gas & Electric Co., San Francisco, Cal. Annual meeting, Sept. 14, Greenbrier Hotel, White Sulphur Springs, W. Va.

**ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS.** Secretary, W. T. Snyder, McKeesport, Pa.

**ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.** Secretary-treasurer, Jos. A. Andrechich, Chicago & Northwestern Railway, Chicago.

**ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.** Secretary, P. W. Drew, 112 West Adams St., Chicago.

**CALIFORNIA ELECTRICAL CONTRACTORS' ASSOCIATION.** Secretary, W. S. Hanbridge, 1108 Merchants' National Bank Building, Los Angeles, Cal.

**CANADIAN ELECTRICAL ASSOCIATION.** Affiliated with N. E. L. A. Secretary-treasurer, Allan Sullivan, 610 Confederation Life Bldg., Toronto, Can.

**COLORADO ELECTRIC CLUB.** Secretary, C. F. Oehlmann. Meets every Thursday at Albany Hotel, Denver, Col.

T. E. Kennedy, 900 15th St., Denver, Col.

**COMMERCIAL SECTION, N. E. L. A.** Secretary, J. F. Becker, 1170 Broadway, N. Y.

**EASTERN NEW YORK SECTION, N. E. L. A.** Secretary, C. S. Van Dyck, Schenectady, N. Y.

**ELECTRIC CLUB OF CHICAGO.** Secretary, Fred M. Rosseland, Monachock Block, Chicago. Meets every Thursday noon at Hotel Sherman.

**ELECTRICAL CONTRACTORS' ASSOCIATION OF GREATER BOSTON.** Secretary, R. S. Hale, 39 Boylston St., Boston.

**ELECTRICAL CONTRACTORS' ASSOCIATION OF MASSACHUSETTS.** Secretary, H. D. Temple, 20 Foster St., Worcester, Mass.

**ELECTRICAL CONTRACTORS' ASSOCIATION OF NEW YORK STATE.** Secretary, Geo. W. Russell, Jr., 25 West 42d St., New York.

**THE CITY OF CHICAGO.** Secretary, M. N. Blumenthal, 179 West Washington St. Meets at noon on the second and fourth Wednesday of each month at 424 South Wabash Ave.

**STATE OF MISSOURI.** Secretary, A. J. Burns, 318 West Ninth St., Kansas City, Mo.

**WISCONSIN.** Secretary, Albert Petermann, 626 Lloyd St., Milwaukee, Wis.

**ELECTRICAL TRIBUTE ASSOCIATION OF CHICAGO.** Secretary, Frederic P. Voss, 1343 Marquette Building Chicago.

**ELECTRICAL CREDIT ASSOCIATION OF PHILADELPHIA.** Secretary, John W. Crum, 1324 Land Title Building, Philadelphia, Pa.

**ELECTRICAL SALESMEN'S ASSOCIATION.** Secretary, Francis Raymond, 125 Michigan Ave., Chicago, Ill.

**ELECTRICAL SUPPLY JOBBERS' ASSOCIATION.** General secretary, Franklin Overhag, 412

meeting, Niagara Falls, Can., Sept. 9-11.

Insurance Building, Montreal, Can.

Executive secretary, A. Jackson Mar-

Philadelphia, Oct. 19-21.

West 39th St., New York.

ARADY ELECTRICAL ASSOCIATION. Sec-

W. J. Collins, 1129 Masonic Temple,

Hotel

B. Owens, Philadelphia, Pa.

urer, Prof. H. V. Bozell, Norman, Okla.

GRAND ELECTRIC CONTRACTORS' ASSO-

Secretary, J. M. Clayton, Atlanta,

retary, S. A. Sewall, 29 West 39th St., N. Y.

ILLINOIS STATE ELECTRICAL ASSOCIATION.

Secretary, H. E. Chubbuck, Peoria, Ill.

General secretary, J. D. Israel, Engineering

Societies Building, 29 West 39th St., New

Philadelphia, Chicago and Pittsburgh. An-

annual meeting, Cleveland, Sept. 21, 1911.

INDEPENDENT ELECTRICAL CONTRACTORS'

tary, A. Newburger, 1153 Myrtle Ave.,

Brooklyn, N. Y.

ICA. Secretary, W. S. Vivian, Grand

ids, Mich.

etary, Thomas Donahue, Lafayette, Ind.

HANA STATE ELECTRICAL CONTRACTORS'

N. Secretary, George Skilman,

is, Ind.

V. I. Houmiller, 29 West 39th St., New

INSTITUTE OF RADIO ENGINEERS. Secre-

E. J. Simon, 71 Broadway, New York.

et Indiana St., Chicago. Meeting second

day of each month at Lewis Institute.

ELECTRICIANS. Secretary, C. R. George,

etary-treasurer, Preston S. Millar, 30th

Francisco, Sept. 13-18, 1915.

Francisco, September, 1915.

various national electrical engineering so-

cieties contributing to its support). General

Westminster, London, S. W., England.

Meeting at San Francisco, Sept. 9-11, 1913.

IOWA ELECTRICAL ASSOCIATION. Affiliated

with N. E. L. A. Secretary, W. H. Thom-

son, Des Moines, Ia.

IOWA ELECTRICAL CONTRACTORS' ASSO-

TIATION. Secretary, M. T. Humphrey, Walter-

loo, Ia.

ASSOCIATION. Secretary, H. E. Weeks, Day-

enport, Ia.

JOVIAN ORDER. Jupiter (president), W. N.

Building, St. Louis, Mo. Annual congress,

St. Louis, Mo., Oct. 14-16.

KANSAS GAS, WATER, ELECTRIC LIGHT AND

STREET RAILWAY ASSOCIATION. Secretary-

treasurer, Ivor Thomas, 237 South Main St.,

Wichita, Kan.

LOUISIANA ELECTRICAL CONTRACTORS' ASSO-

CIATION. Secretary, J. J. Ziegler, 227

Bourbon St. Meeting every Wednesday. Au-

dition Building, New Orleans.

MAINE ELECTRIC ASSOCIATION. Secretary-

treasurer, Walter S. Wymen, Waterville,

Maine.

MICHIGAN ELECTRIC ASSOCIATION. Affiliated

with N. E. L. A. Secretary, Herbert

Silverster, 13 Washington Boulevard, De-

troit, Mich.

MINNESOTA ELECTRIC ASSOCIATION. Secre-

tary-treasurer, P. A. Otto, St. Paul Gas

Light Company, St. Paul, Minn.

MISSISSIPPI ELECTRIC ASSOCIATION. Affiliated

with the National Electric Light Asso-

ciation. Secretary-treasurer, H. F. Wheeler,

Hattiesburg, Miss. Next annual meeting,

Hattiesburg, April 12-14, 1915.

MISSOURI ELECTRIC, GAS, STREET RAILWAY

treasurer, F. D. Beardslee, Union Electric

Light & Power Co., St. Louis.

NATIONAL ARM, PIN AND BRACKET ASSO-

CIATION. Secretary, J. B. Magers, Madison,

Ind.

NATIONAL ASSOCIATION OF ELECTRICAL IN-

SPECTORS. Secretary-treasurer, Wm. L.

Smith, Concord, Mass.

NATIONAL DISTRICT HEATING ASSOCIATION.

Secretary, D. L. Gaskill, Greenville, Ohio.

NATIONAL ELECTRIC LIGHT ASSOCIATION.

Executive secretary, T. C. Martin, Engi-

neering Societies Building, 33 West 39th St.,

NEW YORK STATE ELECTRICAL ASSOCIATION. Sec-

retary, George H. Dulheid, 41 Martin Build-

ing, Utica, N. Y.

ASSOCIATION OF THE UNITED STATES. Secre-

tary, Frederic P. Vose, 1313

Marquette Building, Chicago.

NATIONAL FIRE PROTECTION ASSOCIATION.

Secretary of electrical committee, Ralph

Sweetland, 141 Milk St., Boston, Mass.

Open meeting, New York, March, 1915.

NATIONAL INDEPENDENT TELEPHONE ASSO-

CIATION. Secretary-treasurer, J. B. Earle,

Waco, Tex.

NEBRASKA SECTION, N. E. L. A. Secre-

tary-treasurer, S. J. Bell, David City, Neb.

State St., Boston, Mass.

NEW ENGLAND SECTION, ELECTRIC VEHIC-

LE ASSOCIATION OF AMERICA. Secretary,

L. L. Edgar, 39 Devonshire St., Boston, Mass.

NEW ENGLAND STREET RAILWAY CLUB.

Secretary, H. A. Faulkner, 12 Pearl St.,

Boston, Mass. Meets last Thursday of each

month.

NEW ENGLAND SECTION, N. E. L. A. Secre-

tary, Miss O. E. Bursell, 149 Tremont St.,

Boston, Mass. Annual meeting, Naitra-

ganesset Pier, R. I., Sept. 2-4.

NEW ORLEANS ELECTRICAL CONTRACTORS'

ASSOCIATION. Secretary, S. J. Stewart, 312

Canalade St., New Orleans, La. Meet-

ings, second and fourth Tuesday of each

month.

NEW YORK ELECTRIC RAILWAY ASSOCI-

ATION. Secretary, Charles C. Dietz, 239 West

39th St., New York.

NEW YORK ELECTRICAL CREDIT ASSOCI-

ATION. Affiliated with the National El-

ectric Credit Association. Secretary, Franz

Nelson, 99 Wall St., New York.

NEW YORK ELECTRICAL SOCIETY. Secre-

tary, G. H. Guy, 33 West 39th St., New

York.

NORTHWEST SECTION, N. E. L. A. Secre-

tary, N. W. Brockett, Pioneer Building,

Seattle, Wash.

NORTHERN WHITE CEDAR ASSOCIATION.

Secretary, R. N. Boucher, 743 Lumber Ex-

change, Minneapolis, Minn.

OHIO ELECTRIC LIGHT ASSOCIATION. Secre-

tary, D. L. Gaskill, Greenville, Ohio.

OHIO SOCIETY OF MECHANICAL, ELECTRICAL

AND STAMPS ENGINEERS. Secretary,

Prof. F. E. Sarnon, Ohio State University,

Columbus, Ohio.

OREGON ELECTRICAL CONTRACTORS' ASSO-

CIATION. Secretary, F. C. Green, 291 East

Portland St., Portland, Ore.

PENNSYLVANIA ELECTRIC ASSOCIATION

(State Section, N. E. L. A.). Secretary-

treasurer, S. C. Pohe, Bloomsburg, Pa. An-

annual meeting, Eagle's Mere, Pa., Sept. 8-11.

RAILWAY SIGNAL ASSOCIATION. Secre-

tary-treasurer, C. E. Rosenberg, Times

Building, Bethlehem, Pa.

SOCIETY FOR ELECTRICAL DEVELOPMENT.

West 39th St., New York.

SOCIETY FOR THE PROMOTION OF ENGI-

NEERING EDUCATION. Secretary, Dean F. L.

Bishop, University of Pittsburgh, Pitts-

burgh, Pa.

SOUTHEASTERN SECTION, N. E. L. A.

Secretary-treasurer, A. A. Wilbur, Colum-

bia, Ga. Annual meeting, Isle of Palms,

Charleston, S. C., Aug. 19-21, 1914.

SOUTHWESTERN ELECTRICAL AND GAS AS-

SOCIATION. Secretary, H. S. Cooper, 405

Slaughter Building, Dallas, Tex.

VERMONT ELECTRICAL ASSOCIATION. Secre-

tary-treasurer, A. B. Marsden, Maches-

WESTERN ASSOCIATION OF ELECTRICAL IN-

SPECTORS. Secretary, W. S. Boyd, 76 West

Monroe St., Chicago, Ill.

WESTERN SOCIETY OF ENGINEERS, ELECTRICAL

SECTION. Secretary, J. H. Warder,

127 Mondrack Block, Chicago.

WISCONSIN ELECTRICAL ASSOCIATION. Secre-

tary, George Allison, 1110 First National

Bank Bldg., Milwaukee, Wis.

## Weekly Record of Electrical Patents

JULY 21, 1914.

prepared by Robert Starr Allen, 16 Ex-

change Place, New York, N. Y.]

ELECTRICAL FITTING: M. F.

ein, New York, N. Y. App. filed

1913. Connector for ends of

HIGH-TENSION OSCILLATOR: W.

flin, Germany. App. filed June

2. Parallel-disposed separated

plates inclosed in casing.

ELECTRIC-MOTOR CONTROLLER: H.

st, Cleveland, Ohio. App. filed

1912. Arrangement of manually

and magnetically operated

s for starting.

ELECTRIC CONTROL SYSTEM: J.

st, Cleveland, Ohio. App. filed

1910. Reverser and operating

s therefor.

PROTECTIVE DEVICE FOR SHEATHED

T. E. M.

N. Y. App. filed April 15, 1912. Breaks

electrical continuity of sheathing at inter-

vals.

1,162,984. PROTECTIVE CASING FOR LINE

CONDUCTORS: T. E. Murray, New York,

N. Y. App. filed Nov. 8, 1912. Outlet

construction for sheet-metal moldings.

1,162,987. ELECTRIC FUSE: T. E. Murray,

New York, N. Y. App. filed March 16,

1913. Removable end caps secure fuse

step in place.

E. Murray, New York, N. Y. App. filed

April 16, 1913. U-shaped body portion

closed by flat-flanged cover.

1,162,989. ELECTRIC CUTOFF: T. E. Mur-

ray, New York, N. Y. App. filed June 9,

1913. For three-wire systems; inserts

fuses into the respective circuits.

1,162,990. ELECTRIC CUTOFF: T. E. Mur-

ray, New York, N. Y. App. filed June 9,

1913. Three-wire system; has two switch

levers and fuses.

1,162,991. CONNECTING DEVICE: T. E. Mur-

ray, New York, N. Y. App. filed Oct. 16,

1,162,993. PROTECTIVE DEVICE FOR ELECTRIC

CIRCUITS: T. E. Murray and A. V. A. Mc-

Arg, New York, N. Y. App. filed Dec.

26, 1913. Prevents manually reclosing

switch after an overload and fastening it

so as to make use of the stronger current.

1,162,994. ELECTRIC CUTOFF: T. E. Murray,

New York, N. Y. App. filed Dec. 26, 1913.

Three-wire system; circuit-closing plug is

locked in position by the fuse plugs.

1,162,995. INSULATOR: J. Seguin, Montreal,

Quebec, Canada. App. filed Oct. 14, 1912.

Interposed in the chain of a pull so-ket

J. Anderson, Chicago, Ill. App. filed Sept

current magnets using square cores.



1.104,061. CABLE AND METHOD OF FORMING SAME. J. R. Sauer, U. S. Pat. filed Feb. 25, 1928. For use in telegraph and base circuits.

1.104,062. CABLE AND METHOD OF FORMING SAME. J. R. Sauer, U. S. Pat. filed Feb. 25, 1928. For use in telegraph and base circuits, as in telephone work.

1.104,063. WIRELESS SYSTEM FOR TELEPHONE EXCHANGE. W. F. McArthur, New York, U. S. Pat. filed July 21, 1929. For selector switches.

1.104,065. DETECTOR FOR WIRELESS APPARATUS. B. J. Messner, Washington, D. C. App. filed Dec. 1, 1929. Light spring presses a metal point in inclined direction against contact surface.

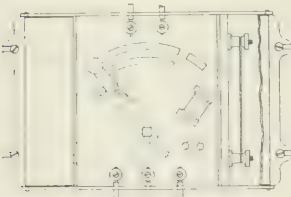
1.104,066. DETECTOR FOR WIRELESS TELEGRAPHY AND TELEPHONE. J. W. Pickett, Adamsburg, Mass. App. filed June 21, 1931. Coiled wire with a contact point of platinized gold.

1.104,077. ELECTROMAGNETIC CIRCUIT-CONTROLLING DEVICE. W. F. Smith, Brooklyn, N. Y. App. filed Nov. 30, 1912. Yoke and pivoted armature construction.

1.104,092. AUTOMOBILE SWITCH. H. W. Young, Chicago, and A. S. Pearl, Maywood, Ill. App. filed Dec. 8, 1911. Operated by key to control the ignition circuit.

1.104,104. TROLLEY GUIDE. E. H. Cauvel, Old City, Pa. App. filed May 20, 1913. Pull on trolley rod throws guide arms up into guiding position at sides of trolley wheel.

1.104,115. CARBON BRUSH. R. F. Hausen, Pittsburgh, Pa. App. filed Dec. 19, 1913. Drives a screw into that part of the copper conductor which has been inserted in the carbon block.



1.104,115—Electric Starter for Motors

1.104,183. ALTERNATING-CURRENT GENERATOR. V. A. Fynn, London, England. App. filed May 23, 1911. Auxiliary generator supplies single-phase current to the commuted winding of the main generator.

1.104,184. DYNAMO-ELECTRIC MACHINE. V. A. Fynn, London, England. App. filed June 17, 1911. Particularly for battery charging.

1.104,195. SWITCHBOARD PLUG. M. A. Janes, Northfield, Mass. App. filed Nov. 13, 1913. Two-part plug head constitutes a clamp for the end of the flexible cord.

1.104,198. VAPOR-ELECTRIC APPARATUS. O. O. Kruh, Schenectady, N. Y. App. filed Dec. 12, 1908. Currents pass freely between electrodes of different function, but not between electrodes of same function.

1.104,205. APPARATUS FOR AUTOMATICALLY INDICATING THE POSITION OF SIGNALS ON LOCOMOTIVES. M. Manthorpe and A. I. Hansen, Copenhagen, Denmark. App. filed Sept. 6, 1913. Shaft on roadbed carries arms to engage dependent arms on locomotive.

1.104,220. THIRD-ROD SUPPORT. W. B. Potter, Schenectady, N. Y. App. filed July 1, 1908. Massive pedestal insulator with an adjustable jaw to clamp rail.

1.104,225. ELECTRIC CONDUCTOR FOR TROLLEY CARS. J. Scott, Cleveland, Ohio. App. filed April 10, 1914. Single-line conductor serves the double purpose of a cable and a line for the trolley.

1.104,233. DYNAMO-ELECTRIC MACHINE. W. Weiler, Berlin, Germany. App. filed Feb. 11, 1913. Novel arrangement to shorten length of time necessary for building up excitation of generators.

1.104,256. APPARATUS FOR AND METHOD OF RECEIVING ELECTRIC WAVES. R. Goldschmidt, Darmstadt, Germany. App. filed March 29, 1911. Diminishes frequency of waves to a degree where they are capable of being directly perceived in a telephone.

1.104,257. HIGH-FREQUENCY GENERATOR. R. Goldschmidt, Darmstadt, Germany. App. filed May 9, 1911. Stator and rotor provided with monophasic windings.

1.104,268. WEIGHING MECHANISM. E. H. Messier, Brooklyn, N. Y. App. filed June

14, 1911. For electrically weighing, recording and registering loads.

1.104,272. APPARATUS FOR TREATING BATTERY PLATES. G. H. Rabenalt, Buffalo, N. Y. App. filed Feb. 6, 1913. Paste allowed to set or harden, as in electrochemical action, while the die is still in engagement therewith.

1.104,273. PROCESS OF TREATING BATTERY PLATES. G. H. Rabenalt, Buffalo, N. Y. App. filed Feb. 6, 1913. Treats in contact pressed paste surface with a reagent to set the surface before the die is removed.

1.104,282. ELECTROMECHANICAL ACTION FOR MUSICAL INSTRUMENTS. M. L. Severy, Arlington Heights, and C. B. Sinclair, Medford, Mass. App. filed Feb. 25, 1910. Control both the mechanical and the electrical vibration of tuned sonorous bodies.

1.104,339. FLAMING-ARC LAMP. S. H. Blake, Pittsfield, Mass. App. filed July 13, 1909. Has an economizer supported by linkages.

1.104,345. SELF-WINDING CLOCK. M. Castel, Iron Mountain, Mich. App. filed Jan. 30, 1914. Weight-driven power shaft and an automatically switched-in motor for winding.

1.104,384. PROCESS OF PRODUCING SILICON MONOXIDE. H. N. Potter, New York, N. Y. App. filed Dec. 30, 1904. Heats silicon dioxide in contact with carbon in a partially filled inclosing chamber.

1.104,395. SUSPENSION-BOX FITTING FOR ELECTRIC INSTALLATION. W. H. Vibber, New London, Conn. App. filed April 15, 1911. For supporting vertical wires in high buildings at intervals to distribute the weight.

1.104,419. LIQUID-CONTROLLED ALARM APPARATUS. S. A. Glynn and E. J. Quinn, East Elv, Nev. App. filed Feb. 21, 1912. Alarm given upon diminution or cessation of a flow of liquid.

1.104,436. CONNECTOR. J. F. Menninger, West Allis, Wis. App. filed Jan. 30, 1913. Has duplicate male and female knife-blade contacts.

1.104,439. AUTOMATIC CIRCUIT-BREAKER. J. Mitchell, Santa Paula, Cal. App. filed Nov. 14, 1912. Ordinary knife switch modified to perform functions of overload or underload circuit-breaker.

1.104,440. ELECTRIC CURRENT INDICATOR. O. Moessner (deceased), Philadelphia, Pa. App. filed Oct. 22, 1913. Plug containing a small signal lamp to indicate when current is in circuit with a flatiron or like device.

1.104,451. TELEPHONE AUTOMATIC TRUNK-SELECTING SYSTEM. M. Setter, Chicago, Ill. App. filed May 6, 1910. Switch automatically selects idle trunk by a continuous movement instead of a step-by-step movement.

1.104,480. SEMAPHORE SIGNALING SYSTEM. R. M. De Vignier, Nollis Terrace, N. Y. App. filed March 23, 1912. Simple form of "answer-back" mechanism.

1.104,499. ELECTRIC HEATING DEVICE. J. A. Heany, Washington, D. C. App. filed Oct. 18, 1913. Heat generated by eddy currents in the body of metal.

1.104,522. AUTOMATIC IGNITION SYSTEM FOR GAS LIGHTERS. J. W. Lundahl, Thomas, Conn. App. filed Sept. 6, 1913. Gas valve closes lighting circuit to automobile gas lamps.

1.104,557. MANUFACTURE OF METALLIC FILAMENTS FOR ELECTRIC INCANDESCENT LAMPS. J. A. Scouler, Hammersmith, London, Eng. App. filed March 14, 1913. Produces a squirtable paste by intimately mixing tungsten powder with a small proportion of viscous solution of sodium silicate.

1.104,572. ELECTRIC HEATER. C. S. Steward, Chattanooga, Tenn. App. filed April 3, 1914. Plate of steel with concentric slots widened at the bottom to take the heater coils.

1.104,577. ELECTRICAL RECEPTACLE. G. B. Thomas, Bridgeport, Conn. App. filed June 14, 1913. Fitting is plugged in by a straight-in push.

1.104,586. ELECTRICALLY OPERATED BRAKE. G. R. Wadsworth, Cleveland, Ohio. App. filed May 2, 1913. Motor-operated brake for autos.

1.104,605. TELEPHONE SYSTEM FOR TRAINS. E. L. Davis and J. W. McFarland, Cherry Tree, Pa. App. filed Jan. 30, 1911. Has a special pole for establishing communication with overhead wires.

1.104,610. RECEIVER FOR TELEPHONES. G. N. Baird, San Francisco, Cal. App. filed July 10, 1912. Increases intensity of sound reproduction by a wedge-shaped armature on diaphragm co-operating with correspondingly shaped pole faces.

1.104,620. RE-FORMING OF FILMS OF ELECTROLYTIC LIGHTNING ARRESTERS. J. W. Brown, Brooklyn, N. Y. App. filed Jan. 6, 1914. Has means for establishing the films of hydroxide on the aluminum trays of the arrester.

1.104,646. ELECTROLYTIC APPARATUS. J. D. Fields, Butte, Mont. App. filed March 11, 1913. For treatment of copper in solution.

1.104,680. TEMPERATURE REGULATOR. F. A. Kuntz, New York, N. Y. App. filed Jan. 27, 1913. Thermostatically governed ventilating blower.

1.104,692. DISTRIBUTING MECHANISM FOR ELECTRIC SIGNS AND SIMILAR DEVICES. L. Miller, Brownwood, Tex. App. filed Sept. 19, 1911. To enable use of small-size flashers.

1.104,695. THERMOSTATIC CIRCUIT CLOSER. J. C. Moessner, Mount Pleasant, S. C. App. filed April 19, 1913. Has a sector and pinion movement.

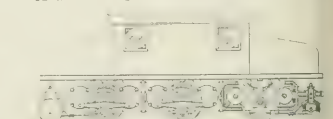
1.104,709. SWITCHBOARD MOUNTING. A. W. Schran, Riverton, N. J. App. filed Dec. 20, 1912. Special mounting for dental switchboards.

1.104,712. WIRELESS TELEGRAPH OR TELEPHONE SYSTEM. W. H. Shepard and A. E. McKechnie, London, England. App. filed Dec. 13, 1913. Alarm device gives "aural" indication when receiving apparatus is rendered operative.

1.104,715. DYNAMO-ELECTRIC MACHINE. S. Sparrow, St. Louis, Mo. App. filed June 15, 1912. Means for starting and operating single-phase motors.

1.104,720. ELECTRICAL CONNECTION. B. B. Turner, Baltimore, Md. App. filed March 6, 1913. Bowed spring plug and socket members for making connections to telephone receivers and the like.

1.104,728. OIL TRANSFORMER. H. Weiss, Vienna, Austria-Hungary. App. filed Oct. 28, 1913. Air is excluded from the oil tank and at the same time the expansion of the oil is provided for.



13,777—Electric Locomotive

1.104,733. DISTRIBUTION OF ELECTRICAL ENERGY. P. V. Hunter, Heaton, Newcastle-upon-Tyne, Eng. App. filed June 21, 1912. Reactance between the generators, which are in series with the conductors.

1.104,734. BYULGAR ALARM. C. F. Lee, Chicago, Ill. App. filed March 26, 1913. Operated by the turning of the knob to release the latch.

1.104,737. ELECTRICAL SWITCH. F. Schnelzer, Cleveland, Ohio. App. filed Feb. 20, 1913. For drills and the like; has push-buttons for operating an oscillator switch-throwing member.

1.104,746. WIRELESS TELEGRAPH OR TELEPHONE SYSTEM. L. W. H. Shepard and A. E. McKechnie, London, Eng. App. filed May 7, 1914. Inertia switch closes circuit through aural device when the receiving circuit has been operative for a predetermined time.

1.104,753. TESTING INSTRUMENT. H. Baluss, Kennett Square, Pa. App. filed July 23, 1910. For testing rail bonds.

1.104,754. ELECTROLYTIC CELL. J. B. Burdick, Chicago, Ill. App. filed Nov. 6, 1912. For decomposing liquids into their constituent gases and preventing the intermingling of the gases within the cell.

1.104,758. ELECTRIC STARTER FOR MOTORS. ALTERNATING OR DIRECT CURRENT. C. E. Pinkerton and A. E. Wason, London, Eng. App. filed Oct. 31, 1913. All fittings combined in a single casing so that only one manipulation is required by the operator.

13,776 (reissue). TELEPHONE EXCHANGE SYSTEM. E. E. Clement, Washington, D. C. App. filed March 25, 1912. (Original patent No. 956,484, April 24, 1910.) Special call resisting means.

13,777 (reissue). ELECTRIC LOCOMOTIVE. L. Le C. Davis (deceased), Pittsburgh, Pa. App. filed Feb. 25, 1914. (Original patent No. 1,074,841, Oct. 7, 1913.) Locomotive frame comprises a plurality of rigidly secured, abouting independent magnetizable motor frames.

13,779 (reissue). RELAY FOR UNIDULATOR CURRENTS. R. Von Lieben and E. Reis, Vienna, Austria-Hungary. App. filed June 10, 1914. (Original patent No. 1,038,910, Sept. 17, 1912. Has an incan descent metallic oxide cathode.

# Electrical World

THE CONSOLIDATION OF ELECTRICAL WORLD AND ENGINEER, and AMERICAN ELECTRICIAN

Published by McGraw Publishing Company, Inc.

Vol. 64

NEW YORK, SATURDAY, AUGUST 8, 1914

No. 6

## Responsibilities During War

The succession of startling events in Europe has thrown upon this country heavy responsibilities, moral, financial and commercial. The first outward signs were the demands for gold for export and the crushing volume of liquidation which re-awakened the New York Stock Exchange to activity. The next sudden step—the closing of the exchange, the rapid perfection of government plans to aid the financial situation, and the additional precautions of the banks to avert disaster by the use of clearing house certificates and the restriction of savings withdrawals—are now matters of history. The movement of the numerous closely associated events has been so swift that, in order to retain a clear outlook, it is essential to bear in mind the extraordinary position in which this country is now placed. Of the main countries of first rank it is the only one that is left to give outside help in restoring order in Europe. It alone has no alliances and is friendly with all. Those considerations may make an opportunity for government action later. The economic wastes of prolonged war will be visited on the civilized world, being proportioned, however, in somewhat the degree of participation in war or in foreign commerce. The shrinkage in security prices here, although temporary in nature, is one of the elements to be reckoned with. This country can produce for markets which are not capable of production for themselves and in that way do much to alleviate the commercial, if not the other, horrors that are inseparable from war.

## Plans for Domestic Business

President Wilson's refusal this week to heed the plea of several senators and postpone the trust legislation program almost escapes attention in the turmoil of war news. The plea was based on the argument that the prosecution of the Presidential program to the bitter end would contribute still further to the causes of untimely settlement of business. Nothing stops the Washington authorities in their onward march. The President apparently can control Congress, and he is determined that corporations subject to trade legislation shall not escape. He apparently could not control the Interstate Commerce Commission, because it was generally believed in Washington that he favored the rate increases exacted by the railroads; but that commission was determined that the railroads should not get what they wanted. If it had so happened that Mr. Wilson's views had failed to meet the approval of Congress and had been adopted by the Interstate Commerce Commission, the contributory causes of our industrial conditions

would have been quite different. It is a matter for wonder that the Interstate commission labored so long and brought forth so little. Even the little that it did grant to the railroads is bedimmed by the "psychological" state of uncertainty in which business finds itself pending a determination of where it stands. Business just now needs all the support and forbearance that the government can give. Ordinary trade is a humdrum sort of a thing without the spectacular qualities which banks have. In the eyes of the public and the authorities its wares are not highly sensitive to daily influences as are the securities which constitute the trading commodities of the banks. Plain business cannot claim instant protection and get it on the ground that its customers are in danger of insolvency, and it is caught with a heavy load of materials in a declining market. This is not in any sense a criticism of the aid which the government wisely extended to safeguard the banking situation on whose maintenance our whole commercial integrity rests; it is a reminder that other forms of business can be helped and strengthened in their legitimate activities by a governmental policy of tolerance and friendliness.

## America's Hour of Opportunity

In time of peace the value of a security is based on its stability and earning power; in time of war its price is determined by the immediate gold it will bring. The continuance of interest or dividends does not matter to the panic-crazed seller. Europe has been a constant and heavy buyer of American public utility securities for several years past. Last week, in the face of certain war, Europe rushed to sell. Naturally prices crumbled, not because the securities and the assets back of them were impaired in the slightest, but because there were a hundred times more sellers than buyers. Utilities were affected like everything else, but not in so great a degree. A number of bankers in New York's financial district have expressed almost unanimously the opinion that the outlook for electrical securities was never better. The effect of the war in Europe, in their opinion, will be extremely favorable to the electrical industries of America. These are not shallow opinions. They are the beliefs of men who are accustomed to back their views with money. Certainly there will be no decrease in the lighting load. There may be some slight temporary decrease in the demands for motor service here and there, but not much if any is looked for. On the contrary, a growth in energy consumption in the next few months is confidently expected after conditions readjust themselves as they surely will.



Important as they are, these things are of small moment compared with the tremendous possibilities that the immediate future holds for America, particularly for every branch of the electrical manufacturing industry in this country. Such an opportunity as now presents itself has never arisen before and is not likely to do so again for generations. Now of all times is the occasion for the United States to become supreme in the markets of the Western Hemisphere and of the rest of the earth that is not at war. For the last quarter of a century Germany has been laboring mightily and with success to establish markets for her goods, especially throughout Latin America. Moreover, since our new tariff went into effect the Germans have been planning a commercial invasion of the United States. With Germany at war with its neighbors on all sides, the threatening conditions have ended. To-day the United States is in the most favorable position in the world—rich, self-supporting and at peace. The Panama Canal will be opened for commerce this month. We have a new banking law that is especially designed to foster our export trade. The temporary reduction in the prices of electrical securities furnishes no cause for alarm. The real values are unimpaired. There is no ground for worry. On the contrary, there is every reason for hope and none at all for fear.

### Fireproof Construction

One would suppose that experience would have shown most thoroughly the desirability of fireproof construction in central stations. Such unfortunately is not the fact. While much progress has been made in the right direction, yet the service in no small number of communities remains at the mercy of chance. The old days of two-story stations and wooden floors riddled with belt holes have fortunately gone by. Yet often, and particularly in hydroelectric plants of the smaller sort, the risks taken are almost as great. With modern cheap concrete construction it is extremely easy to secure fireproof walls. It is in the rest of the structure that serious difficulties are encountered. One can obtain a roof of reinforced-concrete slabs which is truly fireproof and yet so heavy and expensive that it is not often used for small structures. Wooden roofs are dangerously common, sometimes fireproofed so far as the exterior goes by metal or slate coverings, but a source of danger nevertheless. What is true of roofs is doubly true of floors. Nobody has yet devised a cheap and effective fireproof floor, a floor which is reasonably safe even when, as is too often the case, abundantly soaked with oil. Ground floors based fairly on *terra firma* are commonly concreted with good advantage. When local conditions render this too expensive, wood is installed, and conditions are then ripe for a future conflagration.

Various processes have been developed for fireproofing wood, some of them reputed to be reasonably efficient. Those who are interested should take up the matter seriously and see if there cannot be provided material of this sort sufficiently cheap to encourage its use

wherever in electrical works it could be applied to advantage. We do not wish here in any way to detract from the virtues of any of the various fireproofing processes which have been suggested. The fact is, however, that, good as they may be, they have not yet been successfully exploited in a way to make their application convenient and common in station construction. It is time for those who are dealing with fireproof materials of every kind to co-operate with the constructors of small central stations and show them how economically to protect themselves against serious fire hazards. It is easy enough to build a fireproof structure if there are no severe limitations on the cost. It is painfully difficult, on the other hand, to build both cheaply and safely.

### Electrical Drainage Pumping

Some telling facts regarding the use of electric motors for drainage pumping, an application somewhat unusual although with much to recommend it, are given elsewhere in this issue. Electrical pumping is common place enough, and many of the large transmission plants in the far West are doing important work in pumping water from the streams for farm irrigation. The application described is the converse of this, being the pumping of water away from the farms to save them from being inundated. Throughout the great Mississippi valley many thousands of acres of valuable land at certain seasons of the year are so long under water during each season as to be unavailable for agricultural purposes. To deal with this situation levees must be built for cutting off the lands from the direct overflow of the streams and provision must then be made for pumping back to the stream level the water from rainfall.

The engineering features peculiar to this task are rather striking. The pumping must be irregular in amount from month to month and from year to year, following the natural requirements of rainfall at run-off, and must be against a variable head depending on the height of the rivers along the levees. In the past a number of steam pumping plants have been used in this service—for the most part simple steam engine driving centrifugal pumps. The irregular nature of the service makes the costs considerable. The costs of such plants vary from \$70 to \$110 per horsepower and the discontinuous and irregular use brings a large capital and upkeep charges to about one-half of the total cost of service per acre. In recent years electrical pumping plants have been introduced with excellent results. With electric pumping the costs per horsepower are little over half those of the steam plant, and as it is well known that transmitted energy can almost always compete well with steam, the gain in fixed charges is a very material one. The need of working the pumps against varying heads and hence varying speeds has been met by using geared pumps with three available gear ratios secured by changing the pinions, so that the motors always work under advantageous conditions.

The motor rating required for pumping is generally under 50 hp per 1000 acres in the territory where the scheme has been well applied, and hence in the case of a steam pumping station the cost would be considerable for the small proprietor unless he united with others. With motor pumping a farm of moderate size can be easily cared for, and while with steam the cost per acre in a small installation would be almost or quite prohibitive, the motor plant does the work at a cost only slightly dependent on the size of the plant. In a rough way, the cost of drainage pumping, as noted in this issue, has been somewhat in excess of \$1 per acre. This is not a large item of expense from the standpoint of the farmer, considering the benefits he receives. In electric pumping a considerable fraction of the money expended goes to the central station, and hence it can be readily seen that a district reclaimed from the river and covering, as many such districts do, several thousand acres would present a load well worth securing.

### Dealing with the Small Consumer

In a recent paper in the *Elektrotechnischer Zeitschrift* are discussed in some detail many forms of metering devices which have been employed to furnish a cheap means of measuring the energy used by small consumers. Some of them of unfamiliar types here look promising, and American manufacturers would do well to examine somewhat into the foreign experience in these matters for the purpose of helping on the efforts of the central station in the acquisition of load from small consumers. But, as was well shown in the important article by Mr. S. E. Doane published in these columns on May 23, 1914, there is a great deal more in dealing with the small consumer than merely installing a meter of low first cost. It is perfectly feasible to obtain a large load in small units under reasonably favorable conditions. Ordinarily work of this class has been neglected in the past, but its value has now been so well established that we look toward great progress for the future. A certain proportion of the possible customers require fairly large installations—say from fifteen to fifty lamps—with use enough to make ordinary metering thoroughly feasible. Meters for loads of this class are fairly cheap and reliable, and the ordinary methods of handling commercial business work reasonably well. It is the really small consumer, using even as few as half a dozen lamps, who furnishes both the difficult problem of exploitation and a very considerable amount of revenue.

This class of business requires in the first place very careful methods of solicitation adapted to bring into line a consumer who can afford to install only a very small equipment and who has to look carefully toward the expense of installation, and in the second place provision for installation at the minimum cost and the minimum trouble to the consumer. Moreover, there must be the simplest possible system of determining the output and securing payment for it. It will be ob-

served that the cheap meter is only an incident to the last-mentioned requirement. It is not the first cost of the present meters that makes trouble for the central station wishing to cultivate the small consumer. On the contrary, it is the cost of meter maintenance, reading and billing that makes them expensive. In a large station these items cost almost as much for the smallest consumer as for the large consumer. The overhead charges due to the meter and bookkeeping departments greatly reduce the profits when the output sold is small. It is for this reason that contract systems of one kind or another are becoming somewhat popular and successful.

Electric lighting by contract not only renders the meter unnecessary, but it always greatly simplifies the bookkeeping. A customer who is charged just so much a month or quarter, as the case may be, knows in advance how much the charges will be and the date they fall due, and the charges can be collected from him with much less trouble than is requisite in the ordinary course of meter practice. The great problem of the central station is to keep the customer from using an abnormal amount of energy not called for by his contract or operating his lamps to an unreasonable extent, leaving them turned on all night for instance. According to the experience of many who have dealt with contract lighting, these difficulties have been somewhat overestimated. Current-limiting devices check the installation of larger lamps than the contract calls for, although these involve some additional expense, and experience seems to show that they are not so necessary as might be supposed off-hand. Indeed, it is quite likely that the losses from energy thus pilfered by a group of small consumers are considerably less than the upkeep charges of the current-limiting devices. The use of lamps for unreasonably long hours is not so easily handled. Unquestionably in every system where contract lighting is undertaken there will be a certain amount of excess time use, yet most consumers are reasonably thrifty and reasonably honest, and not inclined to keep their lamps in service all night merely because there is no way of preventing their so doing.

The last word has certainly not been said either on the meter or the current-limiting device. The growth of business among small consumers is bound to bring improvements which will lessen the cost of both. Where the central station chooses one or the other scheme of operation to increase its business it must make an effective campaign for cheap wiring, preferably with payment on the instalment plan, so as to make a definite fixed addition to the monthly bill which will not fall heavily on even the smallest consumer if meters are used. The main point is to render as simple as possible the reading and billing, perhaps uniting in one man the meter reader and the bookkeeper. This result is well worth obtaining as part of the general program of making electric service a necessity rather than a luxury and bringing it close to all members of the community, rich and poor alike.



# The News of the Week

## Activities and Events in the Electrical Field— Reports of Meetings—Commission Findings, Etc.

### Liquidation in Public Utility Stocks

From the beginning of the present political upheaval in Europe public utility stocks, both listed and unlisted, have been heavily liquidated on the part of foreign holders, in several instances driving the prices of these stocks down to record low values. European investors, and particularly the English, have been large buyers of American public utility stocks and bonds. A number of issues have been listed on the London Stock Exchange and regularly quoted there. For some weeks these securities have been coming back to this country, selling orders being executed in many cities. The principal interior exchanges for trading in these securities in this country are Chicago, Cleveland, Detroit, Cincinnati, Columbus, Louisville, Grand Rapids, St. Louis and Denver, with large trading in several issues in Boston, Philadelphia and Baltimore. For a while these securities were rapidly bought, but now the buying power is exhausted and dealers are refusing to make bids.

### Utility Issues Listed Abroad

Among American public utility issues listed on the London Stock Exchange are Cities Service Company common and preferred stock, Consolidated Cities Light, Power & Traction Company 5 per cent bonds, Consolidated Gas, Electric Light & Power Company of Baltimore stocks, debentures and general-mortgage bonds, Empire District Electric Company first-mortgage bonds, Georgia Light, Power & Railways Company common stock and first-lien bonds, Kaministiquia Power Company stock and first-mortgage bonds, Mexican Light & Power Company stocks and bonds, Mississippi River Power Company common and preferred stocks and first-mortgage bonds, Montreal Light, Heat & Power Company stocks and bonds, Pacific Gas & Electric Company first and refunding general-mortgage bonds, Pennsylvania Water & Power Company stock and first-mortgage bonds, Philadelphia Company preferred stock and debentures, Shawinigan Water & Power Company stock, bonds and debentures, Alabama Traction, Light & Power Company stock and first-mortgage bonds, Havana Electric Company bonds, Manila Electric Railroad & Lighting Company stock, bonds and debentures, Michigan United Railways Company first-mortgage and refunding bonds, Portland Railway, Light & Power Company first-mortgage bonds, and Porto Rico Railway general and refunding bonds.

### London Market for American Stocks

The issues having the most general market in London are those of the Cities Service Company, Alabama Traction, Light & Power Company, Mississippi River Power Company, Consolidated Gas, Electric Light & Power Company of Baltimore, and Pennsylvania Water & Power Company. It is probable that the Cities Service Company issues have suffered more than any other securities from the foreign liquidation as they had been much more generally distributed abroad, had figured much more largely in English transactions, and also had the best and widest market in this country. Large blocks of both common and preferred stocks of this

company have been liquidated here in the last two weeks, forcing prices to a new low level. The board of directors has decided to defer payment of dividends, including those due Aug. 1, on the preferred and common stock in view of the present situation.

In addition to these stocks which have a market both in New York and London, several stocks of Canadian companies are traded in on the London exchange which have their market on this side in Montreal and Toronto. Among these are Mexico Tramways Company, Mexican Light & Power Company, Montreal Tramways Company, British Columbia Electric Company, Calgary Power Company, Shawinigan Water & Power Company, Toronto Power Company, Winnipeg Electric Railway Company, Brazilian Traction, Light & Power Company and several others. Brazilian Traction, Light & Power Company, the largest of these companies, having over \$100,000,000 of common stock, slumped badly in Montreal and London selling and was one of the causes of the closing of the exchange in the former city.

### Companies Will Earn Despite War

With great difficulty the public utility operators in this country have developed the foreign market, but they educated Europe well in public utility investments. It is thought by these operators that as soon as they war sky is cleared and financial matters have assumed some semblance of stability these securities will once more be eagerly sought by the foreign investor. As one operator remarked, the companies will furnish service during war times and will have just as large earnings. The price of the securities in the market may go down, but the earning power of the companies is the same as before.

### Effects of European Conflict on Electrical Manufacturers

The great struggle which is now progressing on the other side of the Atlantic has tied up the export trade of the electrical manufacturers of this country. The General Electric Company exports monthly electrical apparatus and equipment with an approximate value of \$1,000,000. At the present time this company has goods valued between \$300,000 and \$400,000 somewhere on the seas. The Westinghouse Electric & Manufacturing Company does only a nominal export business. For the most part its patent rights in Europe have been purchased by local companies. Its South American trade, however, is large and has suffered. At present there are in New York City 150 cars loaded with freight from the Westinghouse company, and more follow each day. This freight, consigned to South America, cannot be delivered until some means of passage by water has been provided.

At the New York office of the Westinghouse company it was stated that of the company's subsidiaries in England, France, Italy and Austria only the British company pays any dividends to the American company. These dividends amount to about \$85,000 a year. This, then, in case of an entire shut-down of its European branches is the most the Westinghouse company would

lose from that cause. The other subsidiaries pay no dividends to this country and the Russian company is now practically liquidated. Mr. Tripp, the chairman of the company, is now in London, but the New York office has had no advices from him.

The General Electric Company has no subsidiaries on the continent of Europe, and its only interest abroad lies in its control of the British Thomson-Houston Company. This last company, however, has not been paying dividends and at times has needed help from the home company. The General Electric Company sells its American products to foreign firms and thus creates a market. Therefore, its only loss in Europe would be in the purchase price of the British Thomson-Houston Company and in the absence, for the present, of a European market.

#### Effect on Domestic Business

Far more serious than the interest in foreign companies, however, is the export trade. With commerce blocked owing to the fact that Europe owns the merchant marine, it is, at least for the present, impossible to send merchandise out of this country.

There is one bright spot in the midst of all this threatening disaster. Those countries in whose control the merchant marine now lies are at war—England, Germany, France and Russia. In this age commerce cannot be completely stopped. Thus it would seem that the United States must find some means whereby exports shall be moved.

Moreover, South America has largely been supplied with electrical equipment by Germany and Austria. There are none left now to supply the South American demand but our own manufacturers. While our companies will probably not increase their gross income from sales, owing to the inaccessibility of capital, nevertheless during hostilities they will supply a much larger percentage of equipment and apparatus. Time alone can tell to what extent they will be able to retain that trade once acquired.

#### Progress of Trust Legislation

In view of the foreign complications into which the government of the United States has been thrust as a consequence of the war in Europe, a number of Republican senators visited the White House during the past week and asked President Wilson to consent to postpone further action at this session of Congress on the proposed anti-trust legislation. The President stated that he was determined that final action on the proposed anti-trust bills should be had at this session of Congress, irrespective of any foreign complications. He reiterated his well-known views that it will be better for business to know what is to be done in regard to legislation than to postpone the knowledge.

Following this call at the White House by Republican leaders, the announcement has been made in Washington by the Speaker of the House that Democratic representatives who have been absent must return. It is understood that a similar call will be sent out for Democratic senators.

It is expected that every vote obtainable will be necessary in both the House and the Senate for the passage of some of the amendments to the various trust bills before Congress. Even at this date there is no certainty that they will pass Congress at this session.

Other public business, in connection with the Federal Reserve Board and measures for financial relief consequent upon the war in Europe, has occupied much of the time of the House and Senate during the past week, to the exclusion of consideration of trust legislation.

While there seems to be an agreement that trust legislation is to be passed, it is by no means definitely settled that it will be. So many things are happening in Washington, and may happen, that a change may come, and it is said that the President may not insist upon the passage of this legislation at this session, just as he did not insist upon his nominees for the Federal Reserve Board being confirmed without appearing before the Senate committee on banking and currency.

What little debate there has been on the floor of the Senate the past week in regard to this legislation has been over the federal trade commission bill.

On Monday the Senate spent five hours discussing the trade commission bill without reaching any conclusion. On Wednesday night at 6 o'clock the bill passed the Senate by a vote of 53 to 16. Republican senators joined the Democrats in voting for it.

#### House Passes Water-Power Bill

The so-called Adamson bill, relating to the construction of dams across navigable streams, was passed by the House of Representatives on Aug. 4. In accordance with its requirements, plans and specifications for such dams must be approved by the Secretary of War and the Chief of Engineers before work of construction is commenced. Approval may include the condition that water-power to operate locks, etc., be supplied without cost, or a reasonable annual charge may be made for the benefits that accrue to the grantee by the authority given under the act. The dam shall be so located as to be best adapted to a comprehensive plan for the improvement of the waterway for the use of navigation and for the full development of the water-power.

The rights granted under the act extend over a period of fifty years beginning on the date of the original approval. Upon two years' notice prior to the expiration of the grant the United States has the right to take over the property of the grantee necessary and useful for the generation, transmission and distribution of energy, the payment therefor being based on the actual cost of the lands purchased and used by the grantee and the fair value of the other properties taken over. Allowance will be made for deterioration but not for good will or profit in pending contracts.

The Secretary of War is empowered to prescribe reasonable rates of charges for energy transmitted in "interstate or foreign commerce." When the energy is used within a state having adequate regulation for rates and service to the consumer the Secretary of War will not interfere with the established rules for rates and service.

#### Radio Stations Must Observe Neutrality

Supplementing his general proclamation of the neutrality of the United States in the European war, President Wilson on Aug. 5 issued a specific order prohibiting radio stations within the jurisdiction of this country from transmitting or receiving for delivery messages of an unneutral nature, and from in any way rendering to any of the belligerent powers any unneutral service during the continuance of hostilities. The enforcement of the order is delegated to the Secretary of the Navy, and it was understood that censors would be placed in every foreign radio station to insure the observance of the neutrality order. Besides the more important stations including those at Sayville, L. I., Cape Cod, Mass., and Portland, Maine, it is understood that small amateur stations on roof-tops along the coast will be closed during the conflict.



### Program for Convention of Electric Vehicle Association

The following preliminary program of papers and reports has been announced for the fifth annual convention of the Electric Vehicle Association of America, to be held at the Hotel Bellevue-Stratford, Philadelphia, Monday, Tuesday and Wednesday, Oct. 19, 20 and 21:

President's address, Mr. Frank W. Smith. Report of executive secretary, Mr. A. Jackson Marshall. Reports of committees: Membership and formation of sections, Mr. J. F. Becker; operating records, Mr. W. P. Kennedy; garage and rates, Mr. John F. Gilchrist; insurance, Mr. Day Baker; papers, Mr. S. G. Thompson; legislation, Mr. P. D. Wagoner; educational courses, Mr. M. W. Alexander; standardization, Mr. E. R. Whitney; traffic, Mr. D. C. Fenner; good roads, Col. E. W. M. Bailey; central-station co-operation, Mr. W. W. Freeman; parcels-post delivery, Mr. James H. McGraw; railroad development, Mr. S. G. Thompson; motion-picture film, Mr. W. C. Andrews; constitution and by-laws revision, Mr. Frank W. Frueauff.

Reports of secretaries of association sections: New England, Mr. L. L. Edgar; Chicago, Mr. F. E. McCall; Philadelphia, Mr. J. C. Bartlett; Washington, Mr. C. M. Marsh; Cincinnati, Mr. P. H. Kemble; San Francisco, Mr. J. W. Redpath; Los Angeles, Mr. J. F. Rogan; Pittsburgh, Mr. J. A. Jacques; New York; Detroit, Mr. J. W. Brennan; Cleveland; Toronto.

Papers: "Progress of the Electric Vehicle," Mr. James H. McGraw; "Unusual Applications of Electric Trucks," Mr. F. Nelson Carle; "The Motor Truck in Terminal Freight Handling," Mr. S. G. Thompson; "Electric Vehicles in Parcels Post Service," Mr. W. P. Kennedy; "The National Electric Light Association's Electric Salesman's Handbook, with Especial Reference to Its Electric-Vehicle Section," Mr. T. I. Jones; "Electric Industrial Trucks," symposium by the General Vehicle Company, C. W. Hunt Company, Automatic Transportation Company and Elwell-Parker Company; "Educating the Public to the Field and Use of the Electric Vehicle," Mr. F. C. Henderschott; "Electrical Fire Apparatus," Chief Walker of the Philadelphia Fire Department.

### Twenty-fifth Anniversary of Massachusetts Electric Lighting Association

About fifty members and guests of the Massachusetts Electric Lighting Association celebrated the twenty-fifth anniversary of the organization on July 29 at the Corinthian Yacht Club, Marblehead Neck. President Charles L. Edgar occupied the chair, and an enjoyable feature of the occasion was the presentation by the association of two solid-silver bowls to Mr. Edgar and to Secretary Everett W. Burdett in token of their quarter century of loyal service to the organization. In making the presentation speech, Mr. W. Rodman Peabody, of Boston, emphasized his dependence as a former legislator upon the statement of the association, pointed out the benefits of its policy of always meeting the public half way, and referred to the vision of the industry's future which characterizes its leaders. Informal reminiscences were given by Mr. Burdett, who touched upon the sympathetic appreciation deserved by the pioneers of the central-station industry and urged the vital importance of sound arguments in dealing with legislative committees. In his twenty-five years of service he had found a frank, open policy the best for the public and the companies alike. Six of the charter members of the association attended the meeting. The following officers were elected for the ensuing year: President, Mr. Charles L. Edgar, Boston; vice-

presidents, Messrs. R. W. Day, Springfield, and A. B. Tenney, Malden; secretary and treasurer, Mr. Everett W. Burdett, Boston; executive committee, Messrs. Frederick S. Pratt, Boston; Arthur E. Childs, Clinton; R. W. Rollins, Worcester; J. W. Stevens, Greenfield; Philip Cabot, Boston; Oliver Prescott, New Bedford.

At the business meeting of the association the record of legislative activities at the 1914 session was presented with comments upon the meaning of the various measures considered.

### Malad River Power Rights

The Beaver River Power Company and the Great Shoshone & Twin Falls Water Power Company of Idaho have carried their fight for possession of power rights on the Malad River to the Supreme Court in the form of two appeals. The Beaver River company alleged that its permit for water from the Malad River constituted a prior right over the permit granted to the Great Shoshone company and asked that the latter company be enjoined from further use of water for power from the river. Judge Walters, of the fourth judicial district, granted the injunction and canceled the Great Shoshone company's permit. The Great Shoshone company appealed from this order and also instituted suit in the Supreme Court against the State of Idaho and the members of the land board under the administration of Governor Hawley to condemn certain State lands along the Malad River for the location of a large hydroelectric power plant, dam and reservoir.

### Convention Plans of New England N. E. L. A. Section

The sixth annual convention of the New England Section of the National Electric Light Association will be held at the New Mathewson Hotel, Narragansett Pier, R. I., on Wednesday, Thursday and Friday, Sept. 2, 3 and 4. The convention program includes four sessions, scheduled as follows: Sept. 2—paper on "The Relation of Meter Maintenance to Revenue," by Mr. G. F. Atwater, New Britain, Conn.; paper on "Rates," by Mr. R. S. Hale, Boston Edison Company. Sept. 3—paper on "Old-House Wiring and Special Campaigns," by Mr. E. C. Kimball, Boston Edison Company; report of merchandising and advertising committee; report of committee on recognition of electric-vehicle interests in New England, Mr. W. H. Atkins, chairman, Boston Edison Company. Sept. 4—report of committee on overhead line construction.

### Annual Meeting of Maine Electric Association at Portland

The sixth annual meeting of the Maine Electric Association was held at Portland, Maine, on July 31, headquarters being at the Hotel Falmouth. At the business session the following officers were elected: President, Mr. John H. Maxwell, Livermore Falls; vice-presidents, Mr. F. O. Eaton, Rumford Falls, and Mr. A. H. Ford, Portland; additional members of the executive committee, Mr. W. T. Cobb, Rockland; Mr. C. E. Smith, Newport, and Mr. H. D. Stevens, Fort Fairfield. Mr. W. S. Wyman, Augusta, was re-elected secretary and treasurer. After the business session a special car to the Cape Cottage Casino was furnished by the courtesy of the Cumberland County Power & Light Company, of Portland. At the Casino a shore dinner was enjoyed by about sixty members and guests.

## Consolidation of Independent Ohio Telephone Companies

The plan for consolidating fifteen of the leading independent telephone companies of Ohio has been approved by the Ohio Public Utilities Commission. In accordance therewith the Ohio State Telephone Company was incorporated. Mr. H. M. Daugherty, of Columbus, who presented the case before the Ohio commission, went into the history of the development of the business in Ohio and the financial vicissitudes of some of the companies. Mention was made of the purchase of some of the properties by Eastern financial interests for the purpose of consolidation with the Bell companies and of the abandonment of this idea when the government took action against the Bell plans.

The capital liabilities of the fifteen companies, Mr. Daugherty said, are at present \$25,568,000, which could be reduced to the extent of \$5,396,600 by the consolidation, and then \$2,850,000 would be put into improvements. The new company will have over 250,000 miles of wire and sixty-four exchanges in Ohio. This will give strength to the 600 other independent companies in the State and afford them various facilities which they do not possess now.

Mr. Daugherty said that the new company will be owned and managed by Ohio people, 72 per cent of the stock being owned within the State.

Attorney Karl Burr presented evidence to show that the fifteen companies now have outstanding \$10,013,500 bonds, \$5,497,450 preferred stock and \$7,450,987 common stock. The new company will have \$5,206,000 common stock, \$4,850,000 preferred stock and \$5,000,000 bonds, in addition to \$8,060,200 bonds of constituent companies to be assumed, bringing \$2,850,000 new money into the organization. An aggregate of \$1,953,000 bonds of the constituent companies will be canceled.

Telephone engineers presented figures showing that the values of the properties included in the consolidation aggregate \$26,956,682. Mr. Burr offered the commission a report covering a study of the properties and their requirements for development by Mr. Kempster B. Miller, of McMeen & Miller, Inc., Chicago, showing the necessity of providing improvements and extensions to cost about \$2,539,000.

Mr. Frank A. Davis, president United States Telephone Company, said that it is the purpose to follow the report made by Mr. Miller in making improvements. He expressed the belief that the economies wrought about through a central management will result in such savings that a reduction in rates might be more reasonably expected. The companies involved in the consolidation are as follows: Cuyahoga Telephone Company, Cleveland; Toledo Home Telephone Company, Toledo; Youngstown Telephone Company, Youngstown; United States Telephone Company, Columbus; Columbus Citizens' Telephone Company, Columbus; Home Telephone Company, Dayton; Washington Home Telephone Company, Washington C. H.; London Home Telephone Company, London; Stark County Telephone Company, Canton; Columbiana County Telephone Company, Lisbon; Zanesville Telephone Company, Zanesville; Findlay Home Telephone Company, Findlay; Lancaster Telephone Company, Lancaster; Massillon Telephone Company, Massillon; Citizens' Telephone & Message Company, Fostoria.

The Ohio State Telephone Company was organized by the election of the following officers: President, Mr. Samuel G. McMeen, vice-president McMeen & Miller, Inc., Chicago, and president Columbus Railway, Power & Light Company; secretary, Mr. W. L. Cary; treasurer, Mr. H. B. Taylor; chairman of the board, Mr.

Frank A. Davis; executive committee, Messrs. Frank A. Davis, S. G. McMeen, F. R. Huntington and E. R. Sharp, of Columbus, and H. B. Peters, of Lancaster.

The board of directors consists of Messrs. S. G. McMeen, Frank A. Davis, F. R. Huntington, president Huntington National Bank, Columbus; E. R. Sharp, president State Savings Bank & Trust Company, Columbus; Charles A. Otis, Otis & Company, brokers, Cleveland; Harry Coulby, president Pittsburgh Steamship Company, Cleveland; F. F. Prentiss, vice-president Cleveland Twist Drill Company, Cleveland; Clarence Brown, attorney, Toledo; William Hardee, president National Supply Company, Toledo; George D. Eustis, George D. Eustis & Company, brokers, Cincinnati; A. McL. Marshall, attorney, Dayton; H. C. Kiefaber, vice-president Dayton Savings & Trust Company, Dayton; D. J. Cable, president Lima Home Telephone Company, Lima; H. B. Peters, president Fairfield National Bank, Lancaster, and Frank L. Beam, president Ohio Independent Telephone Association, Mount Vernon.

## Electric Cooking, Lighting and "Wireless" on Ocean-going Lifeboat

The 36-ft. gasoline-engine-driven lifeboat *Lundin*, which left New York July 31 with a crew of seven persons aboard for a trial trip across the Atlantic Ocean, since abandoned on account of the war in Europe, is equipped with a three-plate electric stove, a 6-volt gasoline-engine starter, incandescent cabin lamps, electric fans, electric running lamps, a 7-in. search-lamp and wireless apparatus. Electricity was chosen for lighting



ELECTRICALLY EQUIPPED LIFEBOAT

and cooking in order, it is explained, to eliminate any chance of explosion or fire from gasoline vapor coming in contact with exposed flames. Other reasons for the use of electricity were, of course, its convenience and cleanliness. A 2.5-kw Sprague generator connected through a clutch and a silent-running chain furnishes energy for all of the electrical equipment and in addition charges a 12-volt, 80-amp-hr. Edison storage battery at a 15-amp rate. The battery supplies energy for an emergency 12-volt lighting circuit and for the engine starter. The boat is also wired with a 110-volt circuit of tungsten lamps fed with energy directly from the generator. The wireless apparatus has a sending range of 50 miles to 100 miles but can receive messages from a distance of 400 miles to 600 miles.

With the cessation of hostilities in Europe the trip of the *Lundin* across the Atlantic may be resumed, or she may be sent to the San Francisco Exposition by way of the Panama Canal.



## Springfield (Mo.) Company Asks for Rehearing of Rate Order

The Springfield (Mo.) Gas & Electric Company, through its attorneys, Messrs. Olin, Butler & Curkeet, of Madison, Wis., and Mr. W. D. Tatlow, of Springfield, has asked the Public Service Commission of Missouri for a rehearing on the decision in the electrical rate case, rendered on June 23, as noted in our columns of July 4.

A number of grounds are stated. The decision is declared to be in violation of the constitutions of the United States and Missouri. Although an administrative body, the commission, it is stated, exercised judicial powers. The value of \$300,000 placed on the property of the electrical department is questioned; the fair and reasonable present value is shown by the evidence to be largely in excess of that sum. The company also declares that the commission refused to value for rate-making purposes a large part of the property owned and used and useful in the electric service.

Concerning the finding of the commission that the interlineation made in a contract for motor service was made fraudulently to the injury of the public, the company says that such a finding is in excess of the power of the commission in that it is a purely judicial question, and that there is no evidence to support this finding.

The decision held that the supplementary contract of Aug. 16, 1912, as originally written without the erasures appearing in Article 5 thereof, is in full force and that under its terms it is the duty of the Ozark Power & Water Company not only to furnish the energy from the hydroelectric plant but to connect its transmission lines with the steam plant of the Empire District Electric Company at Joplin to serve as an auxiliary service for Springfield. This finding is declared to be in excess of the power of the commission, contrary to the great weight of the evidence and irrelevant and immaterial for the reason that there is and has been no valid contract at any time between the Springfield Gas & Electric Company and the Empire District Electric Company, and the Empire District Electric Company was never a party to the supplementary contract, nor to the original agreement between the Springfield Gas & Electric Company, the Springfield Traction Company and the Ozark Power & Water Company, dated Dec. 30, 1911. The finding by the commission that Mr. H. L. Doherty "is the principal owner and operator of the Ozark Power & Water Company, and also the Empire District Electric Company," is, the company says, contrary to fact and to the great weight of the evidence in this case.

The commission held that the respondent's relay steam plant was not necessary to be maintained at Springfield and that it was not used and useful in the furnishing of electric energy. This finding is unsupported by any evidence in this case and is contrary to fact, for the reason that since the closing of the testimony in this case there have occurred a large number of additional interruptions in the supply transmitted under the contract with the Ozark company. The evidence proved the necessity for maintaining the relay steam plant by reason of the insufficiency and uncertainty of the flow in the White River at the Ozark dam during the summer of 1912. The respondent offers to prove upon any rehearing that may be granted that the flow of the White River during the summer of 1913 was similarly insufficient and inadequate and will be in 1914 and in future years.

The commission held that the contract of sale on Feb. 17, 1913, to take effect as of Jan. 1, 1913, whereby the Springfield Traction Company transferred to the Springfield Gas & Electric Company the portion of the

power and generating plant the legal title to which was theretofore owned by the Traction company was fraudulent. This finding is declared to be contrary to the evidence, in excess of the power of the commission and irrelevant and immaterial because it was the sole duty of the commission to ascertain and determine the fair and reasonable present value of all of the property used and useful in the manufacture and distribution of electric energy irrespective of the question of the ownership or title of such property. The sale did not involve any change in the real ownership of the property, because the entire capital stock and all the bonds of the Springfield Gas & Electric Company and the Springfield Traction Company were and are owned by the Springfield Railway & Light Company.

The commission erred, the company holds, in not apportioning the electrical property between the Springfield Traction Company and the electrical department of the Springfield Gas & Electric Company on the basis of use as determined by the maximum demand for electricity by the company and the department respectively. The failure of the commission to allow for going value is also attacked.

The allowance of 7 per cent as a fair and reasonable rate of return is questioned as unjust and unreasonably low. The commission proceeded upon an erroneous principle in measuring such return by a fair and reasonable return upon an adequately secured loan instead of measuring such return in proportion to the hazard and risk of a business venture.

The company says further that the commission erred in refusing to allow as a proper and legitimate expense the amount necessarily expended in good faith in properly and adequately preparing and presenting the evidence in this case to the commission, and also in disallowing as an expense all charges for managerial service and expenses by the officials and employees of the Federal Light & Traction Company and of the Springfield Gas & Electric Company other than those resident in Springfield. Errors made by the commission in its allowance for operating expenses are pointed out.

The order of the commission directed a change in rates which would cause, in its opinion, a reduction of 37 per cent below the 1913 revenues. This is declared to be unreasonable, unjust and confiscatory. Nevertheless, the rates fixed by the commission will cause a reduction greatly in excess of 37 per cent, to wit, to the extent of 50 per cent. The order further fixes rates which the company says are unjust, unreasonable and discriminatory as between the different classes of consumers.

The commission also erred in fixing the rate for electrical energy upon the basis of the operating expenses of the respondent at a time when it was using a steam generating plant exclusively and did not make any allowance for a return on capital invested in the steam generating plant.

## Judge Henry Named for Maryland Commission

Governor Goldsborough has announced the appointment of former Judge W. L. Henry, of Dorchester County, Maryland, as a member of the Maryland Public Service Commission, succeeding Hon. Philip I. Laird, former chairman of the board, who resigned. The new commissioner, who is a Democrat, will take office at once and will serve about eighteen months to complete Chairman Laird's unexpired term. Judge Henry is a resident of Cambridge and is fifty years of age. Commissioner Alberg G. Towers has been designated as chairman of the commission.

## PUBLIC SERVICE COMMISSION NEWS

## Idaho Commission

At the request of the commission a meeting of representatives of public utility companies was held at the Owyhee Hotel, Boise, for the purpose of presenting to the commission resolutions for the standardization of operation of crossings of transmission lines, interurban systems and signal wires. The meeting was presided over by Mr. Charles E. Cochran, assistant general attorney of the Oregon-Washington Railroad & Navigation Company. Mr. Fred L. Goddard, of the Utah Power & Light Company, acted as secretary.

## California Commission

The application of the Yolo County Consolidated Water Company to lease all of its property for a period of twenty years with an optional extension of fifteen years to the Yolo Water & Power Company was granted. The rental price is to be decided when the Yolo Water & Power Company shall have its rates established by the commission.

The commission dismissed without prejudice the application of the Indian Valley Electric Light & Power Company for permission to issue \$81,535 bonds, on the basis that the proceeds from the sale of the bonds were to be used in the development of the reservoir site of the Round Valley Water Company, which property is now in litigation.

## Massachusetts Commission

As noted in our issue of July 18, the Massachusetts Gas and Electric Light Commission ordered the reduction of the price of electric energy supplied to the residents of Cambridge by the Cambridge Electric Light Company.

The street-lighting prices were made up of a fixed charge and an operating charge. For 6.6-amp magnetite-arc lamps operating 4000 hours per year the company received \$108.50 per lamp, \$78.30 being paid for every such lamp operated daily until midnight. The board orders reductions to \$98 in the former and \$72.50 in the latter case so long as not less than sixty of each class are operated, and establishes the following prices for incandescent street and bridge lamps burning 4000 hours per year (all night and every night), so long as not less than 740 of such lamps are supplied: 50-watt lamps, \$17; 75-watt, \$20; 100-watt, \$25; 125-watt, \$29; 250-watt, \$50; three-light clusters of 100-watt tungsten lamps, \$60; two lamps per post of 250 watts each, one burning all night and the other until midnight, \$73; 60-watt lamps burning until 10 p. m., \$12.50 each. The order allows the addition of \$1 per lamp per year for incandescent lamps installed in arc-lamp hoods or outer globes, and of \$2 per lamp per year for incandescent lamps installed on ornamental posts, with the deductions for outage and ornamental lighting set forth in the company's schedule.

The commission points out that the company has been managed with skill and prudence, and that it serves a densely populated and compact territory having varied industries. The old prices for public incandescent lamps varied from \$20.37 to \$23.57 per year for 50-watt lamps to \$59.86 for 250-watt units. The fixed charge varied with the type and size of lamp, though not in strict proportion to size. The variation in operating charge ranged from about 5 cents per kw-hr. for the smallest to about 3.5 cents for the largest-sized incandescent in use, and to a little over 3 cents for the all-night magnetite lamps. The board concedes that a substantial segregated investment is required for street lighting, but feels that the high load-factor of this class of service entitles the city to lower rates.

In the last five years dividends of from 10 per cent

to 22 per cent have been paid on the stock, and a balance has been available for depreciation after the payment of dividends of from \$2,881 to \$93,167. The company contended that with an outstanding capital of \$850,000 and upon an actual investment by the stockholders of \$1,120,000 it was entitled to a return upon \$1,700,000, because some of the stock had been issued at \$200 a share. Regarding this the board says:

"It may be conceded that with respect to a company ably and conservatively managed the board is not required to consider seriously the propriety of a 10 per cent dividend. But there is a wide difference between permitting the company to earn what is, under all the circumstances, a reasonable dividend on its authorized capital and acknowledging that, as a matter of right, it is entitled to earn from now on not less than some certain definite return on its full market value. The law intended impliedly, but plainly, to limit the dividend burden. The contention of the company, on the other hand, would make the law operate to capitalize against the public the earning power of the property under existing conditions and prices. It would convert the strength and security resulting from an amount of capital low, relative to the volume of business, into a menace to the future stability of the company, and would tend seriously to impair, if not wholly to subvert, the manifest purpose of the public policy."

No recommendation was made regarding the company's general commercial lighting and motor-service rates, the justification of these, in the opinion of the commission, being found in the recent rapid development of the company's output and profits.

## Indiana Commission

The Indiana Public Service Commission has authorized the Huntingburg Electric Light Company to change its service from a flat-rate basis to a meter basis. It stipulated a rate for residences of 7 cents per kw-hr., with a rate schedule ranging as low as 2 cents per kw-hr. At present there are only 450 customers in the town.

The commission has just sent letters to the local telephone companies (the Central Union and the Indianapolis) again calling their attention to their failure to comply with requests from the commission, made some time ago, that a merger be made or at least physical connection be provided for with the electric lighting and heating companies. The great duplication on the lines of the two local companies makes it practically impossible for the commission to take any action on the recent petition of the Central Union Telephone Company to revise its rates until some plan of eliminating this waste is under way.

At a conference just held by the commission practically the same steps were taken in the local lighting companies' situation. All of the lighting companies have presented petitions before the commission to revise rates downward and to eliminate alleged discrimination. Now the commission has come forward with an ultimatum to the lighting companies that some method must be found immediately to prevent further duplication of property, or the commission declares it will give the necessary orders for insuring such elimination.

The Merchants' Heat & Light Company has just been awarded the contract to light the city streets, a contract formerly held for ten years by the Indianapolis Light & Heat Company. The immense duplication of distributive property that this will entail is very apparent. This duplication is a part of that which the commission says must be abrogated, under penalty of orders from the commission compelling the companies to take the necessary steps to eliminate such waste.



## Current News Notes

**BUILDING 600-FT. TOWERS FOR PANAMA RADIO STATION.**—Construction work on the first of the three 600-ft. steel towers for the Darien radiotelegraph station on the Isthmus began last month. The one-story concrete power house has already been completed, as have the quarters for the operators and chief electrician. The aerial equipment will consist of three 600-ft. steel towers each having a triangular base with legs at the apexes of 150-ft. equilateral triangles.

**WAYS OF THE ENGLISH IN WAR TIMES.**—The British-Thomson-Houston Company has an interesting agreement with the British government in times of war. The whole working force is called out by the government one afternoon and the next morning 25 per cent return as employees of the government to man the shop. Thus under war conditions the country is enabled to take over the industry with skilled and trained labor. The company is, of course, reimbursed by the government.

**JORDAN ROLLS ONCE MORE.**—Large pumping plants operated by electrical energy supplied by the Utah Power & Light Company have been installed at Utah Lake to lift water from the lake and thus maintain the normal flow of the Jordan River during the summer months when the water is so low that the crops suffer at the most critical period. In the Cache Valley electric pumps are also used to lift the water from the river to the bench lands, thereby bringing thousands of acres of land under cultivation.

**GROWTH OF THE ELECTRIC VEHICLE ASSOCIATION DURING 1914.**—In October, 1913, the Electric Vehicle Association of America had 437 members, with local sections organized in but two cities. Since that time the enrolment has been increased to approximately 850, and sections are now flourishing in New England, Chicago, Philadelphia, Washington, Cincinnati, San Francisco, Los Angeles, Pittsburgh, New York, Detroit, Cleveland and Toronto. The association also has expectations of soon instituting local sections in Buffalo, St. Louis and three or four other cities.

**RAPID RAILWAY INSTALLATION FOR UTAH FOUNDERS' DAY.**—Rapid installation of the electrical equipment of the new Salt Lake & Utah Railroad made possible the inauguration of electric-railway service from Salt Lake City to Provo, Utah, on Founders' Day, July 24, commemorating the arrival of the Mormon pioneers in the Salt Lake valley in 1847. The installation of the two substations, out-door switching stations, etc., was completed in six weeks. An immense traffic marked Founders' Day, a large number of early residents appearing to take their first rides on electric cars.

**ELECTRICITY REQUIRED FOR FIRING NEW EXPLOSIVE.**—A new submarine-mine explosive called "trotol," which cannot be set off by percussion, but which has to be confined and fired by electricity, was employed in the annual war test of submarine mines off Sandy Hook, N. J., last week. Trotol, it is declared, can be melted and handled without danger. Mines loaded with 100 lb. of the new explosive and fired during the recent test threw columns of water and pieces of targets 250 ft. to 350 ft. in the air. Each mine was allowed to remain in the water two hours before being exploded in order to test the water-tight joints in the cable containing the firing circuit.

**LAMP SIGNALS TO CONTROL NEW YORK TRAFFIC.**—Electric lamp signals are proposed for controlling the traffic on Fifth Avenue, New York City, if the scheme of traffic dispatching now being tried out with flag signals proves successful. The new plan devised by the Police Department allows Fifth Avenue traffic to move without interruption through ten-block zones. At intervals of three minutes, or the time required for this movement, the cross-town traffic, which is lighter, will be permitted to pass for fifty seconds. Green signal lamps which can be seen in daylight by the crossing policemen and by drivers of cars will be controlled by towermen in each zone. Traffic policemen at zone terminals will be provided with foot push-buttons with which they can signal the towermen when traffic is to progress. To expedite the arrangement vehicles will not be permitted to make turns to the left but will be compelled to cross the street and find a place in the opposite-bound traffic where they can progress in the direction desired by making a turn to the right. It is expected that the ten-block zone travel will eliminate the delay caused by the usual blockade at each street intersection.

## SOCIETY MEETINGS

**COLORADO ELECTRIC ASSOCIATION.**—The Colorado Electric Light, Power and Railway Association will hold its twelfth annual convention at Glenwood Springs, Col., Sept. 3, 4 and 5, 1914. Mr. Thomas F. Kennedy, 900 Fifteenth Street, Denver, is secretary of the association.

**CLEVELAND ENGINEERING SOCIETY.**—Three hundred members of the Cleveland Engineering Society were entertained at Nela Park, Cleveland, Aug. 1, by officials of the National Electric Lamp Works. Mr. M. Luckiesh delivered a lecture on "Light and Its Effect in Art," which was followed by a program of athletic sports and a dinner.

**AMERICAN ROENTGEN-RAY SOCIETY.**—The American Roentgen-Ray Society will hold its next annual meeting at the Hollenden, Hotel, Cleveland, Ohio, from Sept. 9 to 12. On Sept. 10 Dr. Frederick Dessauer, of Frankfurt, Germany, will demonstrate a tube of his invention which, it is declared, produces X-rays of the same wavelength as the gamma rays of radium.

**DALLAS ELECTRICAL CONTRACTORS ENTERTAIN NEIGHBORS.**—Officers and members of the Dallas (Tex.) Electrical Contractors' Association entertained the members of the Fort Worth Electrical Contractors' Association with a smoker July 21. The event was held in the hall of the Dallas Builders' Exchange, and addresses were delivered by several contractors.

**ELECTRIC CLUB AND JOVIAN OUTING, CHICAGO.**—Members of the Electric Club of Chicago and the Jovian Order of Chicago plan to hold their annual basket luncheon at Ravinia Park, Ill., Aug. 20. The picnic committee, of which Mr. H. A. Mott is chairman, has provided many prizes for races and contests. These awards are now on display at the Chicago Electric Club.

**PENNSYLVANIA ELECTRICAL CONTRACTORS' ASSOCIATION.**—At the last meeting of the Electrical Contractors' Association of the State of Pennsylvania officers were elected as follows: President, Mr. F. M. Shepard, Philadelphia; vice-president, Mr. J. S. Musser, Harrisburg; secretary-treasurer, Mr. M. G. Sellars, Philadelphia; board of directors, Messrs. M. E. Arnold, Philadelphia, and George E. Shepherd, Wilkes-Barre; national director, Mr. George E. Shepherd.

## Electric-Service System at Evansville, Ind.

Combination plants furnishing electric-lighting, steam-heating and electric-railway service—Special connection of condensers—Provisions for low-pressure steam distribution

**E**LECTRIC lighting, district steam heating and gas and street-railway service for Evansville, Ind., as well as energy for all the interurban lines operating out of that city, except one, is now being furnished by the Evansville Public Service Company. This organization is the outgrowth and consolidation of several separate utilities, brief histories of which are given below.

In the fall of 1909 a lighting and heating franchise was secured by the former Public Service Company of Evansville, and a combination steam and generating plant was built on Mulberry Street the following year. In March, 1912, the stock ownership of the Evansville Public Service Company was taken over by the Evansville & Southern Indiana Traction Company, which operates all of the street-railway lines in the city and an interurban line to Patoka, Ind., a distance of 35 miles. During the following July the Evansville Public Service Company and the Evansville Gas & Electric Company were consolidated into the Evansville Public Service Company. About the same time the Public Utilities Company was formed and bought outright all of the property of the Evansville & Southern Indiana Traction Company. At present the physical property of the railway lines and the stock of the Public Service Company are owned by the Public Utilities Company.

The present Evansville Public Service Company, which is an entirely different organization from the old Public Service Company, now furnishes both gas and electricity.

Maximum rates for electric service are fixed by franchise at 7.5 cents, and a discount of 10 per cent is allowed for prompt payment, making a 6.75-cent net rate with a sliding scale for commercial motor-service customers. On the city railway lines "pay-as-you-enter" cars have been placed in service and new track and feeder circuits installed. Now there is, of course, less likelihood of interruption to the electric service than formerly, as the two plants are being operated in conjunction with each other instead of separately. The Division Street station of this company, which has the larger equipment of the two, will, in all probability, be connected to the steam-heating system in a short time. Plans are being made to lay out 2500 ft. of 20-in. pipe to complete a loop main for district heating. Steam heat is required from about the middle of September to the middle of May. Peak loads on the electric-service system occur between 4:45 p. m. and 7:45 p. m. usually.

Eventually all energy will be distributed from the Division Street station, as the company contemplates connecting it with Mulberry Street station by two tie-lines, one to be a No. 000 circuit and the other to consist

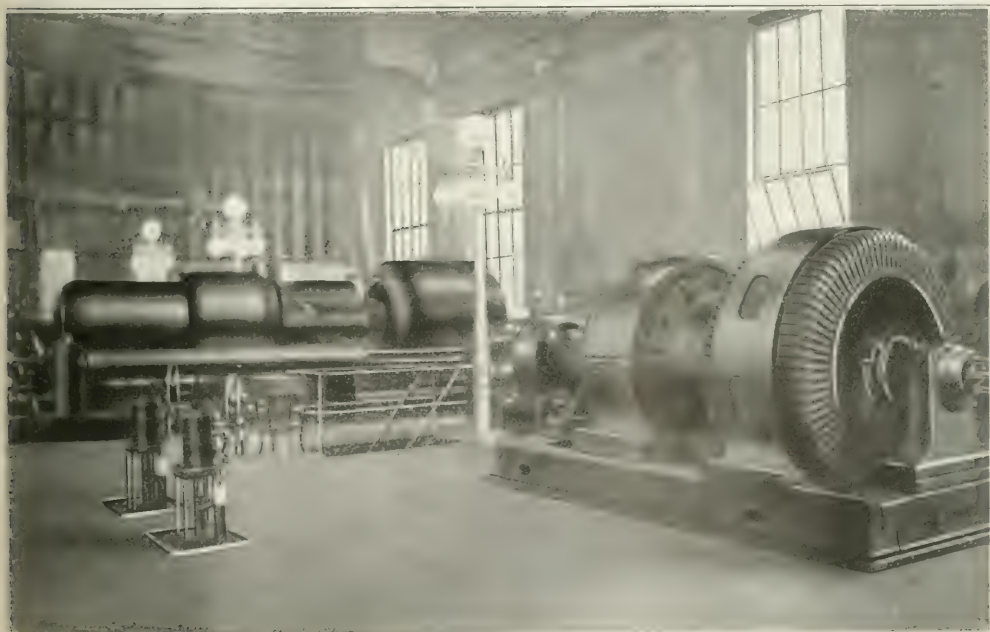


FIG. 1—GENERATING ROOM OF DIVISION STREET STATION





from the deep wells it has been found practicable to circulate the condensing water through the two larger units in series. With a load of 2000 kw on each machine it is possible to obtain a vacuum of 27.5 in. on the machine which is the first to receive the water, while the vacuum in the other unit remains within 3 in. of that obtained in the first machine. The load is generally carried by the two larger machines, but when the demand exceeds 4000 kw the 1000-kw vertical unit is started. This machine also operates condensing, but its surface condenser is provided with water from one of the cooling towers outside the station.

The condensers of the two 2000-kw machines are connected by a 15-in. pipe equipped with a by-pass valve which permits of circulating the water through the condensers in parallel or in series. Worthington condensers having 5200 sq. ft. of cooling surface are used on each of the 2000-kw turbines, and a Wheeler condenser having 4200 sq. ft. of cooling surface is employed on the 1000-kw machine. The 500-kw vertical

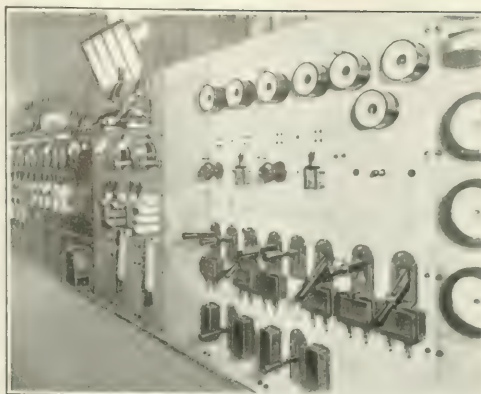


FIG. 6—PORTION OF MAIN SWITCHBOARD

brick and are supported on vertical pin-type insulators attached to horizontal pipes fastened to the vertical uprights. No disconnecting switches are used between the 2300-volt oil switches and the busbars. Current and potential transformers and oil switches also are supported on the same framework and all are easily accessible. The busbars are mounted on one side of the framework and the transformers and oil switches are on the opposite side.

Along the east wall of this generating room are the main and station switchboards. The main switchboard, which is about 90 in. high and 75 ft. long, controls all of the generating units, eight railway circuits and an equal number of commercial-feeder circuits. Each generator panel is provided with four oil-switch handles. One of these is the machine switch, and two are bus switches and are used to connect the machine onto one of the duplicate buses. The latter are interlocked so that it is impossible to close both at the same time.

The motor-generator sets, which furnish energy for the city railway and local interurban service, may be started from either the direct-current or the alternating-current side. Small induction motors on the shafts of the machines permit of starting from the three-phase station buses, while four-contact knife switches and grid resistors are employed for direct-current starting. The grids are supported on channel irons above the back of the switchboards.

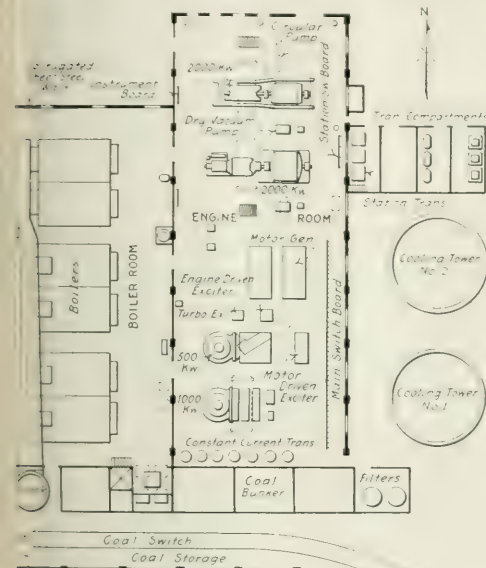


FIG. 5—PLAN OF DIVISION STREET PLANT

unit is provided with an 18-in. jet condenser. Water is supplied to the cooling towers by 14-in. centrifugal pumps which are capable of delivering 3600 gal. of water per minute against a head of 35 ft. These are installed in the basement of the station and are driven by 75-hp, 440-volt General Electric induction motors. Both of the cooling towers are of the Alberger type. The older one has been remodeled to meet better the requirements of the station.

Two 750-kw motor generators have been installed recently to furnish energy for the railway and interurban road. Energy to be delivered to the interurban line at instant points is transmitted over high-tension lines to substations.

As operated at present all of the generators in this station are delta-connected and are delivering energy at 2300 volts, but by joining the windings in star they will generate at 4100 volts, except those controlling railway-feeder circuits. Duplicate 2300-volt buses are installed in the basement on pipe-frame racks. The buses consist of copper tubes insulated with oiled cam-

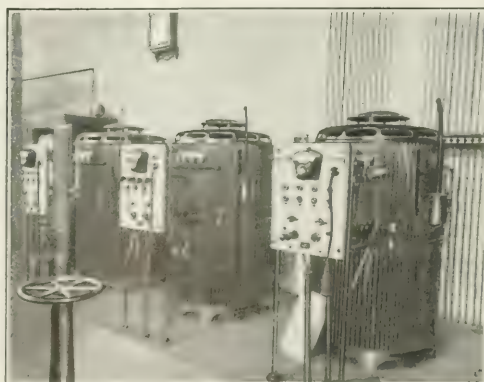


FIG. 7—CONSTANT-CURRENT TRANSFORMERS USED FOR STREET LIGHTING



The transformer equipment supplying energy to the city distribution circuits and to the Evansville Railways Company's lines is segregated in groups housed in separate compartments in the annex adjoining the engine room. A 1000-kva, 22,000/2300-volt bank of three single-phase Westinghouse transformers supplies energy to interurban substations at Princeton and Bower, where new high-tension apparatus has been installed since the merger of the Evansville companies, and a 330-kw, 13,200/2300-volt, three-unit bank of General Electric transformers and an equivalent bank of Westinghouse units furnish energy to substations at Mount Vernon and Newburg.

In the high-tension circuits of the two last-named substations are installed choke coils, "broomstick" disconnecting switches, multi-gap arresters and oil switches, while in the 22,000-volt circuit electrolytic lightning arresters are employed.

Two motor-circuit and six lamp-circuit feeders supply energy for city service. The heaviest feeder extends from the station west along Division Street, while the others radiate in different directions. Energy is distributed at 2300 volts, three-phase, and transformers are installed at intervals of about a block, insuring that no secondary circuit shall be longer than 125 ft. on the average. Tie switches are located at points where circuits pass near each other so that any section can be segregated or fed from several directions.

#### Street-Lighting Installation

In the business sections of the city the street-lighting circuits for incandescent ornamental illumination are laid in basements, while in outlying portions of the city they are inclosed in conduit run along the curbs or at the edge of sidewalks. About 543 General Electric series inclosed-arc lamps and 39 series tungsten lamps are installed. For these the city pays respectively \$65 and \$24 per year per lamp. Besides this equipment there are 132 five-lamp Luxalabra street fixtures, energy for which is paid for by the merchants at \$5 per month. The lamps burn from dusk until midnight. Each fixture contains four 60-watt lamps and one 100-watt unit. The North Side business men contemplate installing thirty-six more posts on Main Street, arranged five to a block. When these are installed twenty blocks on that street will be illuminated by ornamental fixtures. Those now installed are about 60 ft. center to center.

Primary circuits supplying energy to electric signs are run through the alleys. Show-window lamps are connected to the same circuits as the signs and all are controlled from the central station. Two schedules of display lighting are offered, one burning from dusk until midnight and the other commencing thirty minutes sooner and burning until 11 p. m. The sign transformers are installed at intervals of one to two blocks, or so that a 5-kw unit is sufficient to carry the load.

The total output of the Evansville central station last year was 8,088,100 kw-hr. Energy was produced at the switchboard with a coal consumption of about 3.99 lb. per kw-hr. The Mulberry Street plant, which contains two 750-kw Westinghouse non-condensing turbines and one 1000-kw bleeder-type turbine made by the same company, supplies all of the steam used for district heating at present. About 125,000 sq. ft. of heating surface is now connected to the mains and is supplied with steam at 2 lb. pressure. Two rates are offered: One is a flat rate of 30 cents per sq. ft. of heating surface per heating season, and the other is based on the amount of steam consumed. Automatic thermostatic valves, which shut off the steam when the temperature reaches 70 deg. Fahr., are installed in the service feeders when a flat rate is charged.

The officers of the Evansville Public Service Company are: Mr. B. C. Cobb, chairman of the board of directors; Mr. A. C. Blinn, president; Mr. H. W. Marshall, vice-president; Mr. F. J. Haas, secretary; Mr. B. E. Parker, superintendent of railways; Mr. J. C. Silverthorn, general superintendent of the gas department; Mr. B. V. Bosard, superintendent of electrical distribution, and Mr. George Sloates, chief engineer. Mr. Cobb is chairman of the board of directors of the Public Utilities company, Mr. Marshall president, Mr. Blinn vice-president and Mr. Haas secretary. Mr. Blinn is also general manager of both companies.

#### Submarine Power Transmission from Sweden to Denmark

With the sanction of the Swedish and Danish governments, the South Swedish Power Company and the North Sjaeland Electric Works have entered into an agreement for the transmission of 15,000 electrical h from the Laga River in Sweden under the Strait of Oresund by means of a submarine cable to the Danish island of Sjaeland. The point of crossing will be not far from the famous cape of Elsinore, where the scene of Shakespeare's "Hamlet" was laid. The cable will be four miles in length and will transmit energy for lighting the entire north part of Sjaeland.

#### The Cost of Pole Lines

The report of the Board of Public Utility Commissioners of New Jersey on the application of the Jersey Power Company to issue capital stock, which has been mentioned previously in the *Electrical World*, contains much information in regard to costs of pole line construction. The contract with the Hopatcong Mountain Lake Land Development Company for 516 poles shows the following prices: Six 70 ft. long at \$18.50 each; ten of 65 ft. at \$15 each; fifty of 60 ft. at \$11.50; eighty of 55 ft. at \$8.75; 120 of 50 ft. at \$8; 250 of 45 ft. at \$5.50. The average price was \$7.50; the average height was 49 ft.

The cost of poles from Boonton to Millbrook, N. J. is figured by the commission at \$2,660. This allows for 406 poles with a total of 19,250 ft., or an average of 47.3 ft. and an average price of \$6.55 per pole. The estimate is based on an average number of forty-five poles per mile. The commission's engineer, Mr. H. Carver, testified that in his judgment \$4.10 was an adequate price for setting a pole. The engineer for the company, Mr. Lowe, testified that the cost of stringing wire would average about \$25 per mile of wire. The commission allowed \$45 per mile for stringing wire from Millbrook to Dover owing to the conditions under which this wire must be strung.

In general, on the figures of the company the commission estimated the average price of poles delivered on the cars at \$7.50 each. It allowed on the basis of the evidence \$7.50 as the average cost for unloading, teaming, hauling, digging, locating, framing, setting and tree-trimming, including necessary guys and anchors for poles. The commission allowed for wire per cent more than the estimate of the company; inasmuch as the estimate allowed nothing for sag. For braces, insulators and cross-arms on poles the commission allowed only \$7 between Boonton and Millbrook. To the total net cost of physical construction, as estimated, the commission added 13 per cent for engineering and contingencies. The testimony as to the cost of right-of-way showed an outlay of roughly \$8.00 therefor.

# Electricity Versus Steam in Drainage Pumping

**Data on first cost and operating expenses of steam and motor-driven pumping stations used for draining agricultural lands along Illinois and Mississippi Rivers**

MUCH has been said and written of the advantages of electric drive for pumping water onto arid land—electrical irrigation—but the reverse of this process, the removal of water from the lands in order that they may be cultivated—electrical drainage—is in some sections equally important. On the Mississippi and Illinois Rivers such drainage pumps must operate against a head ranging from zero to 21 ft. and must be able to cope with widely varying quantities of water. Records show, however, that the need for extreme lifts occurs only once in six or seven years and then extends over a period of probably not more than ten days. From records which have been kept in the Coal Creek district on the Illinois River, opposite Beardstown, Ill., the maximum lift exceeded 19 ft. in only two years out of thirteen, and thirty-one was the total number of days during which this lift was exceeded.

Lands comprising most of the drainage districts along the Illinois and Mississippi Rivers are considerably below the level of these streams during part or all of the year. Hence the only practicable method of bringing these lands under cultivation is that of building a levee system, digging ditches and canals and installing a pumping plant to remove the water to a level permitting the land to be farmed. Pumping plants in general have been installed at the lowest points of the district, near the river, the water being collected from the land through a series of streams, open ditches and canals leading into the main canal which terminates at the sump of the pumping plant.



FIG. 1—PUMPING STATION, COAL CREEK DRAINAGE DISTRICT, OPPOSITE BEARSTOWN, ILL.

As given by the Internal Improvement Commission of Illinois, the rainfall for the central part of the State is 35.34 in. However, the maximum rainfall along the Illinois River has been estimated at 41.5 in., and on account of the well-drained condition of the land the run-off has been placed at 31 per cent. Therefore the maximum amount of water to be pumped amounts to

about 31 per cent of 41.5 in., or about 13 in. depth of water on each acre of watershed.

Most pumping stations now in use in these drainage districts are steam-driven and the majority comprise installations of fire-tube boilers and Corliss or four-

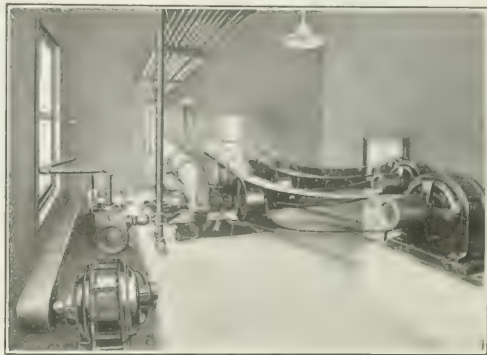


FIG. 2—THREE 2200-VOLT MOTORS DRIVING 22-IN. DOUBLE-SUCTION PUMPS

valve engines, either belted or directly connected to centrifugal pumps. Usually such stations have two pumps, the relative capacities of which are one-third and two-thirds of the total rating of the station. Such a difference in sizes is advisable because of operating conditions which require heavy pumping for only about three months of the year. From 60 to 75 per cent of the total work is ordinarily done from March 15 to June 15, while the remaining 25 to 40 per cent is evenly distributed over the other nine months of the year. Since this condition is detrimental to economic operation of a steam plant, it is usual practice to allow the water to back up in the ditches and to pump down to a lower level only when water enough has been stored to justify starting the plant. This operating condition, it will be seen at once, is opposed, of course, to one of the first requirements of a drainage district. The water should at all times be kept at a desirable level in the main canal. In other plants where pumps are operated on each alternate day and boiler fires are banked between these periods about one-half as much coal is required to bank the fires as is actually needed to pump the water.

## Cost of Steam Pumping Stations

The cost data in Table I have been collected from five steam pumping stations, ranging from 100 hp to 500 hp in rating, situated along the Illinois River between Beardstown and Eldred. In computing the fixed charges, interest has been taken at 6 per cent, taxes and insurance at 1 per cent and depreciation at 10 per cent, giving a total of 17 per cent for annual fixed charges on the original investment. Operating expenses, of which the principal items are coal, labor,



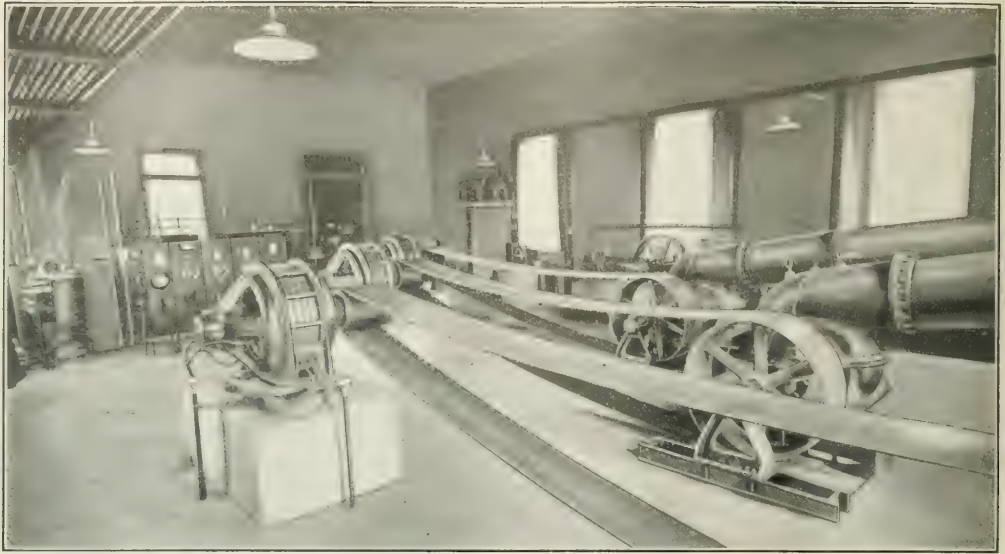


FIG. 3—INTERIOR VIEW OF PUMPING STATION

supplies and repairs, provide merely for the daily operation of the plant.

It will be noted that the average operating expense of the districts given is 75 cents a year an acre, while the average total cost, including fixed charges, is \$1.38 a year an acre. Thus the ratio of operating expense to total cost is 53.6 per cent. It is also noteworthy that the lowest total cost given, namely \$1.11 an acre per year, was obtained in a district with an average lift of less than 3 ft., showing that total expenses do not vary with the lift but that they are sensibly independent of the lift for average lifts not exceeding 10 ft. or 11 ft.

#### Eight Electrically Operated Plants

Recently data have been collected from eight electrically operated plants in Illinois (Table II), showing the costs of the installations as they were made and something of the principal characteristics of each station. The total area drained by these eight plants is

sion lines of several companies, and on account of the differences between operating conditions and owing to the fact that several district systems are not yet in operation it is not possible to present definite figures as to relative cost of operation. However, it has been established that the total cost of operating electric pumping stations for drainage district service is from 10 to 35 per cent less than the total cost of operating steam stations under the same conditions.

#### Solution of the Variable-Head Pumping Problem

In addition to these data on larger installations, it has been shown that the use of electrical energy makes available for drainage a large amount of land which it is impracticable to reclaim by use of steam power. A steam pumping station is efficient only when used for large districts in which the area ranges from 4000 to 5000 acres. It is interesting to note in this connection that one installation now in service on the Illinois

TABLE I—COST DATA FOR FIVE STEAM PUMPING STATIONS

Name of District	Hp. in Engines Installed	Initial Cost of Pumping Plant	Annual Fixed Charges	Annual Operating Expenses	Number of Acres in Watershed	Number of Acres in District	Operating Expense per Acre per Year	Total Cost per Acre per Year	Operating Ratio, per Cent
A	100	\$7,000	\$1,190	\$2,200	2,160	2,160	\$1.020	\$1.57	65
B	275	30,000	5,100	8,412	11,000	11,000	0.765	1.23	62
C	300	50,000	8,500	5,966	16,000	13,000	0.459	1.11	41
D	250	25,000	4,250	5,400	7,420	6,800	0.795	1.42	56
E	325	45,000	5,950	4,700	7,420	6,800	0.690	1.57	44
Totals	1,450	\$147,000	\$24,990	\$26,678	44,000	39,760	\$3.729	\$6.90	268
Average	290	29,400	4,998	5,336	8,800	7,952	0.746	1.38	53.6

54,170 acres, so that the installations are large enough to give what may be considered a fair comparative figure. These data show that the cost of building a modern electric pumping station varies from 50 to 60 per cent of the cost of building a modern steam station to do the same work. The districts selected as examples are supplied with electrical energy from the transmis-

sion lines of several companies, and on account of the differences between operating conditions and owing to the fact that several district systems are not yet in operation it is not possible to present definite figures as to relative cost of operation. However, it has been established that the total cost of operating electric pumping stations for drainage district service is from 10 to 35 per cent less than the total cost of operating steam stations under the same conditions.

As has been said, the speed of the engines in the

steam pumping stations was varied as the head against which they were pumping varied, by the process of lengthening or shortening the cut-off. The method by

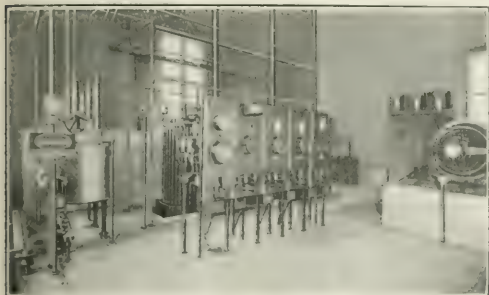


FIG. 4—SWITCHBOARD AND TRANSFORMERS

which alternating-current motors, which inherently operate at a constant speed, were made to meet this variable speed problem is interesting and instructive.

TABLE II—DATA ON ELECTRIC PUMPING STATIONS FOR DRAINAGE DISTRICTS

Number of District	Initial Cost of Electric Station	Initial Cost of Steam Station of Equal Capacity	Percentage of Cost of Electric Station to Cost of Steam Station	Horse-power of Motors Installed	ACREAGE		HORSE-POWER PER 1000 ACRES		NOMINAL CAPACITY OF PLANT		
					District	Water-shed	District	Water-shed	Total Gal. per Minute	Gal. per Minute per District	Acres Water-shed
1	\$20,000	\$35,000	57.1	300	6,700	7,426	44.8	40.4	36,000	5.37	4.85
2	16,000	29,000	55.2	200	3,270	4,300	61.2	46.5	24,000	7.34	5.58
3	10,000	20,000*	50.0	185	3,000		61.7		24,000	8.00	...
4	21,000	37,000	56.7	250†	12,000	18,500	41.6	27.0	71,000	5.91	3.84
5				100‡	12,000	15,000	33.3	26.7	60,000	5.00	4.00
6				135	2,400	2,700	55.3	50.0	17,500	7.29	6.48
7	10,500	17,500*	60.0	125	800		155.0		15,000	18.75	...
8				450	14,000		32.1		66,000*	4.71	...
Totals				1745	54,170				343,500	...	...

\*These figures are estimated to be best available data.

†This electric station is used in conjunction with 250-hp steam station, making total of both stations 500 hp.

‡This electric station is used in conjunction with 300-hp steam station, making total of both stations 400 hp.

Taking, for instance, the Big Swan Levee and Drainage District, a typical installation, from which a 24-in. Worthington centrifugal pump normally removes 14,000 gal. of water a minute during average operation, the changes which were necessary to install successful motor drive can be shown. Formerly, the pump here was driven at speeds varying from 150 r.p.m. to 215 r.p.m. by a steam engine on the foundation shown in Fig. 3. Afterward, however, this unit was replaced by a 100-hp, 585 r.p.m., 2300-volt, three-phase, slip-ring induction motor, mounted on an extension of the former engine foundation. The motor was then connected through gears, a silent chain and a flexible coupling to the pump, which had been left in its former position.

### Three Gears, Three Speeds

By selecting three separate motor pinions to be fitted to the shaft as the head changes against which the pump must work, it is possible to operate the pump itself at 215 r.p.m. or 185 r.p.m. or 150 r.p.m. The lowest speed, 150 r.p.m., is used when the pump is working against a lift of from zero to 7 ft. The second speed is used for operation against lifts varying from 7 ft. to 14 ft., and the third speed, 215 r.p.m., when the lift reaches from 14 ft. to 20 ft. By this ingenious ar-

rangement the pump and the motor both work at high efficiency at all times. Tests have shown that the set never falls more than 5 per cent below its highest possible efficiency. As the motor is always fully loaded, its operation is at approximately 80 per cent power-factor.

In sharp contrast to the time required to start up a steam plant stands out the fact that only two and one-half minutes are required to place an electric station in operation. This, however, is a record, and fifteen minutes is given as the usual time for starting a motor-driven plant.

### Terms of Pumping Contract

According to the terms of the contract between the Big Swan Levee and Drainage District and the Central Illinois Public Service Company, from which energy is purchased, the pumping station is not operated during the three hours of the day over which the electric service company's system peak extends. Apparatus for indoor-type 2300-volt substation is furnished by the electric-service company, but the low-voltage apparatus for lighting and for driving the small air pumps in the plant is owned by the drainage district. Free right-of-

way is also granted to the electric-service company on any part of the land owned by the operators of the drainage district.

### Cost of Developing Low Land

The initial outlay in certain levee districts operating some of the most successful areas has averaged as low as \$30 per acre, while the same improvements for some other districts now being put in operation have cost over \$50 per acre. In view of these higher first costs of development, attention is rapidly being turned toward electrical drainage. With electrically operated stations, it is no longer necessary to concentrate the pumping equipment at one point, but shorter ditches and levees may be dug and the pumping equipment divided into several parts where the construction of a single drainage system would be prohibitive.

The data on first cost and operating expenses of pumping stations presented in this article were collected by Mr. J. Paul Clayton, manager of the commercial department of the Central Illinois Public Service Company, which has been active in encouraging the establishment of electrically operated stations. Most of the figures concerning rainfall were secured from the records of the drainage districts themselves.



## Resonance Tests of Long Transmission Line

Experimental investigation of the voltage rise on an artificial 240-mile line with frequency of 189 cycles per second. By A. E. Kennelly and Harold Pender

IT is well known that a long aerial energy transmission line connected to a polyphase generator at one end *A* and freed at the distant end *B* tends to maintain a higher voltage at *B* than at *A*, a condition commonly called the Ferranti effect from its having first been reported by Ferranti in 1890. The voltage ratio  $E_b/E_a$  may be called the Ferranti ratio or Ferranti factor of the line. This ratio is known to attain its maximum value for a given uniform line, operated at a given single frequency, when the line has such a length as to develop a quarter wave-length in the distance *AB*, so that the line becomes a quarter-wave line. This quarter-wave maximum Ferranti effect is sometimes described as electrical resonance between the inductance and capacity of the line.

At energy-transmission frequencies not exceeding sixty cycles per second, the quarter-wave length of line is so great that it is not approached on the longest transmission line in service; but the higher the impressed frequency the shorter the quarter wave-length, so that some harmonic present in a generator voltage wave may readily develop quarter-wave resonance on actual lengths of energy-transmission line. The Ferranti factor of a long energy-transmission line may therefore be only, say, 1.05 to the fundamental frequency of operation, but a relatively small high frequency ripple in the wave of generated voltage may raise this factor to 1.3 or more. It is, therefore, important to determine how large the Ferranti factor may become to frequencies which may present themselves as harmonic ripples in the voltage wave of a generator. The measurements here reported throw light upon this subject from the experimental standpoint. Hitherto, so far as the writers are aware, the data available have been theoretical only.<sup>1</sup>

The measurements were made by the writers upon part of an artificial energy-transmission line installed in the research laboratory of the Massachusetts Institute of Technology and designed by Dr. Harold Pender and Mr. R. Huxley to imitate a three-phase aerial transmission line consisting of three copper-stranded conductors each of 500,000 circ. mils, spaced interaxially 9 ft. (275 cm). Such a line has been proposed to carry energy from the Victoria Falls to Johannesburg; so that, although the cross-section of copper is fairly large, it represents a line well within the limits of practical serviceability. This artificial line was recently illustrated and briefly described in the *Electrical World*.<sup>2</sup> It is a  $\Pi$  line; that is, a line composed of  $\Pi$ -sections, or series non-ferric inductance coils with condensers tapped to ground from the junction points. Each section corresponds to 30 miles (48 km) of line conductor, and eight sections were used, representing a line 240 miles (386 km) as one conductor of a three-phase transmission system of that length. It was found by experiment that this length of artificial line was in quarter-wave resonance under an impressed frequency

of 189 cycles per second. This would be a triple-frequency harmonic in a generator giving sixty-three cycles per second, and a quintuple-frequency harmonic in a generator of 37.8 cycles. The lumpiness error of the line at 189 cycles is less than one-fifth of 1 per cent; so that the artificial line with its lumped inductances and condensances behaves just like the corresponding line of distributed inductances and condensances, within the limits of observation.

**Generator.**—The generator employed for impressing the 189-cycle frequency was a concatenated induction machine driven above synchronism by a direct-current motor. The oscillographed wave-form of the emf produced by this generator is shown by the triple-frequency curve in Fig. 1, the other curve being that of the voltage impressed on the stator of the first motor. The frequency of the generator was kept as nearly as possible constant during the tests.

**Electrical Connections.**—The connections of the sections with the generator and measuring instruments are indicated in Fig. 2. *G* is the induction-generator connected to the line through an alternating-current ammeter, *a*, the impressed emf, being measured by an alternating-current voltmeter *V*. The conductor *NN* corresponds to ground return or the neutral of a balanced three-phase system.

The potential was measured at the free end *B*, and at intermediate junctions 1, 2 and 3, by means of an electrostatic voltmeter. Between *A* and junction 4 inclusive it was measured by an alternating-current voltmeter and multiplier. This instrument acted as a slight leak on the line, and the values of potential so observed had to be slightly corrected for this leak except at the end *A*.

**Volts Observed at Resonant Frequency.**—Fig. 3 shows the voltages observed along the artificial line. The black dots mark the observations, and the curve is drawn through the corresponding computed values. It will be seen that the observations are in satisfactory agreement with the theoretically deduced values. With 51.5 volts impressed on the sending end *A* of the line, the voltage observed at the distant free end *B* was 1033, representing a Ferranti factor of  $1033 \div 51.5 = 20.06$ . This means that at the particular frequency of 189 cycles the voltage at the distant free end of this particular length and character of line conductor would be twenty times the voltage impressed at the sending end. In a corresponding three-phase aerial line system, if 1000 volts at 189 cycles were impressed at the generating end between any pair of the three line conductors, the voltage between the open ends of the same conductors, 240 miles (386 km) away, would be 20,060 volts. If, however, the impressed voltage were, say, 100 kv, the distant free-end voltage could not of course be expected to reach 2000 kv, because the insulators of the line could not be expected to withstand such a pressure, and the effect of corona losses might be expected to reduce the Ferranti factor long before the insulators broke down. Up to the limits permitted by insulation, however, or of extra losses in the dielectric, such as corona losses, the Ferranti factor of 20 would be ex-

<sup>1</sup>"The Influence of Frequency on the Equivalent Circuits of Alternating-Current Transmission Lines," by A. E. Kennelly, *Electrical World*, Jan. 21, 1909.

<sup>2</sup>"Design for Artificial Transmission Line," *Electrical World*, May 2, 1914, page 980.

pected to apply to this length of line of uniform line constants at this quarter-wave frequency or resonant frequency.

**Currents Observed at Resonant Frequency.**—The current at the generating end *A* in the test with the distant end free was 2.99 amp, which at 51.5 volts gives 154 volt-amp.

The active power at *A* was 154 watts, indicating that the current entering the line was substantially in phase with the impressed voltage. The current along the line was not measured. It would of course diminish to zero at the distant open end *B*, according to a hyperbolic sine law.

When the line was grounded at the far end *B*, keeping the frequency constant at 189 cycles, the condition changed from quarter-wave voltage resonance to quarter-wave current resonance. That is, the current passing to ground at *B* became twenty times as large as the current entering the line at *A*. In order to be able to measure the currents with greater precision, the impressed emf at *A* was raised to 805 volts, when the *A* current was observed to be 0.116 amp with an active power of 85 watts. Coincidentally, the current at *B* was observed to be 2.32 amp, under zero voltage.

**Theory.**—Tests were made of the coils composing the artificial line at the resonant frequency (189 cycles) used in the test. These coils were found to be in electrical agreement within about 1 per cent. They were constructed at the Institute so as to form approximate closed circular solenoids. The condensers were

TABLE I—CONSTANTS FOR A SINGLE  $\Pi$ -SECTION OF ARTIFICIAL LINE AT 189 CYCLES PER SECOND

	Per Section	Per Wire-Mile	Per Wire-Km
Resistance of coil at 25 deg. C.	$R = 3.83$ ohms	0.1277	0.0793
Inductance of coil at 25 deg. C.	$L = 0.0557$ henry	0.001857	0.001154
Capacitance of section condenser	$C = 0.485$ microfarad	0.01617	0.01004
Leakance of section condenser	$G = 3.2$ micromhos	0.1067	0.0663

made of paper and foil by the Western Electric Company and were specially selected with regard to uniformity and low power-factor when tested over a considerable range in frequency. The particulars for a single section are given in Table I. The stated tests on the coils were made at the test frequency *f* of 189.4 cycles per second.

**Calculation by Simple Trigonometry.**—The current  $I_0$ , voltage to neutral  $V_0$ , and power-factor angle  $\varphi_0$  (taken positive for lagging current) at any point on a line at a distance of *l* miles from the load are given by the following expressions, all angles being in degrees,

$$I_0 = \sqrt{A_0^2 + B_0^2 - 2AB \cos(114.6\beta l - \theta)},$$

$$V_0 = \frac{1}{Y} \sqrt{A_0^2 + B_0^2 + 2AB \cos(114.6\beta l + \theta)},$$

$$\varphi = \tan^{-1} \frac{2AB \sin(114.6\beta l - \theta)}{A_0 - B_0}.$$

Note that the quadrant in which  $(\varphi_0 + \psi)$  lies is determined by the algebraic signs of the numerator and denominator of the fraction in the brackets.

The various quantities in these equations have the following values:

*I*, *V* and  $\varphi$  = the current, voltage to neutral and power-factor angle at the load.

*f* = frequency in cycles per second.

*r* = conductor resistance per mile, in ohms.

$x = 2\pi fL$  = conductor reactance per mile in ohms, corresponding to the impressed frequency *f* and inductance *L*.

$z = \sqrt{r^2 + x^2}$  = conductor impedance per mile, in ohms.

*g* = leakage conductance to neutral per mile of line, in micromhos.

$b = 2\pi fC$  = capacity susceptance to neutral per mile of line, in micromhos, corresponding to the impressed frequency *f* and capacity to neutral *C*.

$y = \sqrt{g^2 + b^2}$  = dielectric admittance per mile, in micromhos; for  $g = 0$ ,  $y = b$ .

$$a = 10^3 \sqrt{\frac{yz}{2} \left( \frac{bx - gr}{yz + bx - gr} \right)}, \quad \beta = 10^3 \sqrt{\frac{yz}{2} \left( \frac{yz + bx - gr}{yz - bx + gr} \right)}$$

$$\psi = 10^3 \sqrt{\frac{y}{z}}, \quad \psi = \tan^{-1} \left[ \frac{yz - bx - gr}{yz + bx - gr} \right]$$

Note that  $\psi$  is taken positive for  $gx < br$  and negative for  $gx > br$ .

$$A = \frac{1}{2} \sqrt{I^2 - (YV)^2 - 2YVI \cos(\varphi + \psi)},$$

$$B = \frac{1}{2} \sqrt{I^2 - (YV)^2 - 2YVI \cos(\varphi - \psi)},$$

$$\theta = \tan^{-1} \left[ \frac{2YVI \sin(\varphi + \psi)}{I^2 - (YV)^2} \right].$$

Note that  $\sin \theta$  has the same algebraic sign as the numerator of this fraction and  $\cos \theta$  has the same algebraic sign as the denominator of this fraction; this fixes the quadrant in which  $\theta$  lies.

$$A_0 = A_0 E a^l \text{ and } B_0 = \frac{B}{E a^l}$$

Note also that the velocity of propagation is

$$U = \frac{2\pi f}{\beta} \text{ miles per second}$$

and the wave length of the waves set up is

$$\lambda = \frac{2\pi}{\beta} = \frac{U}{f}.$$

When  $\frac{r}{x}$  and  $\frac{g}{b}$  are small compared with unity (each less than 0.1), then, with an error of less than 0.5 per cent,

$$a = \frac{10^3}{2} \left( r \sqrt{\frac{C}{L}} - y \sqrt{\frac{L}{C}} \right) \text{ deg.}$$

$$\psi = \frac{4.57}{f} \left( \frac{r}{L} - \frac{y}{C} \right) \text{ deg.}$$

When  $\frac{r}{x}$  and  $\frac{g}{b}$  are less than 0.1, these formulas

will be found more convenient for slide-rule calculation than those given above.

It is to be noted that in general  $\epsilon^x = 0.4343 \times$  (the number whose common logarithm is *x*), where *x* is any number. For *x* less than 0.1, then  $\epsilon^x = 1 + x + \frac{x^2}{2}$ , with an error of less than 0.5 per cent. Whence all the calculations may be effected with a slide rule.

It is also to be noted that when  $A = B$  and  $114.6\beta l = 180$  deg. (180 deg. being the value of this angle at the generator end of an exact quarter wave-length line), then  $V_0 = V \left( \frac{E^2 - E^2 a^2}{2} \right) = V a^l$ , when  $al$  is less than 0.1.

In the case of the artificial line under consideration, assuming no error due to lumpiness (which is justified

\*See article on transmission lines in "American Handbook for Electrical Engineers" (Wiley & Sons, New York, 1914).



as shown below), the various constants are as follows:  $I = 0$ ,  $V = 1033$ ,  $f = 189.4$ ,  $r = 0.1277$ ,  $L = 0.001857$ ,  $x = 2.21$ ,  $z = 2.24$ ,  $g = 0.1067$ ,  $C = 0.01617$ ,  $b = 19.2$ ,  $y = 19.2$ ,  $\alpha = 0.000206$ ,  $\beta = 0.00655$ ,  $Y = 0.00293$ ,  $\psi = 1.5^\circ$ ,  $A = B = 1.515$ ,  $\theta = 180^\circ$ ,  $U = 181,400$ ,  $\lambda = 958$ , and a quarter wave-length is then  $958/4 = 239.5$  miles, which checks well with the 240 miles actually used. The calculated voltages at the various junction points are then as given in Table II, the observed values being also given for comparison.

TABLE II—VOLTAGES AT JUNCTION POINTS

Junction	Miles from Local End	Calculated Voltage	Observed Voltage
Generator end	0	1033	1033
1	30	1013	1015
2	60	957	960
3	90	861	860
4	120	734	735
5	150	575	559
6	180	398	397
7	210	207	211
Generator end	240	51.2	51.5

**Calculations in Terms of Hyperbolic Functions.**—The angular velocity corresponding to the frequency of 189.4 cycles per second is  $\omega = 2\pi f = 6.283 \times 189.4 = 1190$  radians per second. At this angular velocity the section coil-reactance  $jX = jL\omega = j66.28$

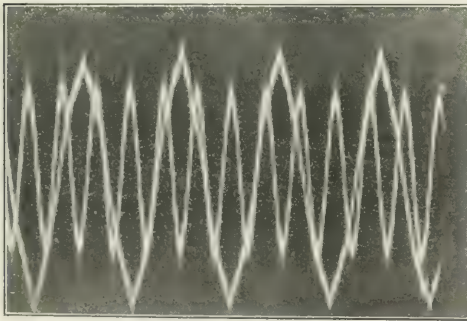


FIG. 1—OSCILLOGRAM OF EMF WAVE IMPRESSED ON ARTIFICIAL LINE

ohms, and the section condenser susceptance  $jC\omega = j577.2 \times 10^{-4}$  mho. The section impedance was, therefore,  $Z_s = 3.83 + j66.28$  ohms  $= 66.53 \angle 86.7^\circ$ , and the section admittance  $Y_s = (3.2 + j577.2) \times 10^{-6}$  mho  $= 577.2 \times 10^{-6} \angle 89.7^\circ$ . The apparent angle subtended by a single section of the line at this frequency—i.e., the angle uncorrected for lumpiness—was:

$$\theta_s'' = \sqrt{Z_s Y_s} = \sqrt{66.53 \angle 86.7^\circ \times 577.2 \times 10^{-6} \angle 89.7^\circ} = \sqrt{0.0384 \angle 176.4^\circ} = 0.1960 \angle 88.2^\circ \text{ hyp.}$$

The lumpiness correction is expressed by the formula<sup>1</sup>:

$$\sinh \frac{\theta_s}{2} = \frac{\theta_s''}{2} = 0.0980 \angle 88.2^\circ$$

From which, by tables,  $\frac{\theta_s}{2} = 0.0980 \angle 88.2^\circ \times 1.002$

$$\angle 0^\circ.01 = 0.09820 \angle 88.2^\circ \text{ hyp, or } \theta_s = 0.1964 \angle 88.2^\circ \text{ hyp.}$$

That is, the correcting factor for the lumpiness of the line was 1.002  $\angle 0^\circ.01$ , or only an increase of two-tenths of 1 per cent, a quantity too small to be measured with certainty. The artificial line behaved, therefore, to this frequency of 189 cycles substantially as though the capacitance were uniformly distributed. The angle subtended by the whole line of eight sections was therefore.

$$\theta_L = 8\theta_s = 1.5712 \angle 88.2^\circ \text{ hyps.} \\ = 0.0493 + j1.5706 \text{ hyps.}$$

The  $j$  component of the angle subtended by a quarter-wave line is  $\frac{\pi}{2}$ , or 1.5708 circular radians; so that the

measured constants agree very well with the computed values for the observed resonant frequency of 189.4 cycles per second.

The voltage  $E_b$  at the distant free end of a line whose angle is  $\theta_L$ , supplied with a voltage  $E_a$  at the generating end is

$$E_b = \frac{E_a}{\cosh \theta_L} \text{ volts.}$$

In this case  $\cosh \theta_L = \cosh (0.0493 + j1.5706) = j0.04932$ ; so that

$$E_b = \frac{E_a}{j0.04932} = -j20.27E_a = 20.27E_a \angle 90^\circ \text{ volts.}$$

The Ferranti factor is therefore 20.27 by computation from the line constants, while the observed value was 20.06, or about 1 per cent less. Table III gives the successive observed and computed voltages at the section junctions.

TABLE III—VOLTAGES AT SECTION JUNCTIONS

Junction	Angle $\delta$ from B	Cosh $\delta$ by Chart	VOLTAGE	
			Computed	Observed
B	0	1.000 $\angle 0^\circ$	1044 $\angle 90^\circ$	1033
1	0.1964 $\angle 88.2^\circ$	0.98 $\angle 0^\circ 10$	1023 $\angle 89^\circ 59$	1015
2	0.393 $\angle 88.2^\circ$	0.924 $\angle 0^\circ 25$	965 $\angle 89^\circ 25$	960
3	0.589 $\angle 88.2^\circ$	0.832 $\angle 0^\circ 55$	869 $\angle 89^\circ 25$	860
4	0.786 $\angle 88.2^\circ$	0.708 $\angle 1^\circ 3$	739 $\angle 88^\circ 7$	735
5	0.982 $\angle 88.2^\circ$	0.555 $\angle 2^\circ 27$	579 $\angle 87^\circ 23$	559
6	1.178 $\angle 88.2^\circ$	0.383 $\angle 5^\circ 3$	400 $\angle 84^\circ 7$	397
7	1.375 $\angle 88.2^\circ$	0.200 $\angle 11^\circ 55$	209 $\angle 78^\circ 5$	211
4	1.571 $\angle 88.2^\circ$	0.0493 $\angle 90^\circ$	51.5 $\angle 10^\circ$	51.5 $\angle 0^\circ$

tion junctions. In the table the values of the cosines in the third column have been taken from the chart<sup>2</sup> by direct inspection.

The apparent surge impedance of a line-section, uncorrected for lumpiness, is

$$z''_o = \sqrt{\frac{Z_s}{Y_s}} = \sqrt{\frac{66.53 \angle 86.7^\circ}{577.2 \times 10^{-6} \angle 89.7^\circ}} \\ = \sqrt{115,300 \angle 3.0^\circ} = 339.6 \angle 1^\circ 5 \text{ ohms.}$$

The lumpiness correcting-factor for a  $\Pi$  line is

$$\frac{1}{\cosh \frac{\theta_s}{2}} = \frac{1}{\cosh 0.0982 \angle 88.2^\circ} = \frac{1}{0.995 \angle 0^\circ.02};$$

so that the corrected surge impedance of the artificial line was

<sup>1</sup>"The Application of Hyperbolic Functions to Electrical Engineering Problems," by A. E. Kennelly, Chapter III, University of London Press.

<sup>2</sup>"Chart Atlas of Complex Hyperbolic and Circular Functions," Chart II, by A. E. Kennelly. Harvard University Press.

$$Z_o = \frac{339.6 \angle 1^\circ.5}{0.995 \angle 0^\circ.02} = 341.3 \angle 1^\circ.5 \text{ ohms.}$$

The impedance which the line should offer at the generating end when freed at the distant end is

$$Z_o / \tanh \theta_L = \frac{341.3 \angle 1^\circ.5}{\tanh \left( 0.0493 + j \frac{\pi}{2} \right)} = \frac{341.3 \angle 1^\circ.5}{20.30 \angle 0^\circ} = 16.81 \angle 1^\circ.5 \text{ ohms.}$$

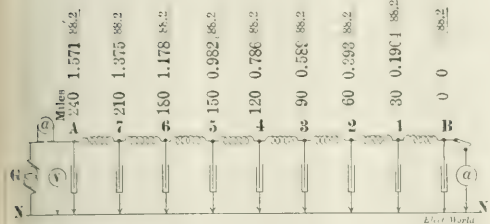


FIG. 2.—DIAGRAM OF CONNECTIONS OF ARTIFICIAL LINE

Under an impressed emf of  $51.5 \angle 0^\circ$  volts, the line should take

$$\frac{51.5 \angle 0^\circ}{16.81 \angle 1^\circ.5} = 3.064 \angle 1^\circ.5 \text{ amp.}$$

This current entering the line would carry a power of  $51.5 \angle 0^\circ \times 3.064 \angle 1^\circ.5 = 157.8 \angle 1^\circ.5$  volt-amp, or 157.7 active watts. The observed values were 2.99 amp and 154 active watts.

Similarly, with the line shorted or connected to neutral ground potential at the distant end, the sending-end impedance should be

$$Z_o \tanh \theta_L = 341.3 \angle 1^\circ.5 \times \tanh \left( 0.0493 + j \frac{\pi}{2} \right) = 341.3 \angle 1^\circ.5 \times 20.30 \angle 0^\circ = 6928 \angle 1^\circ.5;$$

so that under an impressed emf of  $805 \angle 0^\circ$  volts, the entering current should be

$$\frac{805 \angle 0^\circ}{6928 \angle 1^\circ.5} = 0.1162 \angle 1^\circ.5 \text{ amp,}$$

carrying a power of  $805 \angle 0^\circ \times 0.1162 \angle 1^\circ.5 = 93.54 \angle 1^\circ.5$  volt-amp, or 93.48 active watts. The observed values were 0.116 amp and 85 watts, the latter being read at an insensitive part of the wattmeter scale.

The agreement between the observed and computed values of voltage current and power was, therefore, fairly satisfactory.

**Reductions from the Test Relating to Transmission-Line Voltage Regulation.**—The tests above outlined indicate that a relatively small harmonic ripple of the generator-voltage fundamental sine wave may produce a very marked rise of pressure at the distant end of a fairly long power-transmission line when working at light load. Thus, in the case imitated on the artificial line here described, if a 5 per cent triple-harmonic frequency of 189.4 cycles were associated with a 100 per cent fundamental frequency of 63.1 cycles in the voltage at the generating end, the combined root-mean-square voltage at that end would be  $\sqrt{100^2 + 5^2} = 100.5$ , and the maximum possible peak voltage  $105 \sqrt{2}$ . The fundamental frequency voltage at the distant free end would be 114.7, while the triple-frequency voltage would be  $5 \times 20.06 = 100.3$ . The combined root-mean-square voltage at the free end would thus reach

$\sqrt{(114.7)^2 + (100.3)^2} = 152.4$ , while the maximum possible peak voltage would be  $215 \sqrt{2}$ .

As the length of the transmission line is diminished the frequency which will be necessary to excite quarter-wave resonance correspondingly increases, approximately according to the relation  $f = \frac{75,000}{L}$  cycles per

second, where  $L$  is the length of the transmission line in kilometers. Thus a 75-km aerial line (46.6 miles) would develop quarter-wave resonance at approximately 1000 cycles per second.

The Ferranti factor tends to increase somewhat with the frequency, except for the influence of skin effect on the impedance, which opposes the increase. Consequently, the Ferranti factor is of the same order of magnitude over a wide range of frequency. The shorter the transmission line, the higher the frequency that is therefore required to excite quarter-wave resonance. Whereas on a 386-km (240-mile) line only a triple harmonic of sixty-cycle fundamental voltage would suffice, on a 60-km (37.3-mile) line a frequency of about 1250, or about the seventeenth harmonic of the same fundamental voltage, would be necessary. It is thus quite possible to produce distinct resonant rise of voltage at the distant end of a comparatively short transmission line under light load, owing to the presence of an appreciable tooth-frequency harmonic happening to find the line at or near quarter-wave length.

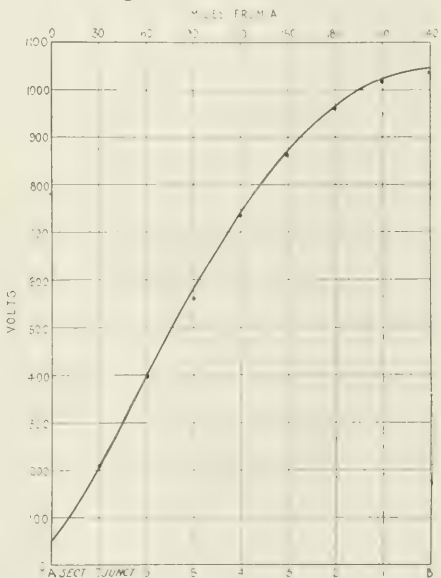


FIG. 3.—THEORETICAL CURVE OF VOLTAGE ALONG ARTIFICIAL LINE AND OBSERVED VALUES

In conclusion, the authors recommend an artificial transmission line\* as a valuable and by no means ex-

\* J. H. Cunningham, "Design, Construction and Test of an Artificial Transmission Line," *Proc. Am. Inst. El. Engrs.*, Jan., 1911, Vol. XXX. A. E. Kennelly and H. Tabossi, "Artificial Power-Transmission Line," *Electrical World*, New York, Feb. 17, 1912. A. E. Kennelly and F. W. Lieberknecht, "Measurements of Voltage and Power Over a Long Artificial Power Transmission Line at Twenty-five and Sixty Cycles per Second," *Proc. Am. Inst. El. Engrs.*, June 25, 1912. A. E. Kennelly, "An Investigation of Transmission-Line Phenomena by Means of Hyperbolic Functions: The Distribution of Voltage and Current Over Artificial Lines in the Steady State," *Electrical World*, New York, Aug. 10, 1912. A. E. Kennelly, "A Convenient Form of Continuous-Current Artificial Line," *Electrical World*, June 14, 1913.



pensive equipment of an electrotechnical laboratory.

*Summary.*—The Ferranti factor, or ratio of rise of potential, was measured experimentally by the writers on a large-copper artificial power-transmission line, representing 240 miles (386 km), at the Massachusetts Institute of Technology, with a frequency of 189 cycles per second. The ratio was found to be 20.06 and was in satisfactory accordance with the theory. This theory, which is essentially hyperbolic, is given both in the hyperbolic form and reduced to corresponding circular terms. The importance of harmonic frequencies contributing to the Ferranti ratio of long transmission lines by happening to excite quarter-wave resonance is pointed out.

### Technical Topics at Ohio E. L. A. Convention

The general features of the convention of the Ohio Electric Light Association, held at Cedar Point, Ohio, July 21 to 24, were reported in the preceding issue, beginning on page 218. Herewith we present abstracts of the reports of the committees on illumination, meters and transmission, together with accounts of the several discussions.

#### Recommendations of Illumination Committee

In the report of the illumination committee, of which Mr. S. E. Doane, Cleveland, was chairman, four broad problems, thought particularly to merit the attention of the association in connection with its lighting service, were discussed. Two of these topics, namely, securing small customers to be found within easy reach of existing lines, and lighting country roads between cities and towns, referred to the extension of electric service into new fields. The other two topics, viz., the improvement in the efficiency of certain sizes of tungsten lamps, and the adoption of 120 volts as a standard potential, dealt more particularly with the development and progress of the existing industry.

The arc lamp as it has been known is passing and is being superseded by high-efficiency tungsten units, said Mr. Doane in opening the discussion of the committee's report. Care, however, should be exercised that central-station men realize just what change in the cost of lighting, especially street lighting, the new high-efficiency lamps will make. Considering that the cost of the energy for street lighting is but 10 per cent of the total cost, prices for street lighting should certainly not be reduced in proportion to the gain in lamp efficiency. In this connection Mr. Doane urged member companies to contend strenuously for street-lighting contracts on the candle-power basis instead of on the basis of energy consumed. In reply to a question Mr. Doane recommended the use of large-current gas-filled lamps, especially those operating at 6.6 amp.

Others who took part in the discussion were Messrs. V. R. Power, Huntington, W. Va.; Henry Schroeder, New York City; W. S. Culver, Cincinnati; F. B. Steele, Dayton; Thomas F. Kelly, Dayton; L. C. Anderson, Franklin; J. C. Martin, Wilmington, and O. H. Hutchings, Dayton.

Standardization of distribution potential at 120 volts, as recommended by the committee, was another of the principal topics under discussion, and inasmuch as this step promised reduction in lamp prices, the recommendation seemed to meet with popular favor. Although it was considered impracticable for all central stations to attempt operation at 120 volts immediately, it was suggested that three potentials, say, 104 volts, 112 volts and 120 volts, be adopted as standards and that each company strive toward a higher potential. A committee was appointed to consider standardization.

Regarding the committee's recommendation that member companies attempt the lighting of country roads, Mr. F. B. Steele read a written discussion by Mr. Thomas F. Kelly, Dayton, in which he reported that the Dayton Power & Light Company has already entered this field with considerable success.

#### Report of Meter Committee

Presenting the report of the meter committee, Mr. A. H. Bryant, Cleveland, chairman, told briefly of the three general conferences held during the past year at Cleveland, Toledo and Columbus. The committee recommended the continuance of these general conferences, the extension to three years of the terms of service of members of the meter committee, the appropriation of money to defray the expenses for a traveling representative of the meter committee who would be expected to visit member companies and to submit a confidential report, and the acceptance of a standard meter-report form.

Opening the discussion, Mr. A. A. Bryant, Cleveland, laid particular stress upon the recommendations to the effect that public meetings of the committee be held during the ensuing year, that money be appropriated for the expenses of a traveling meter-man to help small companies, and that a standard form of report be adopted. In the discussion the following spoke: Messrs. J. C. Martin, Wilmington; Prof. F. C. Caldwell, Columbus; G. E. Snider, Toledo; S. E. Doane, Cleveland; F. H. Krauss, Bellefontaine; D. L. Gaskill, Greenville; John K. Himes, Dayton; O. K. Hutchings, Dayton; W. Parsons, Springfield, and W. S. Culver, Cincinnati.

#### Report on Electrical Transmission

Keeping pace with the advance in high-tension work, the electrical transmission committee, of which Mr. M. H. Wagner was chairman, reported that in its belief 6600-volt distribution has passed the experimental stage and is now so generally used that it should no longer be classed as high-tension. Therefore, the committee recommended that overhead-line specifications for this type of construction be revised and made less stringent than the requirements of the National Electric Light Association.

The recommendations of the committee on electrical transmission caused a rather lengthy discussion covering several features of the report of the National Electric Light Association committee on overhead-line construction. Although opinions varied somewhat, it was generally conceded that there should be standard rules for line construction, and the hope was expressed that the joint report of the United States Bureau of Standards and the National Electric Light Association overhead construction committee, to be published in the fall, would afford just specifications.

Speaking of the practical side of line construction, Mr. D. L. Gaskill, Greenville, summed up the results of his experience in building 85 miles of transmission line in the following advice: Don't allow any trees within possible reaching distance of power lines; use the public highway for right-of-way when possible; for private right-of-way be willing to pay from \$1 to \$2 a pole; buy the best lightning protection there is—it is poor enough; single-phase, 33,000-volt lines with 30-ft. poles and No. 4 wire should be built for \$1,000 a mile, and similar three-phase lines with transformers for \$2,000 a mile; 6600-volt construction ought not to cost over \$700 a mile; in using wooden cross-arms buy them large enough—4-in. by 5-in. fir arms are used at Greenville.

Others taking part in the discussion were Messrs. W. R. Power, Ironton; O. H. Hutchings, Dayton, S. M. Rust, Greenville; L. C. Anderson, Franklin; J. C. Martin, F. C. Caldwell and W. S. Culver.

# Central Station Management

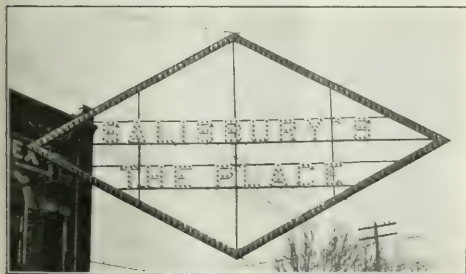
Devoted to Discussion of Administrative Policies, Commercial Methods and Current Practice Among Successful Utilities

## Week-End Talks to Commercial Men

Addresses are made each Saturday afternoon by men prominent in the electrical industry to the members of the commercial department of the Louisville (Ky.) Gas & Electric Company. Mr. Joseph B. Fitzgerald, illuminating engineer of the Westinghouse Electric & Manufacturing Company, recently spoke on the nitrogen-filled lamp. A talk on the electric vehicle was also given by Mr. Henry B. Hewitt, manager of the electric-vehicle department of the Kentucky Wagon Manufacturing Company, of Louisville. It is expected that later there will be a discussion on tennis-court lighting.

## A Small City's Electric Slogan Sign

Salisbury, the county seat of Rowan County, N. C., has the distinction of having erected one of the first electric "booster" signs in the Southeast. This sign, a diamond-shaped slogan structure as shown in the accompanying illustration, was placed in service through the efforts of the Salisbury Industrial Club. The slogan, "Salisbury's the Place," has become the established



ELECTRIC SLOGAN SIGN AT SALISBURY, N. C.

motto of this organization and is used, in its diamond-shaped border, on all stationery and printed matter.

The sign is 19 ft. high by 34 ft. long and contains about 345 lamps. The diamond frame is illuminated by 156 red lamps, while the slogan letters are 24 in. high and carry white lamps. Through arrangements with the North Carolina Public Service Company, both electrical energy to operate the sign and maintenance and repairs are furnished free for a period of ten years. This sign was designed by members of the local industrial club and built by the Federal Sign Company.

## Free Iron Holders at Danville, Ill.

On the theory that any offer wherein the general public is given something for nothing will receive attention, the new-business department of the Danville (Ill.) Street Railway & Light Company has undertaken a reduced-price iron sale, giving with each purchase a

holder by means of which an electric iron may be turned upside-down and used as a hot-plate. These holders are inexpensive, costing at wholesale about 6 cents each, so that if any are left over at the close of the iron sale they can be discreetly given away with ultimate advantage.

## Reduction in Rates in Hartford, Conn.

The Hartford (Conn.) Electric Light Company announced a reduction in rates, taking effect on July 1. From that date the rate for all energy for residence and commercial light, for which the rate had been 9 cents per kw-hr. less 5 per cent for payment in ten days, was reduced to 8 cents less 5 per cent for payment in ten days throughout the entire territory served by the company, both city and suburban. In announcing the reduction the company published advertisements in the daily newspapers saying that its commodity is the only necessity of life which has been steadily reduced in price. It quoted rates and reductions from 1903, when the maximum rate was lowered from 17 cents to 16 cents per kw-hr. In making this change the company also added the 40-watt tungsten lamp to its free renewal list.

## Transmission Service Supersedes Producer-Gas-Engine Plant

Discontinuing the operation of one 100-hp and one 80-hp gas engine, which had been driving 220-volt direct-current generators for seven years, the Pausan Milling Company, Brillion, Wis., will soon be receiving energy from the High Falls plant of the Wisconsin Public Service Company over a 15,000-volt transmission line through Green Bay and Wrightstown. Formerly these engines have been receiving gas from two individual gas producers. Although exhaustive tests have shown a small monetary saving in favor of the gas engines, central-station energy was chosen on account of the ease with which extensions could be made to the service and on account of the reduced personal attention and greater reliability afforded by the service.

With the installation of a 200-kw indoor type substation the system at Brillion will be changed to alternating-current operation, and it is expected that the transmission service will also be extended to Reedsville, Greenleaf, Grims, Forest Junction, Hilbert Junction and Whitelaw. These towns and a few others, within a 30-mile radius, represent a total population of somewhat over 5000. When the lines are completed the inhabitants of these towns will receive energy from the system of the Pausan Milling Company, which in turn will purchase from the Wisconsin Public Service Company, paying \$1 a kw demand plus 1 cent per kw-hr. for the energy at wholesale.

Stone quarries and small factories in this territory now operating with steam will present an excellent opportunity for the building of a motor-service load. Farmers whose land joins the transmission line have



shown exceptional interest in the project, and many of them will build their own extensions in order to secure electric service on their property. The transmission line itself, for which contracts have been let, will be erected for the most part on a wooden-pole line with the wishbone type cross-arm, steel towers being used only where a 465-ft. river span requires extra heavy construction.

### Electrified Fire Engine Saves Expense

The advantage of converting horse-drawn fire apparatus to motor operation is shown by some figures compiled for a former horse-drawn fire engine which was equipped for battery drive by the New York Fire Department. The front wheels of the vehicle were replaced by couple-gear motor-driven wheels operated from a storage battery. The conversion cost \$4,000, but the reduced expense at which the vehicle has since operated apparently justified the change.

Renewals and repairs for two years subsequent to the change cost \$744.29. Of this amount \$486.97 was spent in renewing the battery after the vehicle had been in service one year. Adding to the above maintenance expense the depreciation and battery-charging costs, the total operating expense for the two years amounted to \$1,370.03, as compared with an average of \$1,469.06 for horse-drawn fire engines answering about the same number of calls.

### Electricity Versus Steam for Coal Hoisting

Operating data compiled by the Saw Mill Run Coal Company, Pittsburgh, Pa., on its motor-driven coal-barge unloading apparatus and on the old steam-driven equipment which has been superseded thereby show the relative power and labor costs of these two motive powers under practically identical conditions. When steam was used the items of coal and water to hoist an average of 7722 tons of coal per month cost \$60 and \$15 respectively. Operating the hoist with the motor now installed the cost of energy is about 1 cent per ton, which is only slightly in excess of the former power cost. But, considering labor and maintenance expenses, reliability of operation, rapidity of unloading, convenience of operation, etc., for the two systems, considerable advantage is shown to exist in favor of the electrical equipment.

When steam was used a licensed engineer had to be employed at \$125 per month, but only \$75 is now paid for operating the electric hoist. There are very few repairs or replacements necessary on the motor in comparison with those on the former boiler and steam engine, hence the maintenance expense is less for the present equipment. The motor does not require such frequent attention as the steam apparatus, and can always be operated without waiting for the steam pressure to rise or repairs to be made on frozen pipes. Furthermore, the steam hoist required sixty seconds to make a round trip, whereas the electric hoist can be accelerated more rapidly, making a complete trip in fifty seconds and thus allowing a 20 per cent increase in the amount of coal unloaded in a definite time. During a ten-hour day the electric hoist can transfer 5040 more bushels of coal than it had been found possible to handle with the steam hoist.

In replacing the steam equipment by the electrical outfit the only change made in the hoist was to remove the piston rods, bolt a ring gear to the crank disk and install a 75-hp Westinghouse high-torque wound-rotor induction motor with its pinion meshing in this gear. The vertical hoist from the top of the barge to the

bunker is 65 ft., the radius of the swing is 110 ft., and the average length of the swing is 70 ft. Electricity for operating this apparatus is furnished by the Duquesne Light Company, Pittsburgh, Pa.

### Alley-Arm Ladders for Linemen

Linemen of the Commonwealth Edison Company, Chicago, are, as a rule, instructed to work on all circuits from beneath. There are, of course, cases where this general rule is impracticable, but to make compliance more general the safety department of the company is furnishing to crews who work on alley-arm construction, ladders such as that shown in the illustration herewith. In practice the man carries the ladder up the pole, attaches it beneath the circuit upon which he wishes to work, and steps from the pole by way of



SAFETY LADDER FOR LINEMEN

the arm brace to the ladder, thus avoiding the danger otherwise involved in reaching the end of the arm by crossing over live circuits. The ladders themselves are 8 ft. long, measure from 10 in. to 12 in. wide, and are provided with heavy malleable-iron hooks shaped to fit snugly over the cross-arm.

### A Dustless Housewiring Campaign at Franklin, Ky.

The Franklin (Ky.) Electric & Ice Company is conducting a spirited house-wiring campaign which is accomplishing good results in that little city of 3000 inhabitants. A special offer for July and August quotes particularly low prices, and in connection with the company's advertisement there appears its guarantee that the work will be done without noise, dirt or confusion, and without damage to walls, ceiling or plastering.

# Illumination and Wiring

## Lighting Display at Imperial Theater, Montreal

The electrical equipment of the Imperial Theater, the largest moving-picture house at Montreal, P. Q., includes an unusually tasteful installation of display lighting in contrast with the glaring illumination often found in such establishments. As shown in the accompanying illustration, the front of the house is provided with a harmonious combination of sign, marquee and border lighting. The dominant feature is a vertical sign containing 300 5-watt lamps, bearing the name and emblem of the house, the marquee carrying forty-six frosted lamps of the 15-watt size set 12 ft. above the street. Attractions are announced by two signs set at an angle of about 30 deg. from the wall, each con-



A MONTREAL THEATER SIGN

taining about 200 5-watt lamps. Two hundred 10-watt lamps are used in the panels of the façade, and in the middle front of the building are mounted candelabra, each containing three 40-watt lamps mounted in a single translucent globe. Four flaming-arc lamps with a rating of 6 amp each are installed at the corners of the theater.

The equipment of the cinematograph operating room is unexcelled in Canada. The moving-picture machines are mounted in a fireproof compartment on the roof, with a 10-kw motor-generator set in a separate chamber to supply direct current at 70 volts to the cinematograph arc lamps, which are two in number and rated at 40 amp each. A spot-light and a stereopticon lamp are also installed in the operating room. The generator is driven by a 15-hp, 550-volt, three-phase induc-

tion motor built by the Canadian General Electric Company. The building is also provided with 110-volt alternating-current service and 220-volt direct-current service for emergency use, the pressure reduction being by hand-operated rheostats under such conditions. There are also four motor-driven fans in the establishment, the motors being of 7.5-hp rating each. The theater seats 2400 persons. Energy is purchased at industrial rates from the Montreal Light, Heat & Power Company, the business being of the long-hour type.

## Cost of Gas and Electric Lighting Compared

In a large American city where the price of gas is 80 cents net and the price of electricity 10, 5 and 3 cents net employees of the electric-service company have made up interesting tables to show the compara-

TABLE I—COST OF GAS LIGHTING

(Gas at 80 cents per 1000 cu. ft. Does not include mantles)

Hours' Use	1 Single Reflex	2 Four- Mantle Inverted Arc	3 Five- Mantle Inverted Arc	4 Stand- ard Wool- bach	5 Two- Mantle Upright Arc	6 Four- Mantle Upright Arc
1	\$0.0050	\$0.0178	\$0.0280	\$0.0073	\$0.0146	\$0.0234
2	.0080	.0238	.0338	.0117	.0234	.0410
3	.0119	.0418	.0508	.0161	.0322	.0586
4	.0149	.0538	.0658	.0205	.0410	.0762
5	.0179	.0658	.0808	.0249	.0498	.0938
6	.0209	.0778	.0958	.0293	.0586	.1114
7	.0239	.0898	.1108	.0337	.0674	.1290
8	.0269	.1018	.1258	.0381	.0762	.1466
9	.0299	.1138	.1408	.0425	.0850	.1642
10	.0329	.1258	.1558	.0469	.0938	.1818
11	.0359	.1378	.1708	.0513	.1026	.1994
12	.0389	.1498	.1858	.0557	.1114	.2170

TABLE II—COST OF ELECTRIC LIGHT FOR EQUIVALENT ILLUMINATION

(At rate of 10, 5 and 3 cents per kw-hr. net, including lamp renewals)

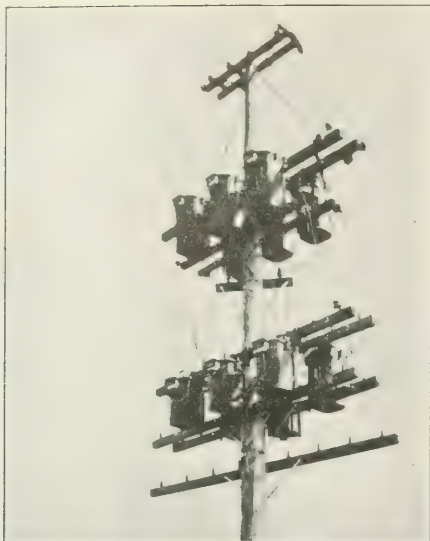
Hours' Use	1 One 60- Watt	2 Two 100- Watt	3 One 250- Watt	4 One 40- Watt	5 One 100- Watt	6 One 150- Watt
1	\$0.0060	\$0.0200	\$0.0250	\$0.0040	\$0.0100	\$0.0150
2	.0090	.0300	.0375	.0060	.0150	.0225
3	.0108	.0360	.0450	.0072	.0180	.0270
4	.0126	.0420	.0525	.0084	.0210	.0315
5	.0144	.0480	.0600	.0096	.0240	.0360
6	.0162	.0540	.0675	.0108	.0270	.0405
7	.0180	.0600	.0750	.0120	.0300	.0450
8	.0198	.0660	.0825	.0132	.0330	.0495
9	.0216	.0720	.0900	.0144	.0360	.0540
10	.0234	.0780	.0975	.0156	.0390	.0585
11	.0252	.0840	.1050	.0168	.0420	.0630
12	.0270	.0900	.1125	.0180	.0450	.0675

tive costs of gas and electric lighting on the basis of equivalent illumination. These tables, which may be of general interest, are reproduced herewith.

## An Interesting Temporary Transformer Installation

Lacking a three-phase, 6600/440-volt transformer with which to complete a city water-works installation, the Central Illinois Light Company, Peoria, Ill., recently devised a scheme whereby twelve smaller standard transformers temporarily supplied the customer with service. Mounting the twelve 2200/220/110-volt transformers in four banks of three each on a pole as shown in the accompanying illustration, the primaries of each group of three transformers were connected in series





TWELVE TRANSFORMERS DOING TEMPORARY DUTY FOR A SINGLE UNIT

across the 6600-volt line, forming an open delta. The secondary coils of the transformers were then grouped in pairs to deliver the desired secondary potential, 440 volts.

#### Guard Around Guy Wires

As an effective precaution against the danger of persons running into or stumbling over guy wires, the Wichita Falls (Tex.) Electric Company incloses the lower portion of its guy wires, to a height of 8 ft., in wooden casings painted white. The painted box warns passersby of an obstruction and in addition prevents anyone receiving an injury in case the guy is energized from an overhead conductor.

#### Largest Electric Roof Sign in the World

The Ontario Furniture Company, Montreal, Canada, operates what the builders contend is the largest electric roof sign in the world on top of the recently completed nine-story reinforced-concrete building of this house-furnishing establishment. The sign was erected at a cost of about \$20,000, and Fig. 1 shows a daylight view of the structure, whose length is 135 ft. and whose height is 77 ft. The total weight is 32.5 tons, and the mechanical problem involved in the secure attachment of the frame to the building is indicated in Fig. 2, which shows the steelwork provided behind the sign proper and the general features of the main frame.

The sign is of the talking variety and is installed near the intersection of Bleury and St. Catherine Streets, facing the most congested traffic point in the city. It is operated with forty sentences in regular display, ten seconds being allowed for each, and is provided with forty-two letter frames and spaces wired out of doors in conduit to rotating contact-making devices housed in an 8-ft. by 16-ft. switch room shown in the central portion of Fig. 2 and illustrated by the interior view, Fig. 3. The principal decorative features

of the sign are two torches at the ends, beside which are "brownies" calling attention to the trade-name of the house, which is known as the "Home of Credit," and a gold-coupon saving scheme which is popular locally. In regular operation most of these pictorial and display features are flashed on and off at intervals, accompanied by the setting up of sentences. The lower border and torches are fixed displays. The great height of the sign is apparent by a comparison of the figures of the men standing on the frame in Fig. 1 with the structure itself. About 6000 5-watt, 10-volt clear tungsten lamps are installed, each letter being fused independently at the contact maker in the operating house and provided with a sign transformer mounted on the frame. Over 25 miles of wire are installed on the sign and the wiring includes connections at 150 junction boxes, 25,000 soldered joints, 225 cutouts, 700 fuses and 1100 ft. of iron conduit. About 200 lb. of insulating tape was required, with nearly 1000 lb. of solder.

On the rear of the main frame the name of the company has recently been installed in a sign running the full length of the structure, the letters being 14 ft. high with white backgrounds and requiring about 1000 5-watt lamps. The different displays on the sign front require the use of forty-five flashers driven by three motors, the flashers being mounted at the side of the operating room as shown in Fig. 3. The figure of the brownies at the front of the sign are 30 ft. high the "Home of Credit" letters being 8 ft. high and the gold-coupon advertisement 12 ft. by 24 ft. The two bottom lines of lettering consist of forty-two letters in which the lamps are so arranged that any letters of the alphabet or any numeral can be displayed, the "set-up" being by templates or cams in the machinery house below. News of the hockey matches, races and election is frequently displayed on the sign.

The frame consists of eight vertical and sixteen horizontal steel angles, the former being  $3\frac{1}{2}$  in. by 3 in. by  $\frac{5}{16}$  in. in size at the lower end, and the latter 3 in. by 3 in. by  $\frac{5}{16}$  in. Eight 10-in. by 12-in. diagonal brace latticed on all four sides by  $2\frac{1}{4}$ -in. by  $\frac{5}{16}$ -in. strap

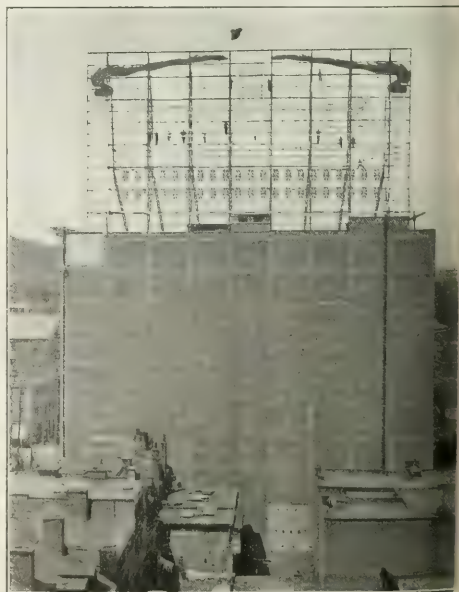


FIG. 1—DAYLIGHT VIEW OF SIGN



FIG. 2—REAR VIEW OF SIGN FROM ROOF

are run from the upper part of the frame to anchorages in the roof. The brace frames are composed of  $2\frac{1}{2}$ -in. by  $2\frac{1}{2}$ -in. by  $\frac{5}{16}$ -in. angles, and each of the brace anchorages is fastened rigidly into the building frame by a pair of  $1\frac{1}{2}$ -in. steel rods terminating at a  $\frac{3}{8}$ -in. by 4-in. by  $\frac{3}{8}$ -in. steel angle plate forced against a wooden block on the under side of the reinforced-concrete girder construction on the eighth floor. Turnbuckles in these rods provide for tightening the anchorages, and at the roof level the opposite anchorages are tied together by 1-in. steel rods, with turnbuckles in the center, as shown in Fig. 2.

The flasher equipment was provided by the National Electric Sign Company, of Jersey City, N. J., and the talking contacts are belt-and-gear-driven by a 1-hp, 110-volt Wagner motor shown in Fig. 3. The other motors required are of about  $\frac{1}{8}$ -hp rating each. The sign is operated nightly from dusk until 11:30 p.m. and has never been out of commission an hour in about a year's service. Energy is supplied by the Montreal Light, Heat & Power Company, and representative consumptions are 2210 kw-hr. for April, 1914, and 3310 kw-hr. for January, 1914. One attendant is required each evening, and general oversight is exercised by Mr. F. J. Dowling, chief electrician of the Ontario company. The sign was designed and built by the Denis Advertising Signs, Ltd., Montreal, P. Q.



FIG. 3—CONTACT-MAKER ROOM

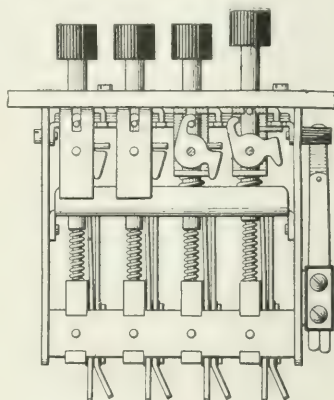
## RECENT TELEPHONE PATENTS

## New Apparatus

A volume-augmenting device is described in a patent granted to Mr. M. E. Pearson, of Seattle, Wash. Numerous small diaphragms are used to close apertures in one side of a fluid container, while a large diaphragm closes an aperture on the other side. The small diaphragms connect with microphone buttons, while the large diaphragm receives the vibrations to be transmitted. The deflection of the small diaphragms is augmented because of the relatively large displacement of fluid during the vibration of the large diaphragm.

A folding antiseptic device has been invented by Mr. C. Russell, of Columbus, Ohio. A liner for the mouthpiece carries at its small end an antiseptic soaked mass of fibrous material, while a folded collapsing cone of paper projects from the open end of the liner to form a trumpet to receive the lips of the user.

Many types of gang keys for ringing and other purposes to indicate the last element operated have been invented. One popular method of indication is to keep the last-operated member slightly depressed. Mr. E. B. Craft has devised a method whereby the last element used is elevated. The operation of any key push de-



INDICATING RINGING KEY

presses all other pushes slightly and locks them. It alone, therefore, returns to the full limit when released. The cut shows a view of the key the patent for which has been assigned to the Western Electric Company.

Mr. G. L. Hughes, of Chicago, has invented a gang switch which is operated by an electromagnet. The various switch springs are mounted in rows upon both sides of a middle spacing strip of insulating material. The pairs of springs have platinum contacts set opposite each other. An electromagnet drives a wedge between the opposing rows of springs, and this wedge carries the necessary contactors.

A patent for a protector mounting has been granted to Mr. Frank B. Cook. A cylindrical insulator carries spring clips for fuses and carbons. A metal nut embedded in the insulator affords a means of attaching the insulator to the base plate. Short nibs from the sheet-metal base piece are raised up to engage the insulator and prevent it from turning about the central mounting screw.

A patent recently issued to Mr. W. W. Dean, of Chicago, describes the structural details of a special design of a harmonic-polarized bell using a signal gong. This patent has been assigned to the Kellogg Switchboard & Supply Company.



## Letters to the Editors

### Sale of American Electrical Supplies in Cuba

*To the Editors of the Electrical World:*

SIRS:—In further discussion of the topic of "Development of Foreign Trade," touched upon editorially in the *Electrical World* of June 13, following the report of Mr. Maurice Oudin's address before the foreign trade convention as reported in your issue of June 6, I believe I can throw some light on conditions connected with the sale of American electrical devices in Cuba.

This island republic, with its 180, or more, sugar mills (all large users of electrical supplies), should be a good customer of American manufacturers. And in addition there is the very rapidly developing field of the small central stations being installed almost monthly—one might say—throughout Cuba. Of the electrical supplies consumed in Cuba, however, a great number, especially incandescent and arc lamps, lamp cord, wire, etc., are made in Germany. Oil engines are also going in, but these are usually German, Swiss or Swedish.

I do not pretend to analyze the question. But let us take an example. The German and American manufacturers were, I believe, developing the nitrogen-filled lamp about the same time. But here in Cuba German nitrogen-filled lamps with ratings all the way from 300 watts to 2000 watts in all the standard voltages were on the retail market and were being snapped up by progressive engineers as early as last December. The agents in Cuba had trouble in filling all their orders, yet at this time American manufacturers were not yet selling these lamps. Only a few sizes had been developed, and lives of 400 or 500 burning hours were all that the makers could then promise. Meanwhile the German lamps were being guaranteed for 800 hours. I used some of the German lamps more than 1000 hours with no burn-outs and no appreciable dimming. My point, therefore, is that these German nitrogen-filled lamps are now fairly well known in Cuba and it is going to be hard indeed to replace them with American lamps.

The same thing happened with the flame-arc lamps when those illuminants were first developed. Thousands of dollars' worth of German flame-arc lamps were sold and are still used.

I know that we Americans pride ourselves on being hustlers, but in some of the items that do not run into big figures in single units we overlook the large field for renewals, and as a result other countries are getting the business which should rightly go to America.

Tuivucu, Cuba.

FRANK H. JONES.

### A Standard Distributing Voltage for China

*To the Editors of the Electrical World:*

SIRS:—At a meeting of the Engineering Society of China held early in the year a committee was appointed to consider the question of standardization of a system or systems of electricity supply in China with a view to placing recommendations before the proper government authorities, officials of foreign settlements, holders (present and prospective) of concessions for the supply of electricity, and the various engineering firms concerned. In view of the multiplicity of voltages, frequencies and systems in use in other countries, it then seemed both desirable and possible to choose a single low-tension system for domestic distribution, and one, or a relatively few, standard systems for generation and transmission.

If the committee succeeds in obtaining official recognition of such a single standard system—and there is

every prospect that it will—the following advantages will be secured:

(1) Buyers of electrical equipment will receive bids on a comparable basis. (2) There will be secured the possibility of interconnecting different systems and the consequent use of large generating systems, a condition quite unfeasible in many of the larger European cities. (3) The variety of electrical stock, such as lamps, meters, motors, transformers and general supplies, to be kept at the supply centers will be minimized. (4) Consumers' appliances will be rendered interchangeable.

The committee, after several meetings, arrived at the following decisions and recommendations:

(1) That generation and distribution generally shall be on a three-phase system at fifty or sixty cycles per second.

(2) That distribution shall be carried out generally on the four-wire, three-phase system with grounded neutral at a pressure of 250 volts between one-phase and neutral, that is, 440 volts (approximately) between phases.

(3) That the standard pressure for domestic lighting and similar supply shall be 250 volts.

(4) That when it is not desirable or economical to use a four-wire, three-phase supply, then a three-wire system with neutral grounded or a two-wire system with one side grounded shall be adopted, in all cases the pressure to ground being 250 volts.

(5) That the use of direct-current systems shall be discouraged and they shall not be allowed for systems involving either over 50 kw in rating or having feeders of over a half mile in length.

(6) That no fuses or switches shall be allowed in the neutral wire.

(7) That where direct-current systems are essential the generation and distribution shall be on the three-wire system at 500 volts between outers, the neutral being grounded.

In connection with the above recommendations it may be said that the committee was unanimous with regard to the method of distribution on the four-wire, three-phase system as most suited to Chinese cities.

A majority was in favor of 250 volts pressure (i.e., between one phase and neutral) on the customer's premises, those members operating systems of 200 volts and upward being of the opinion that the higher pressure of 250 volts would involve practically no additional risk, but would be distinctly advantageous as regards economy in copper, regulation, etc. The system would also allow the use of 440-volt motors on the lighting mains, and thus render unnecessary the use of different mains for lighting and for motors. This in Chinese cities would be prohibitive on account of first costs, on account of the relatively low prices that could be obtained for electric energy, and also on account of the fact that motor loads are very scattered. The American and French representatives were opposed to a maximum pressure on the secondary side higher than 250 volts, i. e., 125 volts to neutral.

Little trouble in the regulation of lighting due to interference of motor loads is anticipated, as it is found by experience that these loads generally do not coincide. The decision to allow both fifty cycles and sixty cycles as standard frequencies was arrived at in view of the fact that a single standard of fifty cycle would not receive support from American manufacturers, and the use of sixty cycles would allow of cheaper plants where first cost is of paramount importance.

R. A. WILLIAMS,

Secretary Electricity Standardization Committee of the Engineering Society of China.

Shanghai, China.

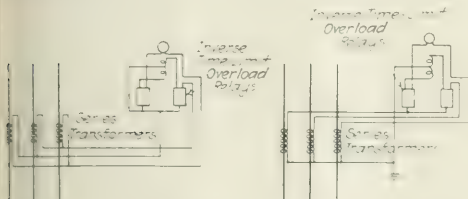
# Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

## Star Connection of Series Transformers

By J. G. KOPPEL

In the erection of a 25,000-volt, three-phase substation which was completed recently, series transformers connected in delta were employed to operate the inverse time-limit overload relays. Not long after the installation the insulation between the primary and



DELTA AND STAR-CONNECTED SERIES TRANSFORMERS

secondary windings of one of the current transformers broke down, allowing the high-potential energy to go to ground through the relay whose casing had been purposely grounded. The relay was destroyed by the discharge. To prevent any repetition of this trouble the transformers were reconnected in star as shown, the neutral point being grounded. As similar trouble did not again occur, the star arrangement is considered the safer method of connecting the apparatus.

## Weathering of Coal and Its Effect on Heating Value

Contrary to the common belief, coal does not suffer serious losses when exposed to the elements. Exhaustive tests and researches have been made by the Uni-

WEATHERING TESTS OF COAL

	Ash	Sulphur	Lib. Fahr. Heat Units	Heat Units Referred to Actual Weight of Coal	Lib. Fahr. Heat Units	Decrease, per Cent.
Test in exposed bins						
Same day as mined	15.26	4.03	12,224	14,787		
Seven days after mining	15.13	3.53	12,164	14,666	121	.82
Two months after mining	15.68	3.61	12,024	14,606	181	1.22
Six months after mining	14.96	3.36	12,081	14,525	262	1.77
One year after mining	14.33	3.29	12,065	14,379	408	2.76
Test in covered bins						
Same day as mined	15.26	4.03	12,224	14,787		
Seven days after mining	15.13	3.53	12,164	14,666	121	.82
Two months after mining	15.07	3.53	12,128	14,505	182	1.22
Six months after mining	14.42	3.37	12,103	14,453	334	2.26
One year after mining	14.77	3.57	11,945	14,323	464	3.14
Test under water						
Same day as mined	15.26	4.03	12,224	14,787		
Same day as submerged	15.13	3.53	12,164	14,666	121	.82
Six months after mining	15.84	3.69	11,937	14,532	225	1.75
One year after mining	15.02	3.81	12,090	11,967	220	1.49

versity of Illinois and the Bureau of Mines, and the bulletins issued indicate that the calorific loss in coal exposed to the open air for one year or more is not

sufficiently great to make such open-air storage of coal prohibitive. Referring particularly to a series of tests conducted by Prof. S. W. Parr and Mr. W. F. Wheeler, of the University of Illinois, the following is taken from their conclusions:

"Coal of the type found in Illinois and neighboring states is not affected seriously during storage when only the change in weight and losses in heating power are considered. The changes in weight may be either gains or losses of probably never over 2 per cent in a period of one year. The heating value decreases most rapidly during the first week after mining and continues to decrease more and more slowly for an indefinite time. In the coals that have been tested 1 per cent is about the average loss for the first week and 3 to 3.5 per cent would cover the losses for a year."

For reference a table of values showing the results of six weathering tests of Vermilion, Williamson and Sangamon (Ill.) nut and screenings is shown.

## A New Thermoscope

By F. A. J. FITZGERALD

In a paper on "A New Automatic Fire Alarm" published in the *Journal of Franklin Institute*, November, 1913, the writer described an invention of Mr. Garretson, which consists in the use of a substance having a negative temperature coefficient as a thermoscope. This apparatus has been the subject of a large amount of research work in the laboratories with which the writer is connected, with the object of producing a commercial thermoscope for various purposes, and since the paper mentioned above was published further developments of some interest have been made.

The so-called thermitite, which is used in making the thermoscopes, is a preparation of silver sulphide which has a very large negative temperature coefficient of electrical resistivity. To give some notion of its behavior as a resistor the curves in Fig. 1 may be referred to. These were obtained by the measurement of a rod of thermitite with threaded ends to which silver terminals were screwed. The electric current was supplied from a small induction coil, and the thermitite formed one arm of a Wheatstone bridge, a telephone receiver being used to find when a balance was obtained. The rod was immersed in an oil bath which was heated by means of a current passed through a nichrome resistor.

The temperature-resistance curve is drawn in two scales, the first showing the change in resistance between 19 deg. and 150 deg., and the second, a large-scale curve, showing the change in resistance between 140 deg. and 166 deg. This is done in order to show the curious change in the curve which occurs somewhere between 157 deg. and 162 deg. This sudden change of resistance in the thermitite is very characteristic and is of considerable practical importance, as will appear later.

In this determination of the resistance of thermitite we may safely assume that the resistances correspond-



ing to the various temperatures are approximately correct, for the temperatures of the oil bath probably represent fairly accurately the temperature of the thermitite rod. When, however, the thermoscopes themselves are used for resistance tests, it is no longer safe to assume that the temperature as indicated by a thermometer in the oil bath or oven in which the thermoscope is placed gives the true temperature of the thermitite. The reason for this is that while the testing current is too small to have any appreciable heating effect on a relatively massive rod of thermitite, it has a distinct effect in the case of the thin strips of thermitite used in the thermoscopes.

The thermoscopes are made by mounting a strip of thermitite about 0.5 mm thick, 5 mm wide and 5 mm to 10 mm long in a suitable holder. For use in places where it is desired to indicate the existence of a high temperature the thermoscope is placed in a circuit provided with an alternating current, and in the same circuit an 80-ohm drop is placed where the indication of an excessive temperature is to be given. The 80-ohm drop works with a current of about 30 milliamp, but the resistance of the thermoscope is so enormously high at ordinary temperatures that no appreciable current passes. If, however, the temperature of the thermoscope is raised, its resistance decreases and the resulting increase in current tends to raise its temperature still more, till finally the point is reached where sufficient current passes to work the drop.

The first use to which the thermoscopes were put was in fire-alarm circuits, but recently thermoscopes have been constructed for use as hot-bearing alarms and for indicating excessive temperatures in cable conduits and transformers.

The diagram of Fig. 2 illustrates the use of the thermoscope as a hot-bearing alarm. In the diagram, *B* represents the bearing fitted with the thermoscope *T*, connected in the circuit from the transformer *G*, which also includes the drop *R* and the alarm gong *A*. The

board, but the same bell and transformer are used for the whole installation.

For use as an alarm in cable conduits the thermoscope is in the form of a brass cylinder which can be drawn into the conduit where desired, with, of course, the

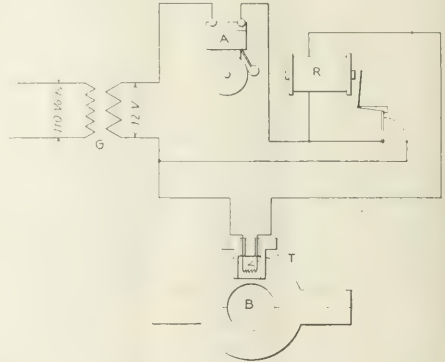


FIG. 2—THERMOSCOPE AS HOT-BEARING ALARM

wires attached for connecting the thermoscope in its circuit.

In the case of oil-cooled or water-cooled transformers the thermoscope is in the form of a small cylindrical brass box which can be placed in the oil at whatever point it is desirable to keep under observation.

As regards the temperature at which the thermoscopes work, this can be made anything desired. In a recently constructed thermoscope for transformers the

FIRE-ALARM-TEST RESULTS WITH NEW THERMOSCOPE

Volt.	Temperature, C	Temperature, Fahr.
15	70 deg.	158 deg.
20	58 deg.	136 deg.
25	46 deg.	115 deg.
30	39 deg.	102 deg.

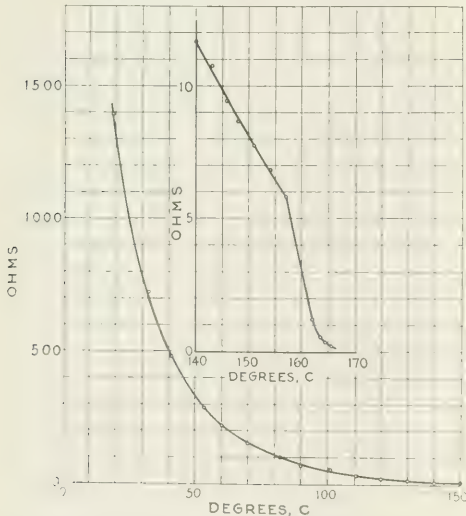


FIG. 1—RESISTANCE CHARACTERISTICS OF THERMITITE

thermoscope is made of brass and threaded so that it may be screwed into the bearing. Where several bearings have to be watched a separate circuit is used for each thermoscope and its corresponding drop, the several drops being mounted as on a telephone switch-

board, but the same bell and transformer are used for the whole installation. When they are connected in parallel and subjected to a certain alternating emf, what is the resultant value of the core flux?

### Transformer Coils in Parallel

A transformer core is wound with two separate coils of the same size and kind of wire, but one has 300 turns and the other has 400 turns. When they are connected in parallel and subjected to a certain alternating emf, what is the resultant value of the core flux?

H. M.

When the coils are operated separately the currents in the two coils tend to produce different values of flux, the larger flux being produced in the coil with the smaller number of turns. When the coils are connected in parallel there is produced a local circulating current which so varies the excitation that the resultant magnetomotive force assumes such a value that the core flux is equivalent to that due to a coil of about 350 turns—the average of the two coils. The value of the resultant core flux is much too large for one coil and too small for the other, and the local circulating current is usually heavy enough to destroy one or both coils.

# Digest of Current Electrical Literature

## Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

### Generators, Motors and Transformers

**Differential Method of Testing Transformers.**—A. E. LAYTON.—One great drawback to the ordinary Sumpter test and its modifications is due to the fact that in addition to the main supply an auxiliary transformer is required, which must be of the correct capacity as regards both current and pressure. The method devel-

can be tested under full-load conditions with one-tenth of the full-load volt-ampere rating of one of the transformers. For a transformation ratio of five to one the consumption is one-fifth and so on. The connections shown in Fig. 1 are those for a temperature test, which is exceedingly simple to carry out by this method. If

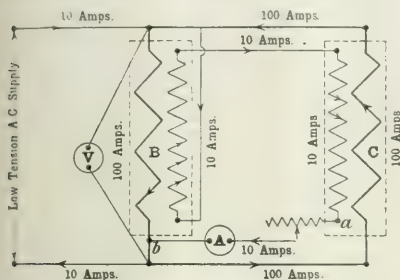


FIG. 1—CONNECTIONS FOR HEATING TEST

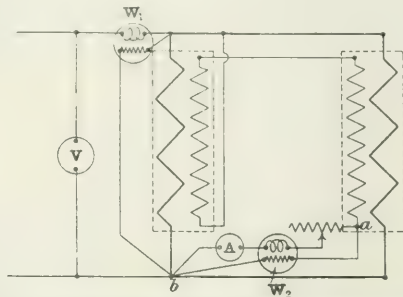


FIG. 2—EFFICIENCY TEST ON TWO TRANSFORMERS

oped by the author requires but one source of supply and is exceedingly easy to carry out. With small ratios of transformation the method can be employed to test a number of transformers at the same time, thus affording a considerable economy in works testing. The diagram of connections for the author's test on two similar transformers is shown in Fig. 1. The two secondary windings are connected in parallel and energized at the correct pressure and frequency. The primary windings (high-tension) are connected in opposition and in series with an adjustable resistance across the secondary terminals of the transformers as shown. The current which flows in the high-tension windings is, therefore, due to the pressure supplied to the low-tension coils. Its value depends upon the leakage impedance of the two transformers in series, together with the impedance of the connections from *a* to *b*. The maximum possible current is obtained when *a* and *b* are short-circuited. Under this condition the current in the high-tension windings is given by dividing the applied secondary pressure by the series leakage impedance of the two transformers. For example, with two transformers each having a leakage impedance of 3 per cent for a transformation ratio of 100/6, normal full-load current would circulate in the high-tension windings when *a* and *b* are short-circuited. For a greater transformation ratio it would be impossible to obtain full-load current with a leakage impedance of 3 per cent or more. To apply the test in such a case it is only necessary to alter the transformation ratio to one-half its normal value, by splitting up the primary into two groups and connecting them in parallel; the current per circuit must, of course, be kept at its normal value and the total current doubled. Neglecting the magnetizing current the total volt-ampereage required for the test is given by the product of the primary high-tension current in amperes and the secondary volts. Hence for a transformation ratio of ten to one, two transformers

necessary the efficiency can be determined at the same time by introducing wattmeters to measure the losses in the transformers. To do this two wattmeters  $W_1$  and  $W_2$  (Fig. 2) are necessary. The first ( $W_1$ ) gives the total power supplied to the system, the second ( $W_2$ ) gives the power wasted in the path from *a* to *b*, including the loss in the ammeter and series coils of the wattmeter. The difference  $W_1 - W_2$  gives the actual transformer losses obtained. Details are given of the experimental results obtained with this method in several specific cases where it was tried.—*London Electrician*, July 10, 1914.

**General Transformer.**—H. KAFKA.—The first part of a mathematical paper on the construction of the exact circular diagrams for the polyphase induction motor (the "general transformer") from the ordinary Heyland diagram.—*Elek. u. Masch.* (Vienna), July 12, 1914.

### Lamps and Lighting

**Electric Lighting for Workmen's Houses.**—LAMPL.—The author emphasizes that it is important for central stations to try to introduce on a large scale electric lamps into workmen's houses. Even if gas for cooking is considered a luxury in such houses, electric lighting will be able to compete with the kerosene lamp, but to encourage this development it is necessary to make the wiring installation as inexpensive as possible, to exchange lamps free, and to employ a flat rate with weekly payments. The experience obtained in the English city of Wednesbury is discussed.—*Elek. Zeit.*, June 18, 1914.

**Electricity and Gas.**—E. WIKANDER.—The author discusses how the present competition between electricity and gas may be rendered less sharp. He urges that electricity be pushed for lighting and gas for heating and cooking. Electric lighting should compete with the kerosene lamp and should displace it completely in cities.—*Elek. Zeit.*, June 25, 1914.



## Traction

*Traction Efficiency of Direct-Current Systems.*—J. LISKA.—The conclusion of his illustrated article on the effect of the motor characteristics on the traction efficiency of direct-current traction systems. In the present instalment the author discusses the motor with saturated iron, the motor with weakening of the field, and the shunt motor, and sums up the results for the different types of motors in a series of curves.—*Elek. u. Masch.* (Vienna), July 12, 1914.

## Installations, Systems and Appliances

*Direct-Current Motor Starters.*—An illustrated description of a new compression-type direct-current motor starter of Ferranti. The whole of the resistance material remains in circuit throughout the process of starting up. A perfectly even reduction of resistance is obtained, and hence there is no sparking except when the circuit is finally broken on the first contact when stopping the motor. The resistance will stand a temperature up to 1200 deg. Fahr. without the slightest injury. All connections are accessible from the front. Replacement of the unit can be carried out on the site at a low cost and is the work of a few minutes only. The resistance element of the starter consists of a column of graphite and nickel disks interspersed, contained in a tube of special heat-resisting insulating material which is inclosed in a steel case. The complete resistance is mounted on the back of an iron face-plate, and compression of the column of disks is effected by a powerful system of toggle-levers connected to the operating lever.—*London Electrician*, July 3, 1914.

*Switching Phenomena.*—W. LINKE.—The first part of a paper in which the author gives a review of the switching phenomena occurring with electric machines and transformers. Avoiding a mathematical treatment, the author emphasizes the physical explanation of switching phenomena with the aid of oscillograms. The disadvantages and dangers of switching processes and the means of making them harmless are discussed. Two types of switching phenomena are distinguished. The first, comprising essentially rises of currents, occurs at approximately normal frequency. The second type, comprising essentially dangerous rises of voltage, occurs at a much higher frequency. In the present instalment the author discusses the phenomena in switching in an inductance without or with iron, switching in a transformer, switching off inductances or transformers, and switching in three-phase windings like the stators of three-phase motors while the rotor is open. The article is to be continued.—*Elek. Zeit.*, July 2, 1914.

*Electric Equipment of Dock.*—An illustrated article on the electric equipment of the new joint dock at Hull, which is the first in Great Britain to be operated entirely by electricity. The whole of the energy required is obtained from the lines of the Hull municipal station. The dock was erected jointly by the North Eastern Railway Company and the Hull & Barnsley Railway Company.—*London Electrician*, June 26, 1914.

## Wires, Wiring and Conduits

*Electric Mains Explosions.*—The report of a committee, consisting of Messrs. T. E. Thorpe, R. Nelson, W. Slingo, J. Swinburn and A. P. Trotter, appointed to consider the cause of the explosions which had occurred in connection with the use of bitumen in laying mains at Nottingham, Hebburn and elsewhere, and to suggest any steps which should be taken to prevent explosions in future from the use of this or similar substances. The conclusions of the committee are as follows: The committee finds that the explosions to which its atten-

tion has been directed have occurred in connection with electric supply by continuous current through separate cables, for the most part insulated with vulcanized bitumen and either drawn into bitumen casing or laid solid in troughs filled with bitumen. The committee finds that no serious explosions have occurred where the supply has been by alternating current, or where concentric or three-core or lead-covered paper-insulated cables have been used, or where cables have been laid solid in pitch compound; but a direct comparison between bitumen and pitch compound cannot be made as the former material has been more extensively used than the latter. In view of the small number of serious accidents which have occurred, compared with the large extent to which vulcanized bitumen cables laid solid in bitumen have been used, the committee is unable to recommend the board of trade to discontinue to approve of this system. In view of conflicting opinions of witnesses the committee cannot recommend that iron or stoneware troughing should be used to the exclusion of wood, but it recommends that wood troughing should be used only where it can be ascertained that the soil is suitable; that where separate mains are laid in troughing each cable should be laid in a separate trough, and that between the troughs there should be a space not less than 2 in. tightly packed with earth or sand. The committee recommends: (1) that separate mains for continuous-current supply should not be laid on the solid system below impervious pavements or close to the walls of houses; (2) that easy bends should be laid at corners and the bitumen or pitch compound should be poured after the straight lengths have cooled; (3) that where sharp corners of troughing are suspected to exist the mains should be opened up and the corners eased; (4) services should be taken into houses (preferably by the use of armored cables) in such a manner that gas can not enter.—*London Electrician*, July 10, 1914.

## Electrophysics and Magnetism

*Disintegration of Ion Cluster in a Gas Under Influence of Electric Field.*—R. D. KLEEMAN.—An account of an experimental investigation the chief results of which are as follows: Experimental evidence was obtained that the negative-ion clusters in a gas are gradually disintegrated through bombardment by neutral molecules, and consequently a condition of equilibrium is that the free negative ions shall gradually form clusters. The average period of life of a negative-ion cluster in air at atmospheric pressure, not specially dried, was calculated to be  $4.2 \times 10^{-7}$  sec. and that of an elementary negative ion  $1.1 \times 10^{-8}$  sec. The corresponding periods of life in CO<sub>2</sub> were shown to be of the same order of magnitude. Evidence was also obtained that the velocity of a negative-ion cluster is greater than proportional to the electric field whose order of magnitude is the same as that readily producing ionization by collision. This is the case in air not specially dried, for values of  $X/p$  equal to 173 and higher, where  $X$  denotes the electric field per centimeter and  $p$  the pressure of the gas in millimeters of mercury. The negative-ion clusters in a gas are disintegrated by an electric field if of sufficient strength through the velocity given to the clusters, the field being of the same order of magnitude as that producing ionization by collision. The magnitude of the effect, like ionization by collision, gradually increases with increase of electric field, which is best shown by curves. It may be stated, however, that the clusters are disintegrated in the case of air, CO<sub>2</sub> and H<sub>2</sub>, when  $X/p$  has respective values of approximately 320, 640, 53 and higher. It may happen that for a certain pressure of the gas and intensity of electric field the chance of a negative-ion cluster's getting broken up in passing over a given di-

ance is less than the chance of a positive ion's producing a new ion by collision. The number of different clusters in a gas is to a certain extent indicated by the kinks on a curve. It appears that the majority of negative clusters consist of one kind only. The kinks in the curve enable us to obtain the mean free path of disintegration of a cluster under the conditions of the experiment, that is, the distance a cluster has to run under the electric field before getting disintegrated. Thus, when the disintegration was due to the effect of the electric field, the mean free path was 0.5 cm in the gases  $\text{CO}_2$  and  $\text{H}_2$ , corresponding to pressures of 4 mm and 15 mm of mercury, and the fields 3720 volts and 160 volts per cm. A theoretical formula for the mean free path of disintegration was deduced.—*Philos. Mag.*, June 19, 1914.

#### Units, Measurements and Instruments

**Electro-Cardiography.**—An illustrated account of recent progress in the study of heart diseases by electrical means as developed especially by Einthoven. The chief part of the apparatus is a special form of Einthoven galvanometer. Its essential feature is a fine silvered glass fiber or "string" about 0.002 mm in diameter contained in a dust-tight metal case *E* and placed between the poles *AA* of a powerful electromagnet (Fig. 3). The field coils *BB* of the galvanometer are wound in two sections and brought up to two sets of terminals, *MN*, on the top of the galvanometer. In his way series or parallel connections may be used, and one galvanometer is available for operations on two pressures, say 110 volts and 220 volts. Field coils for 10 and 20 volts, direct current, for operation from accumulators are also made, the consumption on normal voltage being approximately 60 watts. The sensitivity of the galvanometer may be varied within wide limits by increasing or decreasing the tension on the gal-

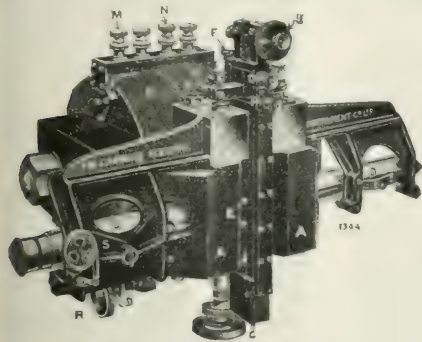


FIG. 3—STRING GALVANOMETER

vanometer string by means of the screw *J*; increase of tension causes decrease in sensitivity and vice versa. An important feature of the Einthoven galvanometer is that varying the sensitivity does not affect the damping, the movements of the string being dead-beat under all working conditions. The currents due to the activity of the heart are made to pass through the conducting string of the galvanometer and the resulting deflections are magnified about 600 times by means of a microscope *GD*. These deflections are photographically recorded on a moving sensitized plate or bromide paper. Owing to its extremely small weight and short period, the string, when properly adjusted, responds accurately to very rapid variations of current without either "overshooting" on the one hand or "lag" on the other, so that each deflection gives a true indication of the

instantaneous emf values. The record of the movements of the string is known as an electrocardiogram. The arrangement of the auxiliary apparatus is also described and some typical electrocardiograms are shown. One of the advantages of the electrocardiographic method of studying the heart is that the patient may be at a considerable distance from the instrument, all that is required being a length of cable to connect the patient to the galvanometer. In hospitals it is often the practice to run small three-wire cables permanently between each ward and the electrocardiograph room; this obviates the necessity of moving the patient (which is frequently inadmissible) and makes it easily possible to obtain records from patients in any part of the hospital.—*London Electrician*, June 26, 1914.

**Thermo-Element.**—An illustrated description of a quick-acting thermo-element of J. H. Mott, based on the principle that the radiation should fall upon as broad a surface as possible. The thermo-element is composed of a large number of metal strips constructed as shown in Fig. 4. There *ab* is a strip of constantan,



FIG. 4—THERMO-ELEMENT

*bc* is a strip of copper and the ends *a* and *c* are soldered to copper bars *e* and *f*. The whole surface of the constantan-copper strips is exposed to the radiation, whereby, as a result of the greatly different heat capacities of the two soldering points, *b* is heated to a higher temperature than *a*. On account of the good heat conductivity between the soldering points temperature equilibrium is obtained after a very short time. Since constantan and copper have different heat conductivities the thickness and length of the two metallic strips are chosen so as to be different and in such ratio that during the radiation the temperature of the metallic strip is a maximum in *b*. This thermo-element is five times faster in action than that of Rubens.—*Elek. Anz.*, June 11, 1914.

**Measuring Small Losses in High-Frequency Systems.**—A. HUND.—An abstract of a thesis presented to the Institution of Technology of Karlsruhe. The method of the differential transformer developed by Hausrath for measuring audible frequencies is applied by the author to investigating high-frequency currents. The principle of the differential transformer is that it is arranged with one secondary coil around which are wound two identical primary coils, the current passing through them in opposite direction. These primary coils always have the same effective resistance, the same effective self-inductance, and the same mutual inductance. If an alternating current is impressed on two circuits in parallel each containing one of the primary windings, there will be no current in the secondary coil if the currents in the two branch circuits of the primary have the same intensity and phase. The author describes the difficulties which had to be overcome in the application of this method to high-frequency currents. The arrangement of his method is described and illustrated and it is stated that it is very suitable for determining the losses in condensers, the high-frequency resistance of coils, etc.—*Elek. Zeit.*, June 18, 1914.

**Magnetograph.**—F. E. SMITH.—A brief note on a (British) Physical Society paper on a magnetograph for measuring variations in the horizontal intensity of the earth's magnetic field. In the case of unifilar instruments for recording variations in *H*, if  $\theta$  is the



angle which the magnetic system makes with the magnetic meridian,  $M$  the moment of the magnet, and  $H$  the horizontal intensity of the earth's field, equilibrium results when  $MH \sin \theta = T \Phi$ , where  $\Phi$  is the torsion on the fiber and  $T$  is a constant. In the instrument described  $\Phi$  may be made great or small, but high sensitiveness is secured by making  $\Phi$  great. The magnet system is supported by a quartz fiber, and a periodic damping is obtained by means of an aluminum vane and two parallel damping plates. To diminish the sensitiveness the effective length of the fiber may be reduced. The general usefulness of the instrument is illustrated by photographic records, which show the instrumental peculiarities to be very small, and indicate that unless the system is aperiodic increased difficulty must result in the interpretation of the records. An over-damped system responds but slightly to rapid pulsations in  $H$ , but follows the slow changes which are common all over the world. The general sensitiveness of the records is about 3 mm for a change in  $H$  of 0.00001 c.g.s. unit, but one record shows a displacement of 8 mm for such a change.—*London Electrician*, July 3, 1914.

#### Telegraphy, Telephony and Signals

*Telephone Transmission Lines*.—A note on a recent British patent (No. 18,018, 1913) of the Western Electric Company and F. T. Woodward for a method of constructing an artificial line to correspond with, or balance, a loaded transmission line. The principle upon which the method depends may be stated thus: the impedance of a long, periodically loaded transmission line, beginning at the fractional part 0.17 to 0.20 section, may be approximated to, at frequencies below the critical frequency, by a three-branch network consisting of a constant resistance in series with a combination consisting of a capacity in parallel with a high time-constant inductance. If  $L$  and  $C$  are the inductance and capacity, respectively, of the transmission line, the values of the resistance, inductance and the capacity of the artificial line should be  $\sqrt{L/C}$ ,  $0.3L$ , and  $0.53C$  respectively. Further particulars are given to suit cases where the loaded line does not begin at about 0.2 section.—*London Elec. Eng'ing*, June 25, 1914.

*Telephone Transformer*.—EUGENE C. HELWIG.—An account of an experimental investigation the object of which was to show the effects of the iron core on the secondary current of a telephone transformer. A new method of investigation was developed and the following conclusions were reached by the author: The value and effect of the eddy currents produced in the iron-wire core are very much greater than is generally supposed, and their effect upon the secondary current wave-form in the telephone transformer should not be neglected. In order to eliminate the effect these eddy currents produce upon the secondary wave-form, it is necessary only to design the core in such a manner that the eddy currents produced in it will have the same wave-form as the current produced in the secondary winding. In order to accomplish this, the equivalent resistance, self-inductance and mutual inductance between the eddy-current circuit and the primary circuit should be equal to the corresponding constants of the secondary circuit. In a transformer thus designed the value of the secondary current at any time would be less than the value of the current in the secondary of a transformer having the same circuit constants and no iron core, but the wave-forms would be identical. The reduction in the amount of energy transformed from the primary circuit into the secondary circuit in a transformer with an iron core, as compared with the amount of energy transformed in a transformer having the same circuit constants but no iron core, is

a matter of small importance compared with the necessity of reproducing the primary wave-form in the secondary. From his results the author concludes that his method of improving telephone transformers is the only practical one.—*Rensselaer Polytechnic Institute, Engineering and Science Series*, No. 6, 1914.

*Cable Steamer*.—An illustrated description of the new cable steamer *Edouard Jeramec* built for the Compagnie Française des Câbles Télégraphiques is given, including a detailed account of the cable machinery and gear.—*London Electrician*, July 3, 1914.

## Book Reviews

THE PRINCIPLES OF AUTOMATIC TELEPHONY. By Walter Atkins. London, England: The *Electrician* Printing & Publishing Company, Ltd. 48 pages, 32 illus. Price, 2 shillings.

A little book treating in some detail the principles underlying automatically operated telephony as practised in Great Britain according to the Strowger and Lorimer systems. By use of a number of clear diagrams and photographs the author presents enough of the fundamentals to give the reader a fair idea of the several common types of selecting, calling and talking apparatus, together with their circuits. The book should prove interesting and valuable to anyone who desires a simple presentation of the basis upon which this branch of wire telephony is being extended.

ELEMENTARY STATICS. A Supplement to Franklin and MacNutt's "Mechanics and Heat." South Bethlehem, Pa.: Franklin, MacNutt & Charles. 48 pages. 65 illus. Price, 50 cents.

A supplementary annex to a textbook on mechanics and heat. The treatment is essentially physical and intended to develop physical conceptions in the mind of the student concerning the statical phenomena analyzed. That is to say, the method of teaching is based on the development of physical concepts rather than on mathematical concepts. Incidentally, some very practical cases of statics in every-day student life are analyzed. To those who believe in this method of presentation the pamphlet will be welcome. The number of problems presented and discussed makes the pamphlet thoroughly practical for classroom use in the teaching of elementary statics.

HOW TO BUILD UP FURNACE EFFICIENCY. By Jos. W. Hays. Published by the author at Rogers Park Chicago, Ill. 126 pages, illus. Price, \$1.

This is the seventh edition of a work that represents an attempt to omit technical language and to write something about furnace losses and efficiency that an reader may understand. The author succeeds admirably. To accomplish this he has adopted a colloquial style that serves to drive home the fundamental truth relating to the efficiency of combustion in boiler furnaces. His wide experience in ferreting out the cause of low efficiency and devising methods of correcting such faults have given him familiarity with his subject, and this is evidenced by the directness, clearness and certainty with which he writes. The book first takes up the various causes of reduced furnace efficiency and then proceeds to show how that efficiency may be raised again to normal. Much of the information contained in the book has been presented before, but is safe to say that even the most familiar facts will carry a new significance to the reader because of the forceful style of the author. Every fireman should have a copy—and read it.

# New Apparatus and Appliances

## An Illustrated Descriptive Record of Recently Developed Manufactured Products of Interest to Electrical Readers

### Electric-Horn Push-Button

A small push-button for use on automobiles, and which can be placed close to the driver's right hand, is being made by the Typhoon Signal Company, Lincoln, Ill. The wiring to the button is concealed in a tube with a

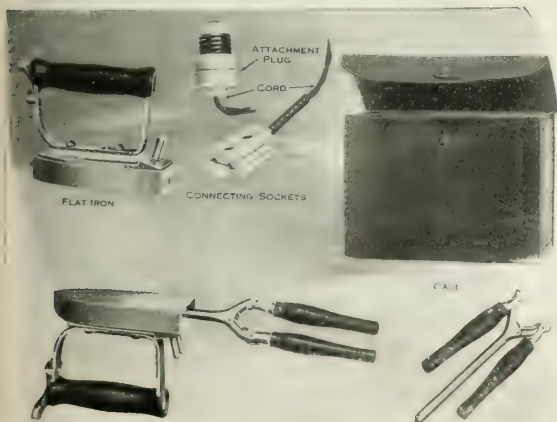


PUSH-BUTTON WIRING FIXTURE

pend near the upper end running alongside the steering column. The tube is fastened to the column by two brackets. At the lower end of the fixture a flexible tube 6 in. long is attached, allowing for offset on the steering post.

### Combination Electric-Heating Set

A combination set consisting of a 2-lb. electric flat-iron (which can also be used to heat water or a curling iron), a cord and plug, a folding curling iron, and a hand-sewed leather case in which the set can be placed when not in use, is being introduced by the Menominee Electric Manufacturing Company, Menominee, Mich.



USED AS CURLING IRON HEATER

COMBINATION ELECTRIC-HEATING SET

The total weight of the set is only 2.75 lb., and the outfit is therefore convenient for traveling. All metal parts are nickel-plated and polished.

### Direct-Current Portable Meters

Direct-current portable ammeters, voltmeters and millivoltmeters of the D'Arsonval type are being made by the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa. These instruments are 5 in. in diameter and are direct-reading. The complete moving



FIG. 1 — PORTABLE VOLTMETER

element is mounted as a unit. An aluminum pointer is used, making it possible to have a light counterweight and therefore a light-weight movement. The scale is made of metal and subtends an arc of 90 deg., giving large open divisions which are uniform throughout. Each meter is mounted in a morocco-covered wood case with heavy beveled glass over the dials. The terminal stud has a V-shaped groove into which the wire lead is inserted; this grooved stud is shown in Fig. 2.

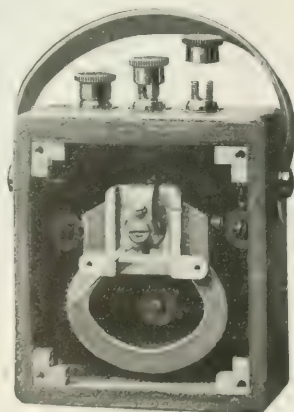
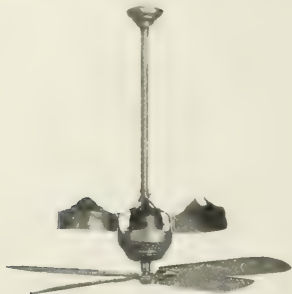


FIG. 2 — PORTABLE VOLTMETER WITH COVER REMOVED



### Ceiling Fan

A 55-watt ceiling fan with motor which can be detached without removing the fan and its support is being placed on the market by the National Motor & Manufacturing Company, Baltimore, Md. In the accompanying illustration is shown the method of re-

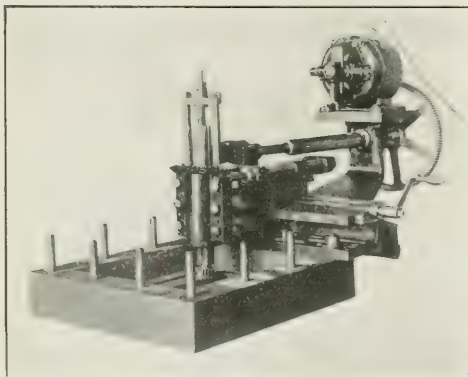


CEILING FAN, SHOWING METHOD OF REMOVING MOTOR

moving the motor through the doors, which are open. The fan may be operated on either alternating current or direct current. For shipping purposes the fan can be easily disassembled.

### Portable Milling Machine

A portable milling machine for milling engine and pump valve-seats and port edge, key-seating shafts, facing pads on large frames, etc., is shown herewith. The machine can also be used as a drill, although not designed for that particular purpose. In the illustration the machine is shown milling the seat and port edges of an engine valve, the method of mounting, by means of bolts through longitudinal slots in the base being clearly shown. The spindle stands clear of the base so that the work is not smothered. The longitudinal travel is 12 in., cross travel 6 in., and vertical adjustment 6 in. Hand adjustment is provided for the



PORTABLE MILLING MACHINE

longitudinal and cross travels in order to avoid the weight and complication necessary with automatic adjustment. This machine is being made by the Pedrick Tool & Machine Company, Philadelphia, Pa., and is operated by a Westinghouse 0.25-hp motor.

### Swivel Attachment Plug

An exploded view of a swivel attachment plug made by the Trumbull Electric Manufacturing Company, Plainville, Conn., is shown herewith. By pressing down



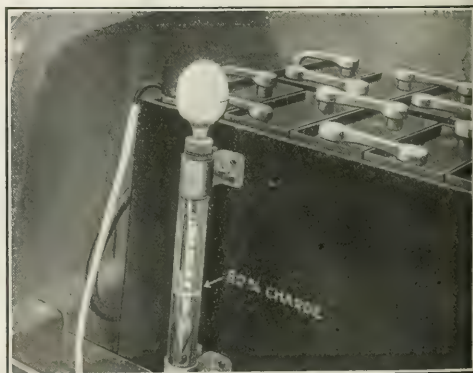
ATTACHMENT PLUG

on the catch marked in the illustration, the bottom of the plug drops out and the device is then open. This catch also acts as a lock.

The plug is made of fireproof material, and, according to the claims of the manufacturer, the operation of wiring it is an easy one.

### Instrument for Indicating Condition of Battery Charge

A so-called "milostat" for indicating the condition of charge of an electric battery at all times is shown in the accompanying illustration. This instrument is in principle a hydrometer, but instead of being graduated for specific-gravity readings, the divisions are made to represent percentages of the acid-density range from full charge to full discharge. If, for instance, the battery is designed to operate the car for 100 miles on one



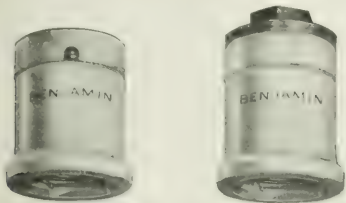
HYDROMETER FOR SHOWING CHARGE OF BATTERY

charge, 100 per cent represents a total distance of 100 miles.

This instrument is being placed on the market by the Fritchle Automobile & Battery Company, Denver, Col.

### Large-Base Sockets for Nitrogen-Filled Tungsten Lamps

As part of an assortment of fixtures for gas-filled tungsten lamps the Benjamin Electric Company, Chicago, Ill., is placing on the market two so-called "mogul" base sockets. These sockets are two-piece porcelain devices and are provided with means for attaching to

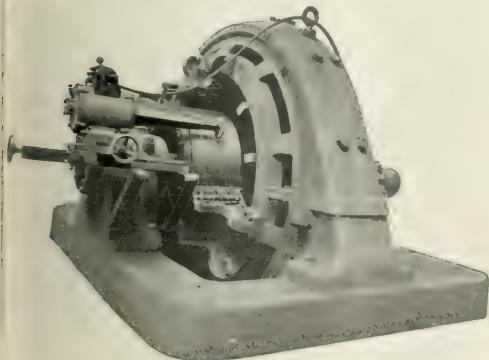


FIGS. 1 AND 2—LARGE-BASE SOCKETS FOR HIGH-CANDLE-POWER TUNGSTEN LAMPS

a flange or surface. The base portion carries the binding terminals, which are easily accessible for wiring. With the socket shown in Fig. 1 wires are brought in through side outlets in the upper part, and with that shown in Fig. 2 through the central opening. The lower portion of these sockets is provided with a shell and bronze-spring center contact, and can be used interchangeably with either socket.

### Commutator-Grinding Machine

A long-snout grinder for commutators attached to a 750-kw rotary converter is shown in the accompanying illustration. The grinder is installed by unloosening the bolts of the bearing cap and inserting a pair of angle irons between the cap and the pedestal. After tightening the bolts again, the slides for the grinder are bolted to the angle irons. When the distance between adjacent brush sets is small, as is the case with fifty-cycle rotary converters, it is necessary to remove one set of brushes. In the illustration the second set has been removed so as not to obstruct the view of the grinding wheel. In special cases this grinder can be used when the machine is in operation; for this operation an insulated grinding wheel is used.

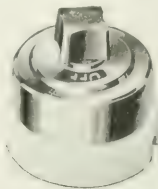


LONG-SNOUT COMMUTATOR GRINDER

This grinding machine is being made by the Witton-Kramer Electric Tool & Hoist Company, Ltd., Witton, Birmingham, England, for which the General Electric Company, 67 Queen Victoria Street, London, England, is sole selling agent.

### Snap Switches

Single-pole, double-pole, three-point, four-point, two-circuit electrolier and three-circuit electrolier snap switches are being placed on the market by the Manhattan Electrical Supply Company, 17 Park Place, New York. The outside diameter of the bases of all these switches is 2 in., and holes for the supporting screws are  $1 \frac{7}{16}$  in. between centers. The ratchet and the



SINGLE-POLE SNAP SWITCH

parts connected to it are attached to the base in such a way, the manufacturers claim, that they cannot become loose or detached in operation. The spring washer on the back of the swivel is constructed so as to take up any wear of the inner switch mechanism resulting from long use. The blade is solidly riveted to the commutator. The driving spring is of large diameter. The brushes are held by flat washers with rectangular holes and are staked in one solid piece. The binding-post screw hole is punched so as to produce a collar which adds to the number of threads through which the screw shank passes. In the illustration herewith is shown a single-pole snap switch with a solid base.

### Electric Crane Controller with Safety Lock

Magnet-switch controllers for single motors or for motors in series, used with cranes of the trolley, bridge or hoist type, are being made by the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa. The

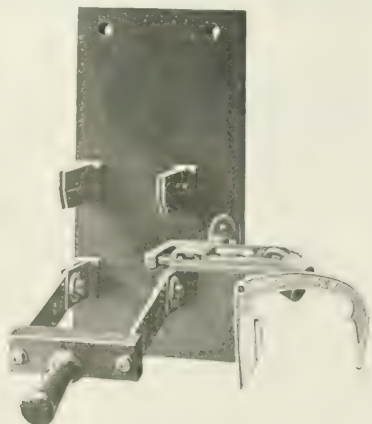


FIG. 1—SAFETY LOCK FOR CRANE CONTROL

magnet-switch contacts, it is claimed, cannot stick together, while the parts are few in number. The number of interlocks is reduced to a minimum. Each switch is equipped with an individual slate base, and the whole assembly is mounted on a pipe frame. Overload pro-



tection is provided by means of two overload relays (one on each side of the line). After the relays have operated, they are automatically reset by bringing the master switch to the "off" position. In order to secure

shades are supported by horizontal iron-pipe goose neck fixtures and braced by chain guys. A 10-in. opal glass diffuser incloses the lower half of each lamp bulb thus concealing the filament from direct view. Venti-

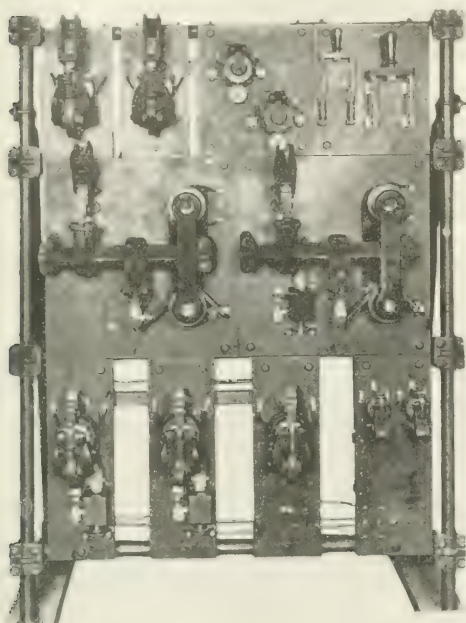


FIG. 2—CONTROLLER FOR USE WITH ELECTRIC CRANES

safety during inspection and repair of the crane apparatus, the device illustrated in Fig. 1 for locking the main-line switch is employed. The switch is kept open until the latter is replaced. Several holes are provided for padlocks.

### Hot-Galvanized Conduit Bushings

Hot-galvanized malleable-iron conduit bushings having a tensile strength of 37,000 lb. per sq. in. are being marketed by the Pittsburgh Valve & Fittings Company, Barberton, Ohio. Being hot-galvanized, these bushings will not rust. The iron used in the manu-



GALVANIZED CONDUIT BUSHING

facture of the fittings is melted in rectangular furnaces with natural draft so that it is possible to test and regulate the composition to obtain homogeneous chemical mixtures.

### Entrance Lighting with High-Efficiency Lamps

Installed on each side of the main entrance to the central Y. M. C. A. building, Chicago, Ill., at a height of about 14 ft. above the sidewalk, is a 1000-watt nitrogen-filled tungsten lamp inclosed in a porcelain-enamelled steel reflector of the diffusing-bowl type. The



ENTRANCE OF CHICAGO Y. M. C. A. BUILDING, SHOWING ILLUMINATION BY MEANS OF NITROGEN-FILLED LAMPS

lateral openings at the tops of the reflectors allow free circulation of air around the lamps.

The above described high-efficiency-lamp fixtures were furnished by the Federal Sign System (Electric), Lakeland and Desplaines Streets, Chicago.

### Adjustable Conduit Hickey

The conduit hickey shown herewith is provided with four notches, two in each end, which, the manufacturer claim, prevents the tool from slipping. The tool is adjustable, and a new hold can be obtained by loosening



ADJUSTABLE CONDUIT HICKEY WITH NOTCHES TO PREVENT TOOL FROM SLIPPING

the nut and shifting the handle. It is made of crucible steel.

This "Anthony" conduit hickey, as it is called, is being made by M. B. Austin & Company, 700 Jackson Boulevard, Chicago, Ill.

# Jobber, Dealer and Contractor

## Fort Wayne Jobber to Take Better Quarters

Moving from its old home at 123 West Columbia street, Fort Wayne, Ind., to the Fisher Building, diagonally across the same thoroughfare, the Protective Electrical Supply Company, of the city named, will have larger and better rooms. The new location, 130-132 West Columbia Street, gives the company the advantage of railroad siding facilities not enjoyed in the present location, so it is expected that handling of all shipments will be expedited and some saving may be effected on haulage. The building to be occupied is of brick and has 31,000 sq. ft. of floor space in its six stories and basement. Having secured an eleven-year lease of this building, the stock of the company will be moved about Jan. 1, 1915.

## An Attractive Electric Appliance Shop

A small shop devoted exclusively to the marketing of electrical appliances, which was opened at Springfield, Mass., early in the present summer, has a number of distinctive features which deserve description. The store was installed by Mr. L. J. Kamper, an experienced electrical salesman and commercial manager, in the belief that the public would respond to the opportunity to deal with a specializing house, following the discontinuance of electric appliance sales by the local lighting company. No fixtures are carried, the stock being composed almost entirely of portable electrical conveniences used in the home, factory or business establishment. The store is located at 300 Bridge Street, close to the business center of Springfield, and has close relations with local contracting houses and the United Electric Light Company, although it is an entirely independent concern.

As the closing out of the appliance-sales business of the United company released a number of high-class store and office fixtures, the Appliance Shop took advantage of its opportunities and purchased among other things two handsome mahogany, plate-glass and marble display cases which are to be seen in the foreground of the accompanying photograph.

Over all, the store measures 39 ft. by 13 ft. 6 in. It is divided into a front or sales section, 23 ft. long, and a rear portion devoted to the carrying of stock, shipping and receiving. On a mezzanine gallery 16 ft. long and 6 ft. wide is located the manager's desk. The gallery commands a view of every part of the store while still being sufficiently removed from the main floor to enable the manager to carry on his desk work or to hold private conferences with visitors.

Instead of purchasing expensive cases to hold the stock in the rear of the store, the management made a deal with a local wooden-box factory by which boxes of 2-in. and 7/8-in. stock, 11 in. by 22 in. by 11 in. in dimensions, were utilized. Sixty-eight of these "unit boxes" have been set up on their sides at the rear of the partition separating the salesroom from the stock room, forming a flexible group of subdivided shelves at cost of only 26 cents per box.

The main plate-glass display cases at the front of the store are each 3 ft. square and 6 ft. high. Two bay windows at the front are effectively utilized for exhibit, and behind the plate-glass cases on each side of the center aisle attractive displays of fans, heating devices, lamps, vibrators, washers, etc., are maintained. Variety is secured by the use of a 3-ft. by 8-ft. by 10-in. table on one side and of a 2-ft. 2-in. by 5-ft. by

3-ft. 6-in. case on the other, the salesroom attendant having a flat-topped desk at the rear, but in a location which commands a view of the main entrance. Several chairs placed in locations convenient to the display cases and table add to the comfort of patrons who may wish to examine goods at leisure. Six baseboard outlets, supplemented by two window outlets, enable appliances to be connected for demonstration in almost any part of the establishment. The lighting of the windows is accomplished by four 60-watt tungsten lamps in each case, mounted in metal reflectors at the top of the casing. The ceiling of the salesroom is 11 ft. 3 in. high, and the general illumination is provided by four 60-watt lamps mounted in a bowl-shaped Alberyl shade 18 in. in diameter, suspended by chains from the ceiling and carried about 8 1/2 ft. above the floor.

Lamps and fans are sold by the shop through a co-operative purchasing agreement with local contracting interests, each house gaining the benefits of quantity discounts by purchasing on a single order. A number of last year's fans in excellent condition have been sold at the shop through the ability of the management to purchase the stock at reduced rates and to take these appliances off the hands of other houses which found them difficult to sell. The bookkeeping is kept up to



ELECTRIC-APPLIANCE SHOP AT SPRINGFIELD, MASS.

the close of each day's business, loose-leaf records showing the cost and selling price of each article and furnishing the store with a continuous inventory. The system is maintained by a clerk in another establishment who gives a portion of her time to the appliance shop.

In its general furnishings the shop is characterized by light green walls, with a white ceiling having a fire-proof metal lining. Grass matting and green rugs serve as floor coverings. Tea is frequently prepared electrically and served to patrons in the afternoon. Later in the season demonstrations of various electrical household appliances will probably be featured.

In its first few weeks of service the store has given every indication of filling a distinct place in the city's retail establishments, and its popularity is steadily increasing. The appliance delivery question is solved by an agreement with a local service starting from the same street, which makes a small flat rate per parcel within the Springfield district, this charge seldom exceeding 10 cents. Based on a low initial cost and operating expenses carefully graduated to the size of the store, the establishment bids fair to meet a definite demand for intelligent, specialized service, and it is one of the first shops of the kind not associated with a central station to be started in the East.



# Industrial and Financial News

## Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

**Trade Reports.**—Bradstreets' reports electrical houses in Boston as having a better demand with collections somewhat improved. The electrical trade of Chicago, however, reports small orders, reduced profits and poor collections.

**Southern Power Company.**—It is reported from Charlotte, N. C., that, owing to the foreign situation, the Southern Power Company has postponed the letting of contracts involving several hundred thousand dollars' worth of equipment.

**Kellogg Switchboard & Supply Company.**—Construction has been started on the new \$600,000 building at the corner of West Adams and Aberdeen Streets, Chicago, to be occupied by the Kellogg Switchboard & Supply Company. The company has taken a lease for twenty years.

**Search-Lamp Sales.**—During the last four or five weeks the Carlisle & Finch Company, of Cincinnati, Ohio, has sold the following search-lamps: nine 19-in., twelve 14-in., five 9-in. and four 7-in. With the exception of two 14-in. lamps for London and one 14-in. lamp for Montreal, the lamps were sold in this country.

**Utah Power & Light Company Aids Farmers.**—The company is bringing large tracts of land in Utah under irrigation by furnishing energy for the operation of pumps to lift water on lands where gravity irrigation cannot be used. The pumping plants are of all sizes, some irrigating thousands of acres and others lifting water for only a 40-acre farm. The largest district contains 40,000 acres.

**Hartford Electric Light Company's New Home.**—The company has moved into its new five-story building on Pearl Street. The building has a 130-ft. front and 110-ft. depth and is wholly fireproof. The company is to occupy the first four floors. A lecture hall, a reading and recreation room, a laboratory and a washroom equipped with shower baths are among the plans for the welfare of the employees. Besides housing the offices the building will contain display rooms, rest rooms, an electric cooking school shortly to be opened to the public, draftsmen's, engineers' and photographic rooms.

**Electrical Equipment for Tannery.**—Contracts for electrical generating and operating equipment in its Louisville (Ky.) plant have been let by the American Oak Leather Company to the Allis-Chalmers Company. These contracts represent an outlay of \$20,000 and will give this tannery one of the largest installations of electrical equipment in the Louisville district. The purchases include two 250-kw generators, one 100-kw generator, and a number of motors rated at 500 hp in the aggregate. It had been the intention of the company to buy used machinery, but investigation of the market led it to invest in new equipment.

**Production of Asbestos.**—The production of asbestos in the United States is small, according to a bulletin recently issued by the Department of the Interior, United States Geological Survey, but in manufactured asbestos products the United States surpasses any other country. The total output of asbestos in this country for 1913 was about 1100 short tons, and all of it came from two producers in Georgia and one producer in Arizona. The world's supply of asbestos is drawn largely from the Province of Quebec, Canada, although the rapid development of the Russian industry is making that country an important factor in the world's supply. The bulletin also contains some interesting statements regarding the nature and composition of insulations containing asbestos placed on the market by various manufacturers.

**Electrical Contracting Firms Consolidate.**—The Court Electric Company, which was incorporated in April under

the Massachusetts laws to do an electrical and contracting business, was absorbed on May 1 by the M. B. Foster Electric Company of Boston, and Mr. St. George and M. Quinlan were taken into the Foster company. The officers of the latter company are Mr. W. P. St. George, president, Mr. J. V. Quinlan, secretary, and Mr. M. B. Foster, treasurer. The Foster Electric Company is one of the largest electrical contracting companies in Boston and has completed contracts for work done throughout New England territory, in Canada, and as far west as Michigan. Included in these contracts is work in the Springfield municipal group of buildings, the Boston Opera House, the Wilbur Theater, the Children's Hospital and the Merchant National Bank, all of Boston. Work is now being done by this company on the Boston City Club's building, the twelve-story Carpenter Building, the Brimmer School, and the Animal Hospital.

**New Plant for Wire Company.**—The Philips Insulate Wire Company, Pawtucket, R. I., will build a new plant which will be connected with the old establishment by tunnels across Freeman Street. The new power house will be about 100 ft. long, 60 ft. wide and 40 ft. high. The generating equipment will consist of two 600-kw, 550-volt three-phase, 60-cycle turbo-generators made by the General Electric Company. Surface condensers made by the Wheeler Condenser & Engineering Company will be employed, using an Edwards air pump and a turbine-drive centrifugal pump made by the De Laval Company. The Barnard cooling tower will be 65 ft. high and will be operated by two fans, 10 ft. in diameter, running at 220 r.p.m. Steam will be furnished by eight 90-in. Manning boiler having a total rating of 2400 boiler-hp. The coal for the boilers will be stored in an underground pocket adjoining the entire length and one end of the power house for a distance of 170 ft. The switchboard equipment will be furnished by the General Electric Company. The new mill building will measure 200 ft. by 200 ft., and will be three stories high.

**Slate for Electrical Equipment.**—The Davis Slate & Manufacturing Company, 608 East Fortieth Street, Chicago, Ill., is in the market with a complete assortment of slate for electrical equipment. Although there are more than 100 active slate quarries in the United States from which it is said that "electrical" slate can be taken, the manufacturer above named claims that only about six of these quarries produce slate that will pass a reasonable test. The best slates for electrical purposes are said to be quarried in Monson County, Maine, and in Rutland County, Vermont. The former is a clear black slate and the latter is a clear purple slate. Both have practically the same insulating value and mechanical characteristics. The Monson slate has the advantage of a natural black color but it is much more expensive and more difficult to obtain than that taken from the Vermont quarries. The latter can readily be finished with a permanent dull-black lacquer in imitation of the Monson slate. Certain grades of Pennsylvania clear-black slate, when carefully selected, are satisfactory and are used to a considerable extent for low-voltage work, instrument bases, box linings, etc.

**Sale of American Incandescent Lamps in Brazil.**—According to the United States Consul-General at Rio de Janeiro Brazil, Mr. Julius G. Lay, Dutch and German incandescent lamps have been replacing American lamps in the Brazilian market during the last few years, the principal reason being the lower prices at which European manufacturers are able to offer their products. While a certain type of American lamp, to yield the profit which local dealers are accustomed to receive, cannot be retailed at less than 42 cents to 45

cents each, the German and Dutch lamps cost but 27.5 cents each in large lots and retail for 32.3 cents. American lamps coming to the Brazilian market are usually packed separately in corrugated paper jackets and then in large wooden cases. The Dutch lamps are protected with similar corrugated paper jackets, but the packing case instead of being wood is a cardboard carton holding 100 lamps. While this packing is not so resistant as a wooden box, merchandise of this class is usually assigned on the Dutch line to a special part of the ship where it will not be crushed by heavier cases. There is no reason, according to Consul-General Lay, why American lamps should not be shipped in the same manner, and perhaps make it possible for American lamps to compete with European in this market.

**Central-Station Business in the New England States.**—The following data and comment regarding central-station business in the New England States may be compared with those for previous months appearing in the *Electrical World* of July 4 and June 6. Returns are now being received from over thirty operating utilities in that territory, but comparable data for previous months of this year are available for relatively few companies. Fortunately a majority of the large distributing systems of New England are among this number, and it is interesting to note theebb and flow of monthly sales as shown in the records of these properties. Table I presents a comparison of gross income and energy output for each month from February to June, inclusive, 1914 and 1913, for eight large operating

TABLE I—NEW ENGLAND STATES—COMPARISON OF INCOME AND OUTPUT FOR FIVE INDIVIDUAL MONTHS, 1914 AND 1913, OF EIGHT LARGE COMPANIES

	GROSS INCOME FROM SALE OF ENERGY			TOTAL ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
Boston Edison	\$1,197,778	\$1,079,490	11.0	30,095,621	27,217,230	10.6
Lowell	1,093,502	1,020,796	7.1	32,516,426	30,192,934	7.7
Providence	1,063,880	977,530	9.0	29,818,976	27,236,993	9.5
Worcester	988,480	897,718	10.2	28,622,362	26,933,765	6.3
Springfield	936,870	885,077	8.2	27,319,320	24,314,904	12.4

utilities; and it may be stated that between them these companies distribute approximately one-third of all the energy sold through lighting and motor-service meters in the New England field. The data for February, March and April have already been given in published tables, while those for May and June are presented here for the first time. It will be seen that the rates of increase shown by the returns for the summer months are maintaining the values which were derived from the earlier data, and that good gains are still being registered on both income and output. The rate of increase on revenue from the sale of energy has varied between 7.1 and 11 per cent over the five-month period; while the energy marketed has never shown less than 6.3 per cent increase, and has gone as high as 12.4 per cent for the month of June. The figures for output provide, of course, a fairly direct reflection of the condition of the energy-consuming industries to whose demand the central stations are ministering. While it is impossible to discredit all that is heard regarding the slackness now prevalent among many of the New England industries, the evidence of these figures cannot well be refuted. The companies included in Table I embrace the urban distributing systems in the cities of Boston, Worcester, Cambridge, New Bedford, Lynn and Springfield, Mass.; Providence, R. I., and Hartford, Conn. In communities such as these the residence-lighting load, after all, is not capable of swaying the total station output to the same extent as the motor-service demand, and the table shows that there is a demand at the stations in 1914 at least 10 per cent greater than last year. Industrially, therefore, New England cannot be standing still, at least so far as its major cities are concerned; though it may be noted that for the five-year period cov-

ered by the last two government censuses there was a demonstrated annual average increase in central-station output of over 17 per cent. In the smaller New England communities such good gains as the foregoing are not now being recorded. In addition to the figures for the eight large companies regarding whose business comparable returns

TABLE II—NEW ENGLAND STATES—COMPARISON OF INCOME AND OUTPUT FOR APRIL AND MAY, 1914 AND 1913, OF ALL COMPANIES REPORTING TO ELECTRICAL WORLD

	GROSS INCOME FROM SALE OF ENERGY			TOTAL ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
April—33 companies	\$1,501,773	\$1,384,255	8.5	43,486,624	39,181,988	10.8
May—41 companies	1,745,160	1,609,234	8.4	52,752,247	50,779,103	3.9

are available for each month from February to June, the *Electrical World* has received reports for the month of May from some thirty-three further utilities, most of them from the smaller towns and cities, although a few of them relate to such considerable systems as those of Manchester, N. H.; Waterbury, Conn., and Portland, Maine. These additional data show that there is a materially lower rate of increase over 1913 among the New England communities of 30,000 population and less. In the aggregate it is found that the gross income of these thirty-three utilities increased from \$711,516 in May, 1913, to \$756,670 in May, 1914, or at a rate of 6.4 per cent; while the energy output of stations increased in the same time from 23,845,338 kw-hr. to 24,129,885 kw-hr., or at a rate of only a little more than 1 per cent. Most of these companies are handling from \$10,000 to \$30,000 of gross sales in the month, and among the thirty-three utilities there are to be found four instances of decreasing revenue. Seven of the companies distributed less energy in May, 1914, than in the same month last year; so that, so far as the smaller towns are concerned, it cannot be said that the figures for electrical demand (which should be a good criterion) indicate any notable increase in industrial activity in the New England States. The combined totals for April and for May for all the companies reporting to the *Electrical World* are shown in Table II. At the present time the June reports for the whole territory are not available, and no inclusions are therefore made for that month. Data for June, supplementary to the figures shown in Table I, will be given in a later issue. Meanwhile it may be noted that the May figures cover an output of energy in excess of the fifty-million mark; and, as nearly as can be estimated, the output of the entire central station industry of New England did not exceed 85,000,000 kw-hr. for the month.

#### NEW YORK METAL MARKET PRICES

	July 28		Aug. 4	
	Bid	Asked	Bid	Asked
Copper Standard spot*	...	13.00	...	...
Selling Prices				
London, standard spot*	58 5/8	59 0	58 5/8	59 0
Prime Lake	13 25/32	13 31/32	12 7/8	13 1/8
Electrolytic	13 00	13 12 1/2	12 50	12 75
Casting	12 87 1/2	13 00	12 37 1/2	12 50
Copper wire loose	11 95 1/2	12 16 1/2	11 00	11 25
Lead	3.90	3.90	3.90	3.90
Nickel	40.00	40.00	40.00	40.00
Sheet zinc, 14 lb. smelter	7.00	7.00	7.00	7.00
Spelter, spot	30.00	30.00	30.00	30.00
Tin, spot	30.00	31.00	30.00	31.00
Aluminum	17 3/4	17 3/4	19.00	20.00
Prompt delivery	17 3/4	17 3/4	19.00	20.00
Future	17 3/4	17 3/4	19.00	20.00

#### \*COPPER EXPORTS

Total tons to August 4.....3,953

\*From daily transactions on the New York Metal Exchange.

†Nominal.  
Note.—The New York Metal Exchange and the London Metal Exchange have been closed until further notice. No reliable quotations on old metals can be obtained for the present. There is no buying in this market.



## Corporate and Financial

**United Electric Securities Company.**—The company has asked tenders until Aug. 11 on as many of its collateral-trust 5 per cent bonds of the twenty-first series as \$23,412 will purchase, on as many of the twenty-fifth series as \$53,728 will purchase, and on as many of the twenty-eighth series as \$73,697 will purchase, making a total of \$150,838. Bonds accepted will be paid for Aug. 13 with accrued interest.

**Columbus Railway, Power & Light Company.**—The company's plan for financial reorganization, as described in the *Electrical World* of June 13, was practically completed at an adjourned meeting of the stockholders. The shareholders by over a three-fourths majority voted in favor of an increase of the capital stock of the company from \$11,550,000 to \$15,145,000. The company is operated by E. W. Clark & Company, of Philadelphia.

**Hannawa Falls Water Power Company.**—The Public Service Commission of the Second District of New York has authorized the Hannawa Falls Water Power Company to purchase a controlling interest in the stock of the Northern Power Company, through which the Hannawa Falls Company has for a long time been disposing of much of its energy. The Hannawa Falls company has hitherto been engaged in the wood-pulp industry.

**A Select List of Public Utility Investments.**—H. F. McConnell & Company, of New York, have issued a forty-four-page booklet entitled "Select List of Public Utility Investments." In all, forty companies are described as to their history, industry and financial standing. The last few pages are taken up with an interesting history of the development of the gas industry, eighteen ways in which one cent's worth of electrical energy can be used and a table showing the approximate yield of stocks paying from 2 to 9 per cent.

**Dayton Power & Light Company Earnings.**—The earnings of the Dayton (Ohio) Power & Light Company for the six months ended June 30 show a very encouraging increase over the same period in 1913, the earnings for some months showing an abnormal increase, largely due to the effects of the flood in the spring of 1913. The surplus for the six months, after deducting preferred dividends and interest charges, is \$49,225. On this basis the company is earning about 3 per cent on \$3,500,000 common stock.

**Annual Report of American Light & Traction Company.**—The earnings statement for the year ended June 30, 1914, shows gross earnings of \$4,415,611, made up of \$3,697,743 as earnings on stocks of subsidiary companies owned by the parent company and of \$717,868 as miscellaneous earnings. Expenses amounted to \$139,466, leaving \$4,276,145 as net earnings. Surplus earnings and reserve from 1913 were \$8,973,146, making \$13,249,291 as total surplus earnings. From this is to be deducted \$3,671,627 for dividends both cash and stock. This left the surplus balance as \$9,577,664.

**Auglaize Power Company Meeting.**—A meeting of the stockholders of the Auglaize Power Company will be held in the company's offices, Spitzer Building, Toledo, Ohio, Aug. 15, to vote on the proposal to issue two kinds of stock. In place of the \$1,000,000 common stock, the stockholders will be asked to authorize \$666,600 preferred stock, to be disposed of as the directors may decide, and \$333,400 common stock in shares of \$100 each. The stockholders will be asked also to authorize the directors to borrow not more than \$200,000 on promissory notes at 6 per cent interest, maturing on or before five years from date, the interest to be paid semi-annually.

**Electric Light & Power Company of Abington and Rockland.**—A special meeting of the stockholders has been called for Aug. 10 for the purpose of authorizing an additional issue of \$47,200, par value, of capital stock. The Board of Gas and Electric Light Commissioners approved of this issue on July 21 and fixed the price at \$140 per share. The holder of each share of present capital stock may subscribe for one-fourth of a share of the new stock if the issue is authorized. The proceeds from the sale, if the issue be approved, are to be devoted to paying a part of the floating indebtedness, which now amounts to \$110,000. The company is under the management of Stone & Webster.

**First Annual Report of Alabama Traction, Light & Power Company, Ltd., Montreal.**—The income statement for sixteen and three-quarter months ended Dec. 31, 1913, shows a net income from operating subsidiaries, before providing for depreciation but after deducting \$84,523 for interest on funded and floating debt, of \$93,133. President James Mitchell in speaking of the business said that while for a time it was disappointing, it is now showing a satisfactory progress. Among the new developments of the company was the completion of the dam on the Coosa River, the placing in operation of the first of the four 17,500-hp units, and the putting in service of a reserve steam plant with a rating of 15,000 hp.

**United States Light & Heating Company Statement.**—Mr. A. H. Ackerman, vice-president and general manager prior to the receivership and retained as general manager under the receivership, has issued from the home office at Niagara Falls, N. Y., the following statement: "The action recently sustained in the appointment of the receivers for the property of the company was a necessary step to conserve the assets for the benefit of all. With assets of three dollars for every dollar of debt, the company is amply stable, and the court's direction to continue the business is the last proof necessary to reassure the buying public. There are already under way plans for broad financing, and with the return of general prosperity in the country the company, more aggressive than ever before, intends to secure its own full share of the business and to continue the manufacture and sale of its special electrical products."

**Bankers' Novel Illustration.**—Messrs. William P. Bonbright & Company, of New York, in their "Fortnightly Review" declared that "investors generally are beginning to realize the advantages of public utility securities as to safety of principal and interest return. We venture to say, however, that comparatively few even among those who specialize in them, are familiar with the physical features of a hydroelectric plant." To supply this information the publishers have prepared in the paper a diagrammatic sketch of a hydroelectric development with an index designating the parts. The illustration is 7½ in. by 5½ in. Starting with the storage reservoir, the path of the water is traced through the turbines into the tailrace. From the power house the lines go out, tying the residential part of a town to the business section. Substations are shown with their transformers and converters. The illustration also shows a steam reserve plant with all of its important details. To make the illustration more realistic even such details as insulators, trolley feeders, distribution lines, lighted lamps, trolley cars and natural scenery are pictured.

**Cities Service Company Defers Dividends.**—The following announcement has been made by the directors of the Cities Service Company: "While hopeful that a general European war will not take place, that the acute conditions which now prevail in all the financial centers of the world will grow no worse, and that normal conditions will soon be established, the directors feel that every precaution should be taken to protect the interests of the company in event the worst should happen. The board has decided, therefore, to defer payment of dividends, including those due Aug. 1, on the preferred and common stock of the Cities Service Company, to the end that the best interests of the corporation and its stockholders may be protected during this period of world-wide financial cataclysm." In a letter to the stockholders the directors said in part that "unless a decided change for the better occurs it may be some time before normal financial conditions will prevail, and all requirements of the company may have to be met from the net earnings of the subsidiary companies. The earnings of these companies are entirely satisfactory, and we expect them to so continue. Your directors feel that all cash resources of the company should be conserved. They hope for an immediate change for the better which will insure a speedy return to normal conditions and enable cash dividends to be resumed. In their decision they are also mindful of the present practically prohibitive rate of exchange, applying at this moment to dividend payments abroad." Another meeting has been called for Aug. 7 to consider further the matter of dividends. The directors will send a weekly letter to the stockholders as long as the unsettled period continues.

## Business Notes

The Niagara Searchlight Company, of Niagara Falls, N. Y., has transferred its sales office to New York City. A. Hall Berry, 97 Warren Street, will be exclusive general sales representative.

Albrecht F. Leue, advertising manager for the Triumph Electric Company, Cincinnati, Ohio, has tendered his resignation, effective Aug. 1, when he will begin the practice of law in Cincinnati.

P. & B. Manufacturing Company, Inc., of 306 Manufacturing Home Building, Milwaukee, Wis., will manufacture electrical fittings and heating appliances. H. H. Petersen is secretary and treasurer.

The Terry Steam Turbine Company, builder of steam turbines, Hartford, Conn., announces that it has appointed Fidanque Brothers & Sons, of New York and Panama, with main office at 15 Whitehall Street, New York City, as its representatives for the republic of Panama and the Canal Zone. The company also announces that on Aug. 1 its Cleveland office, in charge of Mr. L. G. Finlay, was moved from its former location, 710 New England Building, to 503 Union Building, Cleveland, Ohio.

The Stromberg-Carlson Telephone Manufacturing Company has been reincorporated, taking over all the property and assets of the old company of the same name. The new company has substantially the same officers and employees as the old company and will continue in the business of supplying switchboard equipment, telephone and other associated electrical devices. The company's headquarters are at 1050 University Avenue, Rochester, N. Y., and it has branches in Chicago, Toronto, San Francisco and Seattle and agency arrangements in British Columbia and on the Pacific Coast with the Telephone Electric Equipment Company and in Manitoba, Saskatchewan and Alberta with Messrs. Houston & Company, Ltd. The officers are: F. N. Kondolf, president; F. C. Goodwin, vice-president; W. R. McCanne, treasurer and general manager, and W. M. Angle, secretary.

## New Industrial Companies

The Electric City Glass Company, of Buffalo, N. Y., has been incorporated with a capital stock of \$35,000 by A. and O. A. Tresch and C. F. Wagner, of Buffalo, N. Y.

The Federal Lighting Fixture Company, of Buffalo, N. Y., has been incorporated with a capital stock of \$5,000 to do general electrical work. The incorporators are J. M. Morrell, E. T. and J. G. Irr.

The Fruiser Electric Motor Manufacturing Company, of Rochester, N. Y., has been incorporated by H. R. Howard, R. C. Cash and Lillian Weyrauch. The company proposes to manufacture motors, machinery, etc.

The C. W. Elevator Company, of New York, N. Y., has been chartered by C. V. Cheesman, 153 Greene Street, New York, N. Y.; S. Weinschenk and E. Eble, of New York, N. Y. The company proposes to do a general electrical engineering business.

The Horton & Williams Electric Company, of Gary, Ind., has been incorporated by George W. Horton, of Gary, Ind.; H. B. Williams and N. H. Williams. The company is capitalized at \$10,000 and proposes to manufacture and install electrical apparatus.

The United States Train Signal Company, of Portland, Maine, has been incorporated with a capital stock of \$1,000,000 to manufacture and deal in signals, etc. The officers are W. E. Benn, of McAdam Junction, N. B., and W. B. Hall, of Portland, Maine.

The Trenaman Electric Dental Manufacturing Company, of New York, N. Y., has been incorporated with a capital stock of \$50,000 to manufacture dental apparatus, etc. The incorporators are: J. V. Trenaman, T. F. Diack and J. J. Page, of New York, N. Y.

The Decker Manufacturing Corporation, of Brockport, N. Y., has been incorporated with a capital stock of \$26,200 to manufacture and deal in hardware, heating apparatus and lighting fixtures. The incorporators are Charles Decker, H. Holmes and M. M. Decker, of Brockport.

The Cooper Flexible Transmission Company, of Brooklyn, N. Y., has been chartered with a capital stock of \$160,000 by S. C. Yoemans, B. C. Holt and H. Cooper, 618 Sixty-fifth Street, Brooklyn, N. Y. The company proposes to manufacture devices for transmission of power, etc.

The Federal Automatic Safety Device Company, of New York, N. Y., has been granted a charter with a capital stock of \$100,000 for the purpose of doing a general mechanical and electrical engineering business, manufacturing tools, etc. The incorporators are E. T. Moore, of Passaic, N. J.; E. W. Gray, of Newark, N. J., and J. F. S. Moore, of New York, N. Y.

The Lamson Spindle Company, of Dover, Del., has been incorporated with a capital stock of \$6,000,000. The company proposes to manufacture and deal in engines, motors, dynamos, tools and surgical instruments of all kinds; to do a general chemist and druggist business and to acquire, own and develop mineral lands of all kinds. The incorporators are M. M. Hiron, Charles H. Butler, W. I. N. Lofland and W. F. P. Lofland, all of Dover, Del.

## Trade Publications

**Glass Sterilizer.**—An electrically heated glass sterilizer is described in a folder issued by the Quick Electric Heater Company, Cincinnati, Ohio.

**Washing and Wringing Machines.**—The Economy electric washing and wringing machine is described in a folder sent out by the Pittsburgh Gage & Supply Company, Pittsburgh, Pa.

**Lighting System.**—An advance announcement concerning its 12-volt lighting system has been made by the Bosch Magneto Company, 223 West Forty-sixth Street, New York City.

**Electrolier Sockets.**—Weber universal electrolier sockets with keys and pull-chains are described in a folder distributed by the Weber Electric Company, 143 Liberty Street, New York City.

**Rigid Conduit.**—Card No. 10 issued by the Safety-Armorite Conduit Company, Pittsburgh, Pa., contains prices and discounts offered distributors on rigid conduit of the galvanized and enameled type.

**Snap Switches.**—Snap switches with handles specially adapted to finger grip are described in a folder being distributed by the Manhattan Electrical Supply Company, 17 Park Place, New York City.

**Alternating-Current Instruments.**—Switchboard-type alternating-current voltmeters, ammeters and wattmeters are described in a catalog issued by the Kernel Apparatus Company, Cambridge, Mass.

**Ball Bearings for Motors.**—The S K F Ball Bearing Company, 50 Church Street, New York City, has published a thirty-eight-page pamphlet showing applications of ball bearings to various types of motors.

**Fixtures for Nitrogen-Filled Lamps.**—Supports, sockets and reflectors for nitrogen-filled lamps are described in a folder published by the Federal Sign System (Electric), Lake and Desplaines Streets, Chicago, Ill.

**Indicating Fuse Plug.**—A fuse plug which will give an indication, even in the dark, when it has been blown is illustrated in a leaflet published by the Premier Electrical Manufacturing Company, Bridgeport, Conn.

**Rotary Water and Air Pumps.**—Centrifugal water and air pumps and rotary jet condensers manufactured by the Manistee Iron Works Company, Manistee, Mich., are described in a catalog just issued by that company.

**Terminal Tool.**—A device for making permanent and positive terminals on electric wires and flexible cables is described in a booklet issued by the Bosch Magneto Company, 223 West Forty-sixth Street, New York City.

**Lightning and Lightning Protection.**—Reasons for protective apparatus failing to ward off lightning, accounts of the action of lightning and descriptions of protective installations are given in booklets prepared by the National-Standard Company, Niles, Mich., and W. C. Shinn, Lincoln, Neb.



## Personal Mention

Mr. Charles N. Hebner has resigned as secretary of the Illinois Public Utilities Commission.

Mr. Charles Hurmense has been appointed manager of the Sumner (Iowa) Light & Power Company.

Mr. A. W. Cowles has been appointed purchasing agent of the Agawam (Mass.) Electric Company.

Mr. J. F. Perkins has been appointed purchasing agent of the Public Service Company, St. Cloud, Minn.

Mr. A. Boyd has been appointed superintendent of the Glasgow (Ky.) Electric Light & Ice Company.

Mr. L. M. Balzer has been appointed superintendent of the Bettendorf (Iowa) Improvement Company.

Mr. H. H. Heinze has been appointed purchasing agent of the Freeport (Ill.) Railway & Light Company.

Mr. Charles Thomas has resigned as superintendent of the Martinsville (Ind.) Gas & Electric Company.

Mr. J. E. Hensley has been appointed purchasing agent of the Alcorn Electric Light Company, Corinth, Miss.

Mr. Bert Streeter has succeeded Mr. John Feagans as vice-president of the electric works, Washington, Ind.

Mr. L. A. Nickell has been appointed manager and secretary of the Brunswick (Mo.) Light & Water Company.

Mr. H. D. Pole has been appointed superintendent of the Virginia-Western Power Company, Ronceverte, W. Va.

Mr. Fred J. MacLeod was elected chairman of the Massachusetts Public Service Commission at the reorganization meeting held in Boston July 31.

Mr. E. Doughty has been appointed superintendent of the municipal electric plant at Atlantic Highlands, N. J., as successor to Mr. Henry G. Bennett.

Mr. J. M. Smith, for many years electrical engineer with the Crocker-Wheeler Company, Ampere, N. J., and manager of the engineering department since 1911, on Aug. 1, 1914, became associated with the Triumph Electric Company, Cincinnati, Ohio.

Mr. W. Z. McBride, manager of the Vacaville (Cal.) Water & Light Company, was shocked and burned by a 2200-volt wire while repairing an arc lamp in the absence of a lineman. Mr. McBride recovered after being confined to his room for a week.

Mr. Edward L. Cox, who has been appointed manager of the lighting division of the electrical department, H. W. Johns-Manville Company, Madison Avenue and Forty-first Street, New York, was formerly with the Enos & Watkins Company, New York, for eighteen years.

Mr. W. P. Dobson has been appointed director of the experimental laboratories of the Ontario Hydro-Electric Power Commission at Toronto. For the last eighteen months he has been carrying on research work on electrical disturbances in high-tension transmission systems for the University of Toronto Engineering Alumni Association.

Mr. G. Eugene Villaret, who is now in charge of lighting-fixture design with the H. W. Johns-Manville Company, Madison Avenue and Forty-first Street, New York City, was fourteen years with the Thackara Manufacturing Company, Philadelphia, Pa., and during the last ten years has been connected with the Cassidy & Son Manufacturing Company, New York. He received his preliminary training at the Ecole des Beaux Arts, Paris.

Mr. George W. Elliott has resigned as advertising manager of the McGraw Publishing Company, publisher of the *Electrical World*. Mr. Elliott joined the business staff of the *Electrical World* in 1896 and continued as advertising representative until November, 1912, when he was appointed advertising manager of the McGraw Publishing Company and elected a member of the board of directors. With the relaxation of active duties Mr. Elliott plans to take a vacation in Europe.

Mr. Ernest E. Lee has resigned as superintendent of erection of the department of maintenance, Isthmian Canal Commission, and has returned to Evansville, Ind. Mr. Lee, a former employee of the Commonwealth Edison Company of Chicago, joined the Panama Canal engineering staff in 1907 and was placed in charge of the preparation of designs for

the lock machinery and the Atlantic and Pacific generating stations. Later he was promoted to be assistant electrical and mechanical engineer, and in 1911 he was appointed superintendent of erection of operating machinery and electrical equipment for locks, spillways, the Gatun hydroelectric station, substations and transmission line.

Mr. E. C. Deal has been appointed to succeed Mr. J. P. Clark as vice-president and general manager of the public-utility properties controlled by W. N. Coler & Company,



E. C. DEAL

New York City, among which are the North Carolina Public Service Company and the Salisbury & Spencer Railway Company, Greensboro, N. C. Mr. Deal's new headquarters will be at Greensboro. Mr. Deal received his first engineering experience with the Georgia Electric Light Company of Atlanta. Later he was employed in various positions in different parts of the country with public-service properties operated by the Stone & Webster Management Association. In 1904 he left this organization and became associated with W. N. Coler

& Company as chief engineer of the Gas & Electric Company of Bergen County, N. J. When this system was absorbed by the Public Service Corporation of New Jersey he was appointed superintendent of the Bergen division and later of the central division. In 1908 he resigned and became general manager of the Carolina properties of W. N. Coler & Company. Three years later he again left the Coler company and went with the J. G. White Company, Inc., as general manager of the Augusta Railway & Electric Company and the Augusta-Aiken Railway & Electric Company. These companies were later merged into the Augusta-Aiken Railway & Electric Corporation, Mr. Deal continuing as general manager. In 1913 he became vice-president and general manager of the company and early in the present year again resumed his connection with W. N. Coler & Company. For sixteen years Mr. Deal has been active in the National Electric Light Association and at its Chicago convention of 1913 was elected fourth vice-president. In 1913 he also served as president of the South-eastern Section of the N. E. L. A.

## Obituary

Charles H. Cooke, who had been recently associated with plans to develop the water-power of the Delaware River, died at New York, Aug. 1, at the age of sixty-seven. Mr. Cooke was from 1883 to 1886 engaged in general office and field work for the old Edison Electric Lighting Company, and after holding a number of civil-engineering positions became chief engineer of the Needel Mountain Electric & Power Company of Colorado in 1897. The last fifteen years of his life had been given to the Delaware River project.

John B. Allan, for many years an authority on steam-engineering practice in the Middle West, died at his home at Oak Park, Ill., July 28. Mr. Allan was born Jan. 14, 1860, at Davenport, Ia., and received his early education in Muscatine, Ia. In 1882 he was graduated from Worcester (Mass.) Polytechnic Institute and entered the employ of the Edward P. Allis Company, of Milwaukee, where he rose steadily until he was assistant to the chief designer. Gaining shop and erecting experience, he was sent to Chicago in 1886 to open the company's first sales office. Later he was made manager of sales for the engine department of the entire Edward P. Allis Company. Upon the organization of the Allis Chalmers Company he was made vice-president and general manager, in which position he remained until he accepted the position of Western general sales manager for the Westinghouse Machine Company in 1907. Here he remained for three years until failing health prompted him to give up his active work.

## Construction

### New England

**PHILLIPS, MAINE.**—The electric plant of the Phillips El. Lt. & Pwr. Co. was destroyed by fire recently.

**BRADFORD, VT.**—The Bradford El. Ltg. Co. is reconstructing its Bradford village line. A. F. Dickey is assistant manager.

**BOSTON, MASS.**—Bids will be received by the trustees of the Boston City Hospital until Aug. 12 for changes and additions to the electric wiring of east and west pavilions, domestic and laundry buildings, South Department. Proposal blanks may be obtained at the office of Joseph McGinness, 112 Water Street, Boston, where drawings and specifications may be obtained upon deposit of \$5, to be refunded upon return of same.

**GARDNER, MASS.**—The contract for supplying electricity to the State prison camp at West Rutland has been awarded to the Gardner El. Lt. Co. Work will soon be started on the erection of a 2-mile transmission line. The two gas engines now used in the camp will be replaced with electric motors.

**HAVERHILL, MASS.**—The Haverhill El. Co. is contemplating placing all its wires on Essex and Wingate Streets in underground conduits.

**LEXINGTON, MASS.**—The citizens have voted to authorize the Selectmen to make a contract with the Edison El. Ltg. Co. to install 46 lamps of 100 cp to replace the 22 lamps of 60 cp on Massachusetts Avenue, from Grant Street to and including the corner.

**NORTH ABINGTON, MASS.**—The El. Lt. & Pwr. Co. of Abington & Rockland, of North Abington, has called a meeting of stockholders to be held on Aug. 10 to vote on the proposal to increase the stock to \$47,200.

**SPRINGFIELD, MASS.**—The City Supervisors have given their approval of the Springfield municipal plan submitted by the United El. Lt. & Pwr. Co. It is understood that the company will place contract at once for about 400 standards.

**PASCOAG, R. I.**—The Pascoag Fire District has been given permission to erect transmission line on the highways in the village of Harrisville.

### Middle Atlantic

**BELLEVILLE, N. Y.**—The Public Service Commission has approved the construction of an electric light and transmission lines and the exercise of the local franchise by Harlow E. Ralph in Belleville.

**ROCHESTER, N. Y.**—The Town Board of Greece has decided to install electric lamps at Grand View Beach to replace the oil lamps in the life line and to have them installed. The Rochester Ry. & Lt. Co. furnishes electrical service in Greece.

**ROCHESTER, N. Y.**—The Public Service Commission has granted the Rochester Tel. Co. permission to issue \$100,000 in bonds, the proceeds to be used for construction of a new central office in Rochester or the "Northwest" exchange and for various lines in connection therewith.

**WESTFIELD, N. Y.**—At the special election held July 25 the proposal to issue \$7,100 for repairs and improvements to the municipal electric-light plant was carried.

**BOYERTOWN, PA.**—Preparations are being made by the Boyertown El. Co. for the installation of a 500-hp engine and generator in the part of the building now used for an office.

**CONNELLSVILLE, PA.**—A movement has been started by the merchants on Pittsburgh Street for the installation of an ornamental lighting system.

**ELLWOOD CITY, PA.**—Preparations are being made by the electrical committee of the Ellwood Borough Council to extend the street-lighting system of this village. Delays in this district is taken over by Ellwood City. It is also proposed to extend the lines to furnish residential and commercial lighting.

**GETTYSBURG, PA.**—The Town Council has adopted a resolution providing for the installation of a municipal electric-light plant; also to engage an engineer to prepare plans and estimates for same.

**MEDIA, PA.**—The electric light committee expects to purchase within the next 30 days 25 nitrogen-filled lamps of 700 cp, glass nuts and the next two months 35 poles, glass nuts and some No. 6 wire. Preliminary plans have been prepared for the in-

stallation of an additional engine, generator, boiler and new filtration system, but have not yet been approved by the Councils. P. E. Ahern is superintendent.

**PHILADELPHIA, PA.**—The Board of Education is contemplating the installation of a municipal electric-light plant, refrigerating plant, a vacuum cleaning system and a tilting system in the new Frankford High School.

**PHILADELPHIA, PA.**—The Fairmount El. & Mfg. Co. It is reported, will soon ask for the construction of a two-story factory building, 45 ft. by 160 ft., to be erected at Fifty-ninth Street and Woodland Avenue.

**PHILADELPHIA, PA.**—A permit has been issued for the erection of a power house for the Philadelphia El. Co. on the south side of Christian Street, east of Schuylkill Avenue, to cost \$1,000,000. The building will be equipped with two turbo-generators, one of 30,000 kw and the other of 35,000 kw. Contract for construction of building has been awarded to the Fidelity Construction Co. The plan, when completed, it is understood, will furnish electricity to operate the Pennsylvania Railroad lines from Broad Street Station to Paoli. John T. Windrim is architect.

**POTTSVILLE, PA.**—The Reading Co. & Iron Co. is reported, is considering the erection of a power station in Pottsville to furnish electrical energy in the Schuylkill Valley.

**BORDENTOWN, N. J.**—The installation of a municipal electric-light plant is under consideration by the Citizens' League and the City Commission. The cost of the plant is estimated at \$40,000.

**RUTLER, N. J.**—The Council has engaged the Rutger Electric Co., an engineer, of Newark, as consulting engineer in connection with the establishment of a municipal electric-light plant, for which \$25,000 in bonds was recently voted.

**ELIZABETH, N. J.**—The Singer Mfg. Co., manufacturer of sewing machines, is reported to be contemplating the construction of a new power station at its manufacturing plant.

**KEYPORT, N. J.**—The Middlesex-Monmouth El. Lt. & Pwr. Co. has petitioned the Board of Freeholders for permission to erect a transmission line from Whale Creek to South Amboy.

**WOODBOURNE, N. J.**—Arrangements are being made by the Woodbourne El. Co. of Sussex, for the installation of a 150-hp boiler.

**WASHINGTON, D. C.**—Bids will be received at the office of the chief signal officer, Navy Department, Washington, D. C., until Aug. 13 for furnishing the following supplies under Proposal 710: Six standard oil equipments complete for switchboard room, 300 5-in. steel side-cutting pliers, 100 10-in. miscellaneous brass pipe, 100 ft. conduit, 100 ft. 1½-in. conduit and 100 ft. 2½-in. conduit.

**WASHINGTON, D. C.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Aug. 11 for furnishing and installing lighting fixtures in the United States custom house at Boston, Mass.; the United States post office at Minneapolis, Minn.; the United States post office and court house at Muskogee, Okla., and the United States sub-treasury at San Francisco, Cal., in accordance with plans and specifications of which the main one is secured at the above office. For details see proposal columns.

**WASHINGTON, D. C.**—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Aug. 11 for furnishing the following navy yards and naval stations supplies as follows: Charleston, S. C., Schedule 7094—1400 lb. 2-in. and 2½-in. copper pipe, 1000 lb. miscellaneous brass pipe, Schedule 7092—7100 ft. black and galvanized wrought-iron pipe. Boston, Mass., Schedule 7094—Miscellaneous drawn, seamless copper pipe (16-in. lengths); Schedule 7092—Miscellaneous galvanized and black wrought-iron pipe. Newport, R. I., Schedule 7100—Miscellaneous black wrought-iron pipe, standard weight; Schedule 7102—5700 lb. hard-drawn, torpedo bronze tubing, 2000 lb. hard-drawn and annealed copper tubing. Bids will also be received at the same place until Aug. 15 as follows: Portland, Cal., Schedule 7095—650 cutout plug and inclosed fuses, miscellaneous drawn, seamless copper pipe (12-ft. lengths), miscellaneous cold-rolled iron pipe (15-ft. lengths), 6500 evaporator and condenser tubes, miscellaneous engineers' wrenches (semi-finished single, open end, milled openings). Brooklyn, N. Y., Schedule 7094—230-volt 3-hp. 230-volt 3-hp. turning motors and equipment and spare parts; Schedule 7082—One windlass anchor, with two 230-volt direct-current motors and spare parts. Puget Sound, Wash., Sched-

ule 7096—9000 ft. ¾-in. diameter, plow-steel flexible wire rope. Applications for proposals should designate the schedule desired by number.

**WASHINGTON, D. C.**—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Aug. 25 for furnishing at the various navy yards and naval stations supplies as follows: Philadelphia, Pa., Schedule 7111—for furnishing and erecting one centrifugal air compressor for Brooklyn, N. Y., Schedule 7120—13½ variable speed gears, type C, including spare parts, with follow-up control; Schedule 7122—one telephone switchboard, front-connected, type C (type C-72) and spare parts, 22 commercial telephones complete, similar to type HB, 75 telephones, HB, DB, D, HBC, complete, and spare parts; Schedule 7119—200 storage batteries, f.o.b. works, in Norfolk, Va., Schedule 7131—three deck covers for storage batteries; Schedule 7112—32 automatic controlling equipments for operation of engine-room ventilator sets and spare parts, 50 to be delivered to Brooklyn, N. Y., and eight to Norfolk, Va. Washington, D. C., Schedule 7119—two switchboard panels, or contactor, suitable for 2000-volt, 230-volt, direct-current motor; Schedule 7134—5500 cable terminals, type V, 2000 5-amp snap switches; Schedule 7118—miscellaneous rolled naval brass rod, 1½-in. commercial lengths; Schedule 7130—11500 lb. naval brass rod, ¾-in. diameter, commercial lengths; Schedule 7130—11500 lb. naval brass rod, miscellaneous rolled naval brass rod, 1½-in. commercial lengths, Boston, Mass., Schedule 7123—miscellaneous boiler tubes. Charleston, S. C., Schedule 7123—5550 lb. copper tubing, 12-ft. lengths. Bids will also be received at the same place for one 7½-kw turbo-generator set and spare parts, to be delivered at Puget Sound, Wash., as per Schedule 7115. Applications for schedule should designate the schedule desired by number.

### North Central

**BESSEMER, MICH.**—The city of Bessemer has entered into a new contract with the Gogebic & Iron Companies, of La. Co. under the terms of which the company will furnish the city 135 lamps for the same price that it formerly paid for 73 lamps. Ornamental lamps will be installed on several blocks.

**DETROIT, MICH.**—Bids will be received by Marcus L. Freud, Dime Bank Building, Detroit, for an electric motor to be installed in one of the State institutions.

**DETROIT, MICH.**—Plans for a new city hall have been prepared by Preston Brown Walker, Dime Bank Building, Detroit, for the installation of a power plant in the new factory of the Utility Pwr. Co.

**DETROIT, MICH.**—Bids will be received by Charles A. Gads, secretary of board of education, until Aug. 11 for construction of a 16-room school building, adjoining the Fairbanks School building, at Hamilton and Seward Avenues.

**ESCANABA, MICH.**—Arrangements have been made by the Escanaba Trac. Co. for the construction of a third dam and hydro-electric plant on the Escanaba River. The power house will be located about 1000 ft. below Chandler Falls and will be equipped to generate 1000 hp. Practically all energy generated at the plant will be supplied to a large pulp mill to be erected and installed by Milwaukee capitalists. F. L. Utley, secretary and general manager of the Escanaba Trac. Co., will have charge of the work.

**MEMPHIS, MICH.**—The Dugas Motor Car Co. is contemplating the erection of a garage in Menominee, which will be equipped with an electric charging battery sufficient to take care of charging of all electric cars in this district.

**SAGINAW, MICH.**—The city of Saginaw is considering the installation of a new municipal electric-light plant. A new system of street-lighting will also be installed. For further information address Herman H. Eymen, city engineer.

**URBANDALE, MICH.**—Arrangements have been made for the installation of an electric-lighting system in Urandale. The present plans also provide for the use of electric lamps on every street and the entire distance on Main Street, from Battle Creek to this village. Energy for operating the system will be supplied from Battle Creek plant. Urandale has not a post office.

**ASHLAND, OHIO.**—Arrangements, it is reported, have been completed for the erection of an addition to the plant of the Maiwun German Aluminum Co. The new building will be 75 ft. by 40 ft. and will be equipped throughout with electric-motiv power machines. A 10-hp gas engine will drive a 75-kw generator will be installed.



CANTON, CONN.—An agreement has been made that the contract for suction sweepers in seven buildings of the Canton Public School has been awarded to T. J. Thomas, sales manager of the United El. Co., of Canton.

CINCINNATI, OHIO.—Plans are being considered by the Main Street Merchants' Association for the installation of an ornamental street-lighting system on Main Street.

HAMILTON, OHIO.—Plans are being considered by Public Service Director Myers for the installation of a new power-generating unit in the municipal electric-light plant, to cost \$55,000.

MASON, OHIO.—Arrangements have been made for the construction of a municipal electric-light plant, for which \$14,000 in bonds have been authorized.

SYCAMORE, OHIO.—Bids will be received by O. J. Niebel clerk board of trustees of public affairs, until Aug. 14 for improvements to the municipal electric-light plant and water-works system. Plans may be obtained at the above office from George Champe, consulting engineer.

YOUNGSTOWN, OHIO.—Plans for the complete readjustment of the street-lighting system have been decided upon which provide for replacing the 750 arc lamps now in use with 3750 tungsten lamps, the figures being based on lamps of 100 cp. H. Whitford Jones, of Cleveland, is consulting engineer.

MONTICELLO, KY.—The proposal to issue bonds for the installation of an electric-light plant and water-works system will be submitted to the voters at the regular election to be held Nov. 3.

EAST GARY, IND.—Bonds to the amount of \$10,000 have been authorized by the Town Board for the erection of a transmission and distributing system. Electricity for domestic use, it is reported, will be obtained from the Calumet El. Co.

TELL CITY, IND.—The contract for remodeling the municipal electric-light plant has been awarded to the General Electric Co. for \$13,955.

ALTON, ILL.—Bids will be received at the office of the Board of Administration, Capitol Building, Springfield, until Aug. 11 for the erection of an administration building, receiving hospital, cottage for untidy female patients and nurses' home on the site for the Alton State Hospital, near Upper Alton. Plans and specifications may be obtained upon application to James E. Dibek, state architect, 29 South La Salle Street, Chicago, Ill.

CHICAGO, ILL.—The Illinois Public Utilities Commission has granted the Public Service Commission a certificate of convenience for the erection of transmission lines from Streator to Grande Ridge from Kankakee to Chebanse and from Henry to Spring Grove, Solon Mills and Richmond.

SPRINGFIELD, ILL.—Bids will be received by the Board of Administration, Capitol Building, Springfield, Ill., until Aug. 18 as follows: for addition to school building and three cottages at the St. Charles School for Boys at St. Charles, plans and specifications may be secured upon application to James E. Dibek, state architect, 29 South La Salle Street, Chicago. For rehabilitation of the power plant at the Soldiers' Orphans' Home, at Normal, plans and specifications may be secured upon application to E. B. Bantz, managing officer of the institution. Repairs and mason work for four horizontal water-tube boilers at the Anna State Hospital, at Anna, plans and specifications may be seen at the office of the managing officer of the institution.

SPRINGFIELD, ILL.—Bids will be received by the Board of Administration, Capitol Building, Springfield, until Aug. 18 for the erection of buildings, plumbing, heating, sewers, etc., as follows: One cottage for tubercular patients at the Anna State Hospital, Anna; one cottage for tubercular patients at the Kankakee State Hospital, Kankakee; one cottage for tubercular patients, one building for female employees and amusement hall at the Waterbury State Hospital, Waterbury; administration building, receiving buildings and two cottages at the Chicago State Hospital, at Danning; one cottage for tubercular patients at the Lincoln State School and Colony, at Lincoln; three farm cottages at the St. Charles School for Boys, at St. Charles. Plans and specifications may be obtained upon application to James E. Dibek, state architect, 29 South La Salle Street, Chicago.

URBANA, ILL.—The contract for the construction of the addition to the power house of the University of Illinois has been awarded to Freeman & Brooks, of Champaign, at \$44,800. The equipment will in-

clude two 500-hp Babcock & Wilcox water-tube boilers, fitted with Greene stokers.

WAUWATOSA, WIS.—The contract for the construction of the power house for the town of Wauwatosa, Wis., at Wauwatosa, has been awarded to the American Construction Co., at \$37,500.

BRainerd, MINN.—Bids will be received at the office of V. N. Roderick, city clerk, until Aug. 17 for the construction of a city hall and building and a fire station building at Brainerd, including general contract work, heating, plumbing and electrical work in accordance with plans and specifications prepared by Alden & Harris, architects, Commerce Building, St. Paul. Separate bids to be submitted for each part of the work. Copies of plans may be seen at the St. Paul, Duluth and Minneapolis Builders' Exchanges. Extra copies of plans and specifications may be obtained on application to the architects upon deposit of \$25, of which \$15 will be refunded upon return of same.

RUHL, MINN.—The contract for improvements to the municipal electric-light plant and water-works system has been awarded to R. E. Whitaker, Chicago, Ill., to cost about \$50,000. The work includes construction of new tank, installation of new machinery and the erection of a new substation.

CEYLON, MINN.—The city of Ceylon has engaged Earle D. Jackson, of St. Paul, consulting engineer, to prepare plans for a municipal electric-light plant. Bids are being asked for the sale of \$5,000 in bonds for construction of light plant and extending water mains. F. H. Koenecke is city clerk.

DODGE CITY, MINN.—A franchise has been granted to a private company to install an electric-light plant in Dodge City. The company would like to receive prices on a 50-kva or 75-kva, three-phase, 60-cycle, 240-volt generator, and a motor (second hand). Homer G. Hall, manager, has charge of the installation.

GOOD THUNDER, MINN.—The Good Thunder El. Co. has been granted permission to erect a transmission line along the public highway in the township of Rapidan and Lyra and the village of Good Thunder.

MINNEAPOLIS, MINN.—The State Board of Control has awarded the contract for heating and plumbing work at the State Public School in Owatonna to the Clefion Co., of Owatonna, at \$16,467.

DENISON, IA.—The contract for construction of the power house for the municipal electric-light plant has been awarded to Fee & Kobler, at \$5,740, and for furnishing electrical machinery to the McGraw Co., of Omaha, Neb. The plans provide for a 50-hp engine, 35-kw generators. Owing to a change in current a complete change in meters will be necessary.

GALVA, IA.—Plans have been prepared by H. L. Snyder, Engineering Co., for the construction of an electric-light plant and water-works system. The equipment will consist of a 50-hp engine, 35-kw generators, a pump. The cost of the plant is estimated at \$6,000.

LUZERNE, IA.—At an election to be held Aug. 17 the proposal to grant the Iowa Ry. & Lt. Co., of Cedar Rapids, a franchise to furnish electrical service in Luzerne will be submitted to the voters.

LYONS, IA.—The contract for installing the proposed ornamental street-lighting system has been awarded to H. J. Overkamp. The plans provide for 54 iron standards, made by the Iowa Ry. & Lt. Co., of Clinton, each carrying one 100-watt and four 60-watt incandescent lamps, maintained by underground wires. The cost is estimated at about \$170. J. C. Doss, commercial M. F. Henle is president of the Commercial Club.

MANILLA, IA.—The Standard El. Construction Co., of Waterloo, has been awarded the contract for the installation of a complete overhead distribution system, together with 14 electroliers.

SWEA CITY, IA.—The contract for the installation of a complete electric-lighting system, including a 24-hp engine, boiler and boiler, has been awarded to the Standard El. Construction Co., of Waterloo.

VAN CLEVE, IA.—Bids will be received by the Consolidated Independent School District of Van Cleave, until Aug. 24 for the construction of school building. Separate bids to be submitted for heating, plumbing and electrical wiring. J. F. Ingels is secretary board of directors.

AUXVASSE, MO.—Application has been made to the Public Service Commission by M. R. Kennedy for permission to install an electric-light plant in Auxvasse.

BIRCH TREE, MO.—Franchises, it is reported, have been granted by the State for the installation of an electric-light plant and water-works system. The electric-light

plant, it is understood, will be installed at once.

HOPKINS, MO.—D. A. Dalbey, of Grant City, recently granted a franchise, is planning to install an electric-light plant in Hopkins, to cost about \$10,000; he will also install an ice plant.

GROTON, S. D.—The Groton Lt. & Pwr. Co. expects to purchase one 125-hp boiler, one 60-kw generator, one 35-kw generator and one 60-hp oil engine. J. D. Jones is secretary.

BLAIR, NEB.—At an election held recently the proposal to establish a municipal electric-light plant was defeated.

LARNED, KAN.—Bids will be received by the city clerk, Larned, until Aug. 14 for electric-light plant. Worley & Black, Reliance Building, Kansas City, Mo., are engineers.

SALINA, KAN.—The Salina Lt. Pwr. & Gas Co. is planning to build an addition to its boiler room and to install one 400-hp boiler, erect cooling tower, remodel switch board and reconstruct a good portion of its works. J. E. Harsh is manager.

TOPEKA, KAN.—F. M. Newland, commissioner of light and water, in his budget for 1915, asks for a new generating unit to supply electricity for street-lighting, to be installed at the municipal electric-light plant. The cost of the equipment is estimated at \$4,500.

## Southern States

CONCORD, N. C.—The city of Concord is contemplating the installation of an ornamental street-lighting system. Bids, which are now being received, L. A. Fisher is superintendent of the municipal electric-light plant.

DENMARK, S. C.—The citizens have voted to install an electric-lighting system in Denmark.

WALLHALLA, S. C.—Bids, it is reported will be received by the city of Wallhalla until Aug. 12 for the erection of a pole-line distribution system. The J. B. McCar Co., Third National Bank, Atlanta, Ga., is consulting engineer.

PAVO, GA.—At an election held recently the proposal to issue bonds for the installation of an electric-lighting system was carried. The citizens have also subscribed \$600 toward a fund for ornamental plant in the business district.

PALATKA, FLA.—The property of the Palatka Lt. & Pwr. Co., it is reported, has been purchased by Paul H. Norcross, of the Solomon-Norcross Co., of Atlanta, Ga. The plant, it is understood, will be rebuilt.

CUMBERLAND GAP, TENN.—The Kentucky Utilities Co., having obtained the right-of-way from the town of Cumberland Gap, will furnish electrical service here. The company will also supply energy to maintain the electric system of the Lincoln Memorial, near here.

LEBANON, TENN.—A movement has been started by the Business Men's Association to establish an ornamental street lighting system on the Public Square and intersecting streets of Lebanon. L. K. Grigsby is chairman of committee.

CITRONELLE, ALA.—The Citronell Pub. Ser. Corp., recently incorporated, is planning to install an electric-light plant here. The power plant will be 57 ft. by 21 ft., and will be equipped to develop 75 kw 5 miles of transmission lines will be erected of which 2 miles have been completed. The company will also install a 24-hp engine and boiler, and would like to receive estimates on ice and electrical machinery. Edward P. Corey, of Citronelle, is president, and Elliott C. Wells, of Citronelle, is engineer.

FLORENCE, ALA.—Arrangements, it is reported, have been made by N. F. Thompson, of Birmingham, for the purchase of the Cypress Creek property, including 114 acres of land and water-powers, which he proposes to develop.

MABEN, MISS.—The Board of Aldermen has granted F. H. Mudd a franchise to install and operate an electric-light plant in Mablen.

WETSON, MISS.—The contract for rebuilding the local electric-light plant, recently destroyed by an explosion, has been awarded to Dabbs & Wetmore, of Meridian.

GLENWOOD, ARK.—The Town Council has granted John W. Widen, of Springdale, a franchise to construct and operate a electric-light plant in Glenwood.

BREAUX BRIDGE, LA.—Bids will be received by the city of Breaux Bridge until Aug. 20 for the purchase of a 24-hp electric-light and water extension bonds. C. J. Rees is Mayor.

GUTHRIE, OKLA.—The City Commi-

gioners have called an election, to be held Aug. 11, to vote on the proposal to purchase the electric-light and power plant (estimated cost, \$250,000) and to issue bonds for same; also to vote on a bond issue of \$25,000 for improvements to the water supply system.

**GUZALANS, TEX.**—All bids received July 20 by the Gonzales Wtr. Pwr. Co. for construction of a reinforced-concrete dam on the Gonzales River have been rejected. The dam will be received at the office of Frank S. Taylor, Scarborough Building, Austin, Tex., until Aug. 12.

**HOUSTON, TEX.**—The City Council has passed an ordinance requiring the Houston El. Co. to construct a double-track railway on several streets of the city.

**LOCKHART, TEX.**—Within the next 90 days, the Lockhart Water Works expects to purchase one carload of poles, 30 ft. long for use in the water supply system. The water mains within the next 30 days. C. E. Jones is manager.

**SAN ANTONIO, TEX.**—The San Antonio & Austin Interurban Ry. Co. is now negotiating for the sale of \$2,000,000 in bonds, to provide funds for the construction of an electric railway and power station. The proposed line is to run between San Antonio and Austin, a distance of about 50 miles.

**TEAGUE, TEX.**—The Magnolia Petroleum Co. is erecting a large pumping station on its pipe line about 2 miles below Teague. The company will install an electric-light plant and water system.

## Pacific States

**CHEHALIS, WASH.**—The City Council has passed the ordinance granting an electric light and power franchise to B. F. Walling, Jr., representing Eastern capitalists. The question of granting the franchise will be submitted to the voters at a special election to be held Sept. 8.

**TACOMA, WASH.**—The Mutual El. Lt. & Pwr. Co. has applied to the Commissioners of Pierce County for a 25-year franchise to construct and operate an electric light and power system and telephone lines on Pioneer way and a number of country roads.

**PASADENA, CAL.**—The City Commissioners have decided to install a new 300-kw, 50-cycle, 2300-volt generator in the municipal electric-light plant, bids for which will be received until Aug. 11. The additional unit will double the output of the plant and will cost about \$30,000. C. W. Koerner is general manager.

**LOS BANOS, CAL.**—Surveys are being made by the San Joaquin Lt. & Pwr. Co. of Fresno for the construction of a transmission line from Los Banos to the Oro Loma country.

**WATTS, CAL.**—The power house of the Pacific El. Ry. Co. at Watts was damaged recently.

**CULDESAC, IDAHO.**—The City Council has granted W. L. Marrs, of Coeur d'Alene, a franchise to construct and operate an electric-light plant in Culdesac. Work on construction of the plant, it is understood, will begin about Sept. 1.

**EPHRAIM, UTAH.**—The electric light commission expects to purchase within the next two months three transformers and 75 meters. J. H. Jensen is city electrician.

**EUREKA, UTAH.**—Work, it is understood, will soon begin on the erection of the new substation of the Utah Pwr. Co. to furnish electricity in this district. The building will be 50 ft. by 70 ft.

**PHOENIX, ARIZ.**—The Secretary of the Interior has authorized the Reclamation Service to execute a contract with the General Electric Co., of Schenectady, N. Y., for one vertical alternating-current generator for the Salt River irrigation project, to cost \$23,852.

**HAYRE, MONT.**—Improvements and extensions, it is reported, are contemplated by the Hayre El. Co., involving an expenditure of about \$50,000.

**DENVER, CO.**—Merchants and property owners on California Street, between Fifteenth to Eighteenth Street, have submitted a proposal to the City Commission offering to supply the standards and lamps for an ornamental lighting system provided that the city will maintain same. Property owners on several other streets have offered to install ornamental lamps and standards, the city will bear the cost of maintenance.

**EATON, CO.**—The Farmers' El. & Pwr. Co., recently organized, has taken over the property of the Eaton Pwr. Co., of Eaton. The company is capitalized at \$50,000 and will furnish electricity for lamps and motors in Eaton and surrounding country.

**FORT COLLINS, CO.**—Preparations, it is reported, are being made by the Great Western Granite Mfg. Co., of Fort Collins, for the erection of a power plant, 32,000 ft. of 26-in. pipe line and a large finishing plant, bids for which will be asked early in the fall.

## Canada

**FORT FRASER, B. C.**—Plans have been filed by the Anderson Pwr. Co., of Victoria, B. C., for the construction of two dams (capacity 10,000 acre-ft.) at Fort Fraser.

**KAMLOOPS, B. C.**—The government telephone and telegraph system in and around Kamloops, including Shuswap Lake and North Thompson, it is understood, will be reconstructed and extended. The cost of the work is estimated at about \$110,000. J. T. Whalen is general superintendent of the Dominion government telephone and telegraph system.

**VICTORIA, B. C.**—The new Royal Jubilee Hospital, for which tenders were recently awarded, covering the first unit of construction, which consists of a brick power house and laundry buildings, will be equipped with an isolated electric plant, plans for which have been prepared by H. C. Moss, of Seattle, Wash. The initial installation will consist of one 75-kw and one 125-kw turbo-generator set, provision being made for increasing the equipment for future extensions. Plans for the electric equipment include the installation of fixtures and lamps complete, designs of the fixtures to be furnished. A special signal system will be installed to operate in conjunction with the clock system. Electrically heated burners are to be provided for converting food from the kitchen to the different wards.

**CHATHAM, ONT.**—The City Council has adopted a resolution authorizing the opening of negotiations with the Hydro-Electric Commission of Ontario for electricity; also

declaring all negotiations with the Chatham Gas Co. at an end.

**PETERBOROUGH, ONT.**—The City Council has decided to take the necessary steps to secure authority to take over the property of the Peterborough Lt. & Pwr. Co., which has been expropriated, the city to pay the company \$100,000, the amount fixed by the Hydro-Electric Commission.

**ST. THOMAS, ONT.**—The City Council is reported to have decided to replace the arc lamps now in use on Talbot Street with nitrogen tungsten lamps. The wooden poles, it is understood, will be replaced by metal combination trolley and lamp-posts.

**WALKERVILLE, ONT.**—The Hydro-Electric Power Commission of Ontario is planning to furnish hydroelectric power in Walkerville and has offered the Walkerville Lt. & Pwr. Co. \$75,000 for its plant and property, which was refused. The company, it is reported, places the valuation at \$84,000.

**SWIFT CURRENT, SASK.**—Debentures to the amount of \$196,000 have been issued by the town of Swift Current for local improvements, of which \$60,000 will be used for a municipal electric-light plant.

## Miscellaneous

**PANAMA.**—Bids will be received at the office of the general purchasing officer of the Panama Canal, Washington, D. C., until Aug. 17 for furnishing shell hoists, motor-driven pumps and float switches for fortifications. Blanks and general information relating to this circular (No. 863) may be obtained from the above office or the offices of the assistant purchasing officers at 14 State Street, New York, N. Y.; 614 Whitney-Central Building, New Orleans, La., and 1086 North Point Street, San Francisco, Cal.

## New Incorporations

**DETROIT, FLA.**—The Detroit Ice, Lt. & Pwr. Co. has been organized with a capital stock of \$25,000 for the purpose of constructing an electric-light and ice plant. The officers are: F. W. Symmes, president; M. G. Tracy, vice-president, and C. F. Keep, secretary and treasurer.

**BUTLER, IND.**—The Butler Utilities Co. has been chartered with a capital stock of \$25,000 by C. M. Lott, W. F. Shumaker and E. A. Farnham. The company proposes to furnish water, light, heat and power.

**CONNERSVILLE, IND.**—The Connerville Hydraulic Co. has been incorporated with a capital stock of \$10,000 to furnish hydraulic power, etc. The incorporators are P. H. Roots, F. M. Roots and M. Padlin.

**VINAL HAVEN, MAINE.**—The Vinal Haven El. Pwr. Co. has been incorporated with a capital stock of \$50,000 to generate and distribute electricity. F. S. Walls is president, and T. E. Libby, treasurer, both of Vinaland.

**RENO, NEV.**—The Portneuf Pwr. Co. has been incorporated by A. D. Ayres, E. C. Dalzel and D. C. Papson. The company is capitalized at \$100,000 and proposes to acquire and distribute electricity for lamps, heaters and motors.

# Weekly Record of Electrical Patents

## UNITED STATES PATENTS ISSUED JULY 28, 1914.

[Prepared by Robert Starr Allen, 16 Exchange Place, New York, N. Y.]

1,104,761. CAR TRUCK. W. S. Adams, Philadelphia, Pa. App. filed Sept. 5, 1913. Leaf-spring mounting for swing bolster truck.

1,104,764. DYNAMO-ELECTRIC MACHINE. FRANK, G. Dunn, East Orange, N. J. App. filed April 19, 1910. Special means for centering the rotor.

1,104,785. MOTOR-CONTROL SYSTEM. G. Dunn, New York, N. Y. App. filed Jan. 4, 1913. For rolling mills of the two-high type.

1,104,788. MACHINE FOR INCLOSING CORDS IN THE WRAPPERS. E. W. Potthoff, Hartford, Conn. App. filed May 29, 1913. Inserts tearing cord between the tire or coil and the paper wrapper being applied to the same.

1,104,793. ELECTRICAL GENERATING SYSTEM. L. V. Grillet and J. B. Truchetet, Paris, France. App. filed Oct. 18, 1911. Armature is longitudinally movable to vary the output of the machine.

1,104,795. MAGNETO. E. Hahnen, Roxbury, Mass. App. filed Aug. 22, 1912. Manually oscillates the armature from the steering post for starting.

1,104,796. ELECTRIC CIRCUIT REGULATOR. C. Aalborg, Wilkinsburg, Pa. App. filed March 1, 1913. Automatically controls the movements of the regulator coils interdependent and has means for locking the coils at a predetermined point of travel.

1,104,800. MOTOR CONTROLLER. A. J. Horton, White Plains, N. Y. App. filed Oct. 16, 1911. Reversing and resistance-controlling device.

1,104,807. ELECTRIC INCANDESCENT LAMP. A. S. Knight, Newark, N. J. App. filed

May 16, 1910. Has straight tungsten filaments stretched between the ends thereof.

1,104,828. GALVANIC BATTERY. J. E. Preston, Stockport, Eng. App. filed Nov. 12, 1910. Reversible type; has special seating and insulating means.

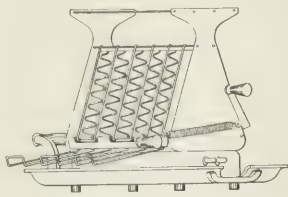
1,104,835. MAGNETO IGNITION DEVICE. F. Schuster and E. L. Munn, Wiesbaden, Berlin, Germany. App. filed Jan. 23, 1913. Sends the current through the armature in alternating directions.

1,104,841. RESISTANCE SET. I. B. Smith, Ambler, Pa. App. filed March 12, 1913. Has a special construction of contacts for cutting in and out the resistance units.

1,104,842. METHOD OF PLATING. J. A. Smith, Attleboro, Mass. App. filed Feb. 27, 1914. Coats with gold solder, plates with gold and heats.



- 1,104,849. VOLTAGE REGULATOR: W. A. Turpin, Jr., Bridge, N. Y. App. filed May 1, 1911. Car-lighting system with a vibrating short-circuit device.
- 1,104,860. EXHAUSTION ALARMS FOR INTER-AL COMBUSTION ENGINES: G. V. Ahara, Toledo, Ohio. App. filed June 7, 1913. Magneto operated mechanism for fuel-pump-operating mechanism; for stationary engines.
- 1,104,865. METHOD OF MAKING STORAGE-BATTERY ELECTRODES: H. C. Hubbel, Newark, N. J. App. filed Nov. 18, 1912. Mixes precipitated active material with conducting elements, dries to thick dough, forms into cakes, dries and strongly compresses.
- 1,104,908. ANTISEPTIC PROTECTOR: T. Lamb, Brooklyn, N. Y. App. filed Dec. 9, 1912. For telephone mouthpiece or receiver.
- 1,104,930. ELECTRIC WALL BOX: J. G. Raquette, Cleveland, Ohio. App. filed May 25, 1912. Constructed so that a number can be assembled in a gang.
- 1,104,931. SOCKET FOR INCANDESCENT ELECTRIC LAMPS: A. C. Recker, Oakville, Conn. App. filed Oct. 27, 1913. Has a ring attached to neck thereof for use in suspension fixtures.
- 1,104,939. ELECTRIC MUSICAL INSTRUMENT: M. L. Severy, Arlington Heights, and G. B. Sinclair, Winthrop, Mass. App. filed Feb. 23, 1906. Strings are vibrated by the pulsatory magnetic attraction of electromagnets.
- 1,104,956. TELEPHONE OPERATOR'S EQUIPMENT: W. G. Blauevit, New York, N. Y., and E. C. Molina, Bloomfield, N. J. App. filed March 14, 1913. Reduces the number of acts and the mental effort required in making connections.
- 1,104,959. VACUUM LIGHTNING ARRESTER: F. S. Chapman, Toledo, Ohio. App. filed July 9, 1912. One or both of the electrodes are inclosed within shields of material to withstand the intense heat produced by the static discharge.
- 1,104,960. LIGHTNING ARRESTER: F. S. Chapman, Toledo, Ohio. App. filed Dec. 24, 1912. Has provision for permanently spacing and supporting the electrodes in the evacuated vessel.
- 1,104,969. PULP DISTRIBUTOR FOR CONCENTRATORS: W. E. Darrow, Sutter Creek, Cal. App. filed July 28, 1913. Rotary type; keeps the pulp in continuous motion.
- 1,104,978. PROCESS OF PRODUCING ACETIC ACID: E. H. French, Dayton, and J. W. Withrow, Columbus, Ohio. App. filed July 9, 1909. Subjects the distillate from acetate of lime to electrolysis.
- 1,105,014. TRANSFORMER: W. M. Austin, Zelenople, Pa. App. filed Feb. 23, 1911. Core lamina having hexagonal contour and a hexagonal aperture.
- 1,105,015. ELECTROLYTIC CELL: D. B. Ayerst, Wilmington, Del. App. filed Feb. 24, 1913. Keeps the diaphragm clean. Keeps electrolyte electrolytic in saturation and regulates its temperature, and frees it of the chlorine as it is given off.
- 1,105,029. AUTOMATIC COMBULATOR FOR RADIOTELEGRAPH PLANTS WITH INDIRECT EXCITATION: E. Girardeau, Paris, France. App. filed Dec. 4, 1911. Plant automatically made ready as a receiver as soon as the lever of the key is released.
- 1,105,035. AUTOMOBILE LIGHT: A. L. McMurtry, Sound Beach, Conn. App. filed Aug. 31, 1912. Shifting of transmission lever into reverse position causes circuit through a searchlamp at the rear.
- 1,105,044. FIRE-ALARM SYSTEM: E. Schumann, Charlottenburg, Germany. App. filed June 28, 1913. Connection made to ground only upon alarm being given or wire broken.
- 1,105,059. SUPPORT FOR FILAMENTS: W. R. Whitney, Schenectady, N. Y. App. filed June 14, 1907. Coiled spring of tungsten supports two tungsten filaments.
- 1,105,066. TELEGRAPHIC TRANSMITTER: J. J. Comer, Santa Monica, Cal. App. filed March 4, 1907. An insulating strip extends into the carbon granules to separate two electrodes and deflect the path of current from one to the other.
- 1,105,070. ARTIFICIAL RESISTANCE: G. J. Gage, Hillyard, Wash. App. filed March 31, 1913. Graphite and carbondrum with a binder.
- 1,105,144. DRY-BATTERY CONTAINER: H. T. Johnson (deceased), New York, N. Y. App. filed July 18, 1912. Carton with closing flaps through which the terminal wires are passed.
- 1,105,155. SELF-REGULATING DYNAMO: T. M. Mueller, Detroit, Mich. App. filed May 15, 1913. Automatic means for changing from shunt-wound machine to compound-wound and back to shunt-wound.
- 1,105,175. ROTARY ELECTRIC FURNACE: A. S. Bemis, Cleveland, Ohio. App. filed Jan. 22, 1912. Has a hollow electrode through which the material feeds onto a flat rotating electrode.
- 1,105,194. SELECTIVE MECHANICAL OPERATOR: E. R. Gill, Yonkers, N. Y. App. filed May 25, 1905. Wheel or like element rotated by a predetermined step-by-step action. (110 claims.)
- 1,105,200. TOASTER: S. A. Wiltzie, Erie, Pa. App. filed Jan. 22, 1912. Has a swinging carrier which automatically reverses the toast.
- 1,105,231. SYSTEM OF ELECTRICAL DISTRIBUTION: J. L. Woodbridge, Philadelphia, Pa. App. filed July 28, 1906. Special booster control.
- 1,105,232. SYSTEM OF ELECTRICAL DISTRIBUTION: J. L. Woodbridge, Philadelphia, Pa. App. filed April 20, 1909. Storage battery relieves the generating source of load fluctuation or provides uniform distribution of load over several phases.
- 1,105,267. INSULATING BLOCK: A. E. Goetz, New York, N. Y. App. filed Dec. 31, 1913. Insulating base for insertion in metallic molding.
- 1,105,284. ELECTRICAL OUTLET BOX AND THE LIKE: A. McMurtrie, New York, N. Y. App. filed Jan. 15, 1906. Has means for attaching it to a I-beam.
- 1,105,292. APPARATUS FOR ELECTROPLATING AND THE LIKE: A. Murphy, Quincy, Mass. App. filed Oct. 22, 1913. For small articles; has revoluble outer conical vessel.
- 1,105,293. MAGNETIC SEPARATOR: H. J. H. Nathorst, Malmberg, Sweden. App. filed March 5, 1913. Rotating drum with electromagnets of alternating polarity within the same.
- 1,105,305. LAMP-SOCKET SHELL: H. E. Reeve, New York, N. Y. App. filed March 8, 1911. Has a boss serving as a thumb-hold for releasing the catch which secures the cap in place.



1,105,230—Toaster.

- 1,105,311. ALTERNATING-CURRENT ELECTROMAGNETIC SWITCH: A. Sundt, Yonkers, N. Y. App. filed Nov. 1907. Substantially silent in operation and chattering minimized.
- 1,105,324. MECHANICAL HORN: G. C. Dean, Bronxville, N. Y. App. filed July 10, 1908. Two sources of current connected in opposition at transmitting station, with a condenser and transformer at receiving end.
- 1,105,329. CABLE TELEGRAPHY: I. Kiteas, Philadelphia, Pa. App. filed Oct. 28, 1908. Includes two sources of current connected in opposition at transmitting station, with a condenser and transformer at receiving end.
- 1,105,344. TELEPHONE SYSTEM: E. R. Corwin, Chicago, Ill. App. filed June 1, 1909. Calling lines automatically connected with responsive apparatus belonging to operators that are not busy. (Fifty-four claims.)
- 1,105,345. TELEPHONY: E. R. Corwin, Chicago, Ill. App. filed Aug. 24, 1911. Either of two telephone lines may be connected with a third line and establish a busy-test condition in connection with the third line.
- 1,105,346. TELEPHONY: M. L. Johnson, Chicago, Ill. App. filed May 22, 1911. Selecting mechanism also applies ringing current.
- 1,105,347. TELEPHONY: M. L. Johnson, Chicago, Ill. App. filed Aug. 10, 1911. Has a common-battery exchange and a second common-battery exchange connected thereto by a trunk line, together with link connectors for the lines leading to the exchanges. (Twenty-two claims.)
- 1,105,348. TELEPHONE SYSTEM: C. A. Bals, Chicago, Ill. App. filed June 24, 1912. Intercommunication without the aid of an exchange.
- 1,105,349. SWITCHING MECHANISM: C. A. Bals, Chicago, Ill. App. filed June 24, 1912. For intercommunicating telephone systems.
- 1,105,350. SIGNALING SYSTEM: M. L. Johnson, Chicago, Ill. App. filed July 15, 1912. Signal receivers selectively associated with telephone lines.
- 1,105,361. IGNITION DYNAMO: C. T. Mason, Sumner, S. D. App. filed May 10, 1913. Permanent magnets and an adjustable field structure. (Thirty-nine claims.)
- 1,105,385. PROTECTING HIGH-VOLTAGE TRANSFORMER: M. O. Troy, Schenectady, N. Y. App. filed Nov. 14, 1908. A small transformer in parallel with the line and the main transformer serve as a buffer.
- 1,105,392. CIRCUIT PROTECTION: G. Wright, Schenectady, N. Y. App. filed Dec. 26, 1909. Circuit-interrupting means is caused to open after conditions of excessive current flow have ceased.
- 1,105,399. CONTACT POINT: J. F. Cadel, Baltimore, Md. App. filed June 15, 1907. Platinum tip upset over a conical recessed boss.
- 1,105,436. POLICE AND FIRE-ALARM SYSTEM: J. H. Hughes, Chicago, Ill. App. filed Feb. 12, 1913. Combined with common-battery telephone system.
- 1,105,465. EXCESS ELECTRIC-CURRENT INDICATOR: J. Stone, Pittsburgh, Pa. App. filed Feb. 9, 1912. Reactance automatically inserted in circuit, rendering the energy-consuming devices inoperative when it is attempted to take more than the agreed amount of current.
- 1,105,481. ELECTRICAL MEASURING INSTRUMENT: R. E. Brown, Philadelphia, Pa. App. filed Feb. 12, 1913. D'Arsonval galvanometer having a core guided and supported between the pole faces on sliding bracket.
- 1,105,485. INTERCOMMUNICATING TELEGRAPH OR TELEPHONE DEVICE: A. C. Carlson, Butler, Pa. App. filed Feb. 9, 1912. Breaks one circuit when another is closed, thus releasing other circuit when it is desired to use one circuit.
- 1,105,499. ELECTRICAL CONTACT: E. E. Clement, Washington, D. C. App. filed Sept. 29, 1906. Narrow strips of platinum rolled or plated on a blank from which contact springs are cut.
- 1,105,490. TELEPHONE-EXCHANGE SYSTEM: E. E. Clement, Washington, D. C. App. filed Nov. 26, 1906. Semi-automatic. (Twenty-five claims.)
- 1,105,491. ELECTRICAL SELECTIVE SWITCH: E. E. Clement, Washington, D. C. App. filed April 12, 1906. Specific construction of contacts and electromagnet operating means.
- 1,105,492. TELEPHONE EXCHANGE SYSTEM: E. E. Clement, Washington, D. C. App. filed Oct. 26, 1907. Release of time required for sending the impulses for operating the automatic switches. (Twenty-two claims.)
- 1,105,499. STORAGE-BATTERY PLATE: R. Drumburg, New York, N. Y. App. filed July 1, 1907. Unit within thin cells and fitted to hold electrolyte supports the plates of different polarity.
- 1,105,504. COAT AND HAT PROTECTOR: E. Gargon, Philadelphia, Pa. App. filed April 16, 1913. Key-operated; gives signal if mistake is made.
- 1,105,521. INSULATOR ATTACHMENT: J. A. Kenhardt, Wellston, Okla. App. filed Aug. 15, 1913. Wire-holding clamp.
- 1,105,538. ELECTRIC FURNACE: H. F. I. Schwahn, Belleville, Ill. App. filed Sept. 26, 1912. A resistor over a checker on a base into which the furnace is an upper and a lower chamber.
- 1,105,545. TELEPHONE EXCHANGE SYSTEM: E. E. Clement, Washington, D. C. App. filed April 10, 1914. Operator can directly control the connections or wait for the various switches to complete their several operations. (Fifty-three claims.)
- 1,105,557. ARRESTER FOR STRONG CURRENTS: H. W. Garton, Brooklyn, N. Y. App. filed July 22, 1913. Embodies a rectangular member having hygroscopic qualities interposed between the live and ground terminals.
- 1,105,563. TELEPHONY: M. L. Johnson, Chicago, Ill. App. filed Aug. 10, 1911. Particularly for private branch exchanges. (Twenty-eight claims.)
- 1,105,564. TELEPHONY: C. A. Bals, Chicago, Ill. App. filed June 27, 1913. Circuit-changing keys with elements to hold them in the actuated position and a common terminal for all keys for restoring them.
- 1,105,589. TELEPHONE EXCHANGE SYSTEM: E. E. Clement, Washington, D. C. App. filed Dec. 28, 1905. Calling subscriber answered by operators and the desired connections effected by automatic mechanism controlled from the subscriber's station.

# Electrical World

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## The Duty Now to Be Performed

President Wilson is in one of the characteristic moods that so frequently distinguish his public announcements when he says that there is no cause for alarm in this country and that there is an opportunity for this nation to reap great permanent glory provided nobody loses his head. This is at once a reassurance and a caution. Reason is more likely to rule in the higher matters of state if it rules in those of lesser importance throughout the nation. There is a time for all things, and these are the moments when it is profitable to remember that confidence begets confidence. It is idle to attempt to forecast the ultimate results of the appalling events in Europe, but it is well worth while for each industry and all of its people to work earnestly to keep this country orderly in the chaos of world markets. Sooner or later the war clouds will lift, and if sober judgment directs business affairs here the nation will be ready, as Mr. Wilson tells us to remember, to help the rest of the world. What the authorities want done to further this end will be done with courage by all business interests. It is a task in which each one has a part. That part does not lie in the denial of grave and troublous conditions abroad, but in the determination to assert and make the most of the bountiful sources of satisfaction that business men find here if they stir themselves enough to look about. With the first shock of greatly altered conditions already withstood creditably, it is natural for the electrical and all other industries of tested and proved strength to return to vigorous work.

## Urgent Need for Merchant Marine

Nothing that has occurred in the history of the nation has so aroused it to a realization of our woefully inadequate merchant marine as the present unhappy situation. With crops and products in abundance and gaping markets we are letting the days slip by without selling freely to needy buyers. It is true, as Mr. Maurice Coster points out in the interview published elsewhere in this issue, that the effective development of export trade by manufacturers requires the co-operation of the government and the banks. Banks have taken steps to furnish facilities for handling funds in the temporary cessation of European banking operations. The question now is whether our government will do its part. The government cannot create merchant vessels out of a clear sky but it can do something by speedy enactment of the pending relief measure. After following for many years a halting policy in the development of a merchant marine the

nation cannot in a day undo the mischief which inevitably results from that policy. What it can do is to conclude that it has been unwise to the point of improvidence in ignoring the lack of steamships to move goods to foreign lands and that it will adopt forehanded measures for the future. If it was necessary to judge the chances of legislation favoring this end only by the recent activities of the present body of lawmakers in Washington, there would be some doubts about relief. The members now sitting in Congress have labored to put fetters on business rather than to remove hindrances to commercial advance. However, responsibility and a real crisis bring out the best in man. Congress can rectify for the future the mistake of the past. The object lesson is plain. This country has relied too much on foreign aid in its export trade. As matters stand now, it is not free to go ahead and build up that trade without the consent of others who are virtually natural competitors. It will not answer to say loftily that since the crops and goods are here nations that want them will find a way to come and get them. That delinquent attitude belongs to the old days. American manufacturers require a policy in Congress that will supply vessels to promote and protect their commerce.

## The Springfield Rate Case

The Missouri Public Service Commission has denied the application of the Springfield Gas & Electric Company for a rehearing of the electrical rate case. Unless the company is to conform to the terms of this drastic order, the only thing that it can do now is to take the case into the courts. We had occasion in an earlier case to commend the Missouri commission for its courage in rescinding an order which it was wrong in issuing. Because of the revelation in that case that the commissioners were not above admitting that they were human and had made a mistake there was some reason to think that in the Springfield case the answer of the company might lead to a reconsideration of the merits of the finding. No such attitude controlled the commission, however. The one member who, upon reconsideration, expressed grave doubts whether the company had been allowed sufficient valuation and an adequate return was outvoted by his colleagues. The petition of the company for a rehearing, which was reported in last week's issue, presents the argument with a noticeable absence of the byplays to the galleries which encumbered the original decision of the commission. The answer of the company was dignified; the decision of the commission was plainly deficient in that dignity which should characterize the rulings of a body having



such vast powers. The extreme language of the commission is revealed in sharp contrast with the calm answer of the company. It has come to be the practice of some of the commissions, whenever the way is open, to "roast the corporations." This is an easy way of acquiring notoriety. It should be just as fair for the companies to criticise commissions guilty of dereliction or actions taken with an eye to the unthinking public applause as for commissions to attack companies. Practically, however, the commissions have the upper hand. It is inexpedient for the companies to criticise them. The fact that the companies are somewhat dependent on the good will of the commissions does not make chastisement by the commissions any fairer; it ought to make the commissions temperate in their language. We do not urge that wrongs be ignored, but do urge that the commissions and the companies co-operate to develop the best properties and service to the end that all interests concerned may be conserved and protected. Few of the commissions are deeply sunk in politics, but those that permit their conclusions to be spoiled by political considerations do much to discredit the policy of regulation.

### The Alton Auxiliary Plant

The steam auxiliary of the Keokuk plant, a description of which is published in this issue, represents an excellent example of this class of generating station. The design of auxiliary stations calls for good judgment. The character of the installation as well as its size depends upon the hydraulic conditions in a way that may become exceedingly puzzling. In some instances, when the auxiliary station is likely seldom to be called into action, minimum cost is the controlling feature of design. In other cases, when the load on the auxiliary station is carried for long periods, it is necessary to design for very high efficiency even at large expense.

In the present case the conditions are such that it seemed wise to put all the steam reserve into a single large unit, worked in parallel when necessary with the substation fed with energy from the Keokuk station. Hence the installation of a single large turbo-generator with its boiler equipment standing alone at its work, although there is ample provision for the enlargement of the equipment when needed. The steam plant proper is perhaps the most interesting feature, although the electrical portion of the plant is somewhat out of the ordinary also. For economical service it is necessary to operate the auxiliary plant at widely varying loads, and a combination of natural and forced draft has been introduced to meet the load requirements. For light loads the stack furnishes ample draft, but when the plant is to be operated at the limit of its output a steam-driven blower delivering up to 100,000 cu. ft. of air per minute is put into service.

In the condenser equipment an interesting problem had to be solved. Water for the condenser is obtained from the Mississippi, there being a considerable variation in the temperature and in the lift required. The condenser pump is therefore electrically driven from a

special variable-speed direct-current motor, receiving energy from one of the rotary converters with which the station is provided, so that the speed can be nicely adjusted to maintain high efficiency under any conditions of water supply. One very admirable feature resides in the complete provision made for the continuous weighing of both the water and the coal consumed so that the plant can be kept practically under test conditions all the time if it is found desirable. A complete set of instruments records all the operating temperatures so that it is easy to follow every detail that affects the efficiency. Altogether the plant is very unusual, especially considering the fact that it is fundamentally an auxiliary, and it contains many details worthy of careful examination by the designing engineer who wishes to keep in touch with the latest practice.

### The Making of Rate Schedules

In a recent article in the *Elektrotechnische Zeitschrift* Dr. G. Siegel summarizes very instructively the chief features of the systems of charging for lighting and motor service in use throughout the countries most active in electrical distribution. Without plunging into dismal statistics, already made useless by the exigencies of the world struggle now in progress, certain facts must be recognized as forming the basis of prices in every country. To begin with, the general scale of prices for electric service is determined by local conditions which vary from country to country and from place to place in each country. The most important of these is the cost of fuel.

In spite of the ingenuity that has been exercised in working out so-called scientific rates, the bald fact that practically the world over different prices are charged for energy for lighting and for motor service drawn from the very same mains gives irrefutable proof that the rate is actually determined on principles wholly commercial as are the prices of any other commodity. In case of some of the modified demand systems now in use the same schedule may apparently be made operative for lighting and for motor service, but there is no real exception to the rule, for a little examination almost invariably shows that the scale is so formulated as to separate the two classes of service practically, if not theoretically.

Looking over Dr. Siegel's data, it at once appears that, on the whole, throughout the world the tendency is toward a rate based on a standby charge plus a meter charge in the larger stations, while a flat rate or discountered meter rate is the rule in the smaller stations. Perhaps the lesson to be drawn is that on heavily loaded systems the standby costs are far more keenly felt than in small plants where fully loaded apparatus and lines are the exception. Flat rates either by contract or by meter are decidedly the exception in all countries. But the demand idea has undergone an interesting evolution which shows at least an elementary recognition of its one-sided character. In theory, the measured demand is what really determines the

standby costs, in so far as these are unrelated to the time of their occurrence. In practice it seems to have been the general rule that for the purpose of fixing rates the demand is taken in some arbitrary and conventional manner. Just what form is given to it depends upon circumstances, and the usual result is probably nearer to a just average charge than the measured demand would be.

In any such scheme of charging the fixed price can be and often is so set as to produce the same general result as some particular form of quantity discount, and this ultimately is the equivalent of selecting a schedule of prices based on what the traffic will stand considering the local demands and conditions. Such is commonly the final result of the commercial evolution of a rate schedule quite independent of its beginnings. In the many municipal plants in England and on the Continent various elements tend to modify the prices charged in a most irregular fashion. Speaking broadly, the municipal prices in England are relatively low as compared with those on the Continent, where complaints of the prices are often heard. Perhaps this result is attributable to the tendency, especially strong in Germany, for cities to engage in many kinds of business on a profit-making basis.

The point of greatest variation in rate schedules seems to be the relation between the lighting and the motor-service charges. This is true of our own country and most others as well. In two cities apparently working on about the same basis in lighting enormous variations are found in the motor-service rates, especially in the heavier classes of service. Dr. Siegel's data make it evident that such variations are general phenomena, and that there is great need to arrive at standard methods of reckoning so that in two neighboring or even contiguous communities there may not be wide differences in charges for similar services.

### Optimum Wave-Length in Radiotelegraphy

The best wave-length for use in regular communication between any pair of radio stations is governed by a number of factors, which must include interference conditions, antenna characteristics of sender and receiver, and international or federal regulations, as well as the absorptive or other qualities of the media through which transmission is effected. Since in the average station one or more of these factors are not fixed by design, it has been customary to build instruments having a considerable range of wave-length and to select the most suitable adjustment after the stations have been erected and placed in operation. Sometimes, however, all the conditions which govern the choice of wave-frequency may be predetermined, and in such instances it is interesting to consider just how much the efficiency of transmission is affected by what lies between the two installations being investigated.

On page 326 of the present issue Mr. A. S. Blatterman discusses the quasi-theoretical determination of optimum wave-length in wireless telegraphy. His con-

clusions are based upon a study of the Austin-Cohen radio-transmission equation as graphically solved for distance in terms of wave-length, antenna height and antenna current. Obviously the results drawn from such consideration can apply only to the effects of the media of transmission, but even when so limited the conclusions have a marked degree of interest to radio engineers. Mr. Blatterman's assumption of constancy of antenna current when the wave-length is changed and the applied power held invariable cannot be accepted for all cases, yet it is true that many antennas have a nearly constant effective resistance for a large range of wave-lengths above twice the fundamental. For such aerials the results from the transmission equation may be applied with little modification, while for others a determination of the relative magnitudes of current and of transmission efficiency changes with wave-length will show at once how much importance may be attached to the selection of a wave-frequency having minimum absorption.

Certain curves in the present article show graphical solutions for distance as a function of the wave-length. From Fig. 7 it may be noted that, so far as the transmission expression determines the relation, the optimum wave-length is independent of all of the quantities except the distance. This result may be considered as further evidence that results of this sort have to do only with the media of wave propagation, and, even then, with only those of which the absorption coefficients are known. The results derived by the author have been confirmed in part by experiments of Prof. A. H. Taylor.

In applying the curves and equations given in the present article it should be noted that the distances are expressed in statute miles and that use has been made of the numerical coefficients determined by Austin and Cohen. Where computations are intended to give an index for commercial radiotelegraphy, it is well to remember that, if the static interference at the receiving station is severe, antenna currents as great as 200 microamperes may be required to permit continuous reading of messages. It is also important that the choice of high antenna or high current with the indicated reduced value of the other factor is not purely one of investment versus running expenses, since there are involved the questions of increased atmospheric difficulties at the receiver as the height becomes greater, and of the changes in applied power needed to produce at the sender a given current strength in any type of aerial as the effective height and working wave-length are altered.

It is hoped that the continued publication of material such as Mr. Blatterman presents will result in the wider appreciation of the fundamentals of radio-transmission engineering, and that there will be brought forward from time to time experimental data which will be of value in confirming or overthrowing the present hypotheses as to absorption, reflection and refraction of long electromagnetic waves emitted by earthed oscillators.



# The News of the Week

## Activities and Events in the Electrical Field— Reports of Meetings—Commission Findings, Etc.

### Suit to Enjoin Los Angeles Bond Issue

An action has been begun at Los Angeles, Cal., to enjoin the sale by the city, or the use of any part of the proceeds, of the issue of \$6,500,000 "power" bonds authorized by the voters on May 8. The proceeds of the bonds were to be used for the completion of a hydro-electric generating station and the construction or acquisition of an electric distribution system. The complaint in the bill is that the city combined under one issue bonds for more than one purpose, and that while it was generally supposed that \$1,250,000 was to be used for completion of the generating station and \$4,250,000 for a distribution system, nothing in the ordinance compels such a division of expenditures. Before this action was begun the bonds had been held to be legal by a firm of attorneys.

### Status of Water-Power Legislation

The Adamson bill, which was passed by the House last week, has been referred to the Senate committee on commerce, but no action has been taken on it as yet owing to the mass of emergency work before the Senate as a consequence of the European war.

In the absence of Senator Clarke, of Arkansas, Senator Simmons, of North Carolina, is acting chairman of the committee on commerce. It is stated at Senator Simmons' office that it has not been decided whether or not there shall be Senate hearings on the bill. The question is under consideration.

Representative Foster has reported from the rules committee of the House a special rule providing for the early consideration of the administration's four conservation bills. But he has provided an amendment that the consideration of these bills shall not interfere with the consideration of any measure relating to war tax revenues or the bonded debt of the United States.

### Hearing on Separation of Washington Utilities

The committee on the District of Columbia of the House of Representatives held a hearing on Aug. 6 on a bill which directs the separation of the Washington Railway & Electric Company and the Potomac Electric Power Company of Washington, D. C. The following appeared before the committee: Mr. Clarence P. King, president of the Washington Railway & Electric Company; Mr. W. F. Ham, vice-president; Capt. Charles Holm, of New York, counsel for the company; Mr. Paul M. Lincoln, of Pittsburgh, and Mr. A. K. Baylor, of New York. The Washington Railway & Electric Company owns a controlling interest in the Potomac Electric Power Company.

The principal event of the hearing was the unexpected proposition advanced by Representative Prouty, of Iowa, a member of the committee, that the two companies, instead of being forced by an act of Congress to separate, be allowed to consolidate. The railway officials, including Mr. King and Mr. Ham, said that in their opinion such an arrangement would be

agreeable to the companies. Mr. Ham, in his testimony before the committee, opposed the contention of the Public Utilities Commission of Washington that the Washington Railway & Electric Company has not maintained a proper depreciation account.

Mr. Ham informed the committee that since 1902 the dividends paid by the company have averaged only 2.8 per cent. They have been larger of recent years. Mr. Ham questioned the expert knowledge of the commission to prescribe what should be a proper depreciation account for a railway company.

Referring specifically to Representative Prouty's suggestion of a consolidation of the two companies, Mr. Ham declared that he believes that the time is not far distant when the advantages will be realized of consolidating all the railway companies and the Power company of the District of Columbia. He said this would settle "the transfer problem" once and for all and would give the companies a sound financial basis, with the prospect of going forward to meet the demands of future growth in the capital.

### Recommendations of Committee for London Electricity Supply

As a result of the report submitted by Messrs. Merz and McLellan in regard to the supply of electrica energy in London, which was discussed in the *Electrical World* of May 2, May 9 and June 13, 1914, the special electricity committee of the London County Council has made public its conclusions on this subject. The committee concludes that from the point of view of dealing in the most satisfactory manner with the needs of London in regard to the supply of electrica energy and with due regard to future developments effect should be given gradually to the technical conclusions contained in the report of Messrs. Merz and McLellan.

It is the belief of the committee that a new authority or controlling body, should be created which should probably contain representatives of the London County Council, the five other county councils and the three county boroughs concerned. The principle of the scheme outlined by the committee is that the machinery to be set up with the object of bringing the new undertaking into existence should provide for a combination of municipal ownership and control with private operation. The committee is of the opinion that the efficient and profitable working of the undertaking in the interest of all concerned will be secured most effectively by the adoption of an arrangement under which the capital shall be provided in definite proportions by the authority and a company. The company would have possession of the whole of the undertaking including any undertakings acquired for a definite period, subject to full powers of control and supervision by the authority. The authority should advance as loan two-thirds of the capital required for addition and betterments, while the remaining one-third should be furnished by the company. It is suggested that the whole of the money required for the transfer of exist-

ing undertakings should be provided by the authority. The authority would be empowered to resume possession of the undertaking at the end of the term of the contract on payment to the company of a sum equal to the capital provided by it for the purposes thereof. The arrangement provides for complete ultimate ownership by the authority.

The committee emphasizes that its scheme represents a combination of municipal and private enterprise designed to insure full control by, and an adequate share of profits to, the public with the flexibility and commercial enterprise of company management.

## War-Time Possibilities of Electrical Export Trade

By T. C. MARTIN

At the present moment, owing to the frightful war which is now being waged in Europe and which has sealed the outlets of our leading competitors, it would seem as though opportunity were knocking at our doors in respect to American export trade more loudly than it ever knocked before; but it will probably be some time before the exact conditions under which new trade can be developed will make themselves apparent. Never since the Napoleonic days has the world been confronted with such problems in the readjustment of its affairs, and even he who would be most adventurous must be reasonably cautious. It stands to reason, first of all, that if we are going to do a larger export trade we must at least have the ships in which to place the goods, so that over and above all necessities looms that of the immediate rehabilitation of the American mercantile marine. At one time our flag was seen on every sea and a large proportion of the world's commerce was carried in American bottoms. Latterly to see an American flag in a foreign port has been so rare in occurrence as to give a shock.

As to the electrical export trade, it has reached as high as \$25,000,000 a year in strictly electrical goods. There seems no reason why this electrical figure should not be easily surpassed in the near future. During the past year or two there has been a tendency to a decline in these figures, but this may be regarded as a sympathetic falling off, due to the general reduction in the volume and value of world trade as a whole. So far as electrical apparatus exported is concerned, it is fortunate that the countries now involved in war have in reality been our smallest patrons, chiefly owing to the operation of protective tariffs. This is not true of England, but there we come in contact and competition with the material exported from Germany, and apparently we could not stand the brunt of its competition, this being especially true of incandescent lamps. It is a matter to be deplored that during the past few years the published statistics of the Department of Commerce and Labor as to export trade have been utterly useless as any indication of the destination of electrical apparatus shipped from this country. At one time the statistics were given in great detail as to our principal and even our minor customers, but this practice has virtually been dropped; and even as to the apparatus itself, more of it is lumped together under the one broad category of "all others" than is mentioned as specific produce. Under such circumstances it is extremely difficult to form an intelligent idea and offer any pertinent suggestion as to the present course of export electrical trade and what is best to be done.

The fact remains, however, that we have fared best in the neutral markets of the world, and with the closure of the productive centers of Europe the cessation of demand there affects so small a percentage of the \$15,000,000 or \$20,000,000 we are now sending out that

it might easily be forgotten. Canada has been one of our best customers and we still have access to her markets. Japan has been a very good customer. Mexico has been an extremely good customer and even at the present time is probably taking much electrical material from us. We have also exported heavily to South America, the Cape (South Africa), East Indies and China. Possibly England, as soon as she has reasserted her supremacy of the seas, will be doing a fairly large export trade again, but it would seem that all supplies from Germany, one of our chief competitors, must be entirely cut off for some time to come. There are latent possibilities in Italy, whose connections with South America are far more considerable than is generally understood in this country; but Italy has never been a great exporter of electrical apparatus, and the whole market outside of Europe, and even that in some of the European countries not involved in war, would appear to be ours if we are willing to go after it. When peace is restored we may not be able to retain all the trade we have secured, but much will be retained.

It is a matter of deep grief and to be deplored that all Europe should thus be plunged in war and that all her energies should be devoted to the destruction of human lives and property; but the war is not of our making or wishing, while, on the other hand, it is not less a duty than an opportunity for us to supply the whole world with the electrical apparatus and material which are to-day prime necessities of civilization. If, as is probable, electrical export trade of the last year has reached a total of \$20,000,000, it should certainly amount to \$40,000,000 or \$50,000,000 during the next twelve months. Not only has the opportunity presented itself for the sale of standard apparatus, but through the new channels opened up we should be able to supply a great many of the diverse electrical devices and appliances for which the demand will grow in proportion as they become known. At the present time it is amazing how few of our electrical manufacturers, numbering at this time not far short of 1000, are known in the markets of the world by name or by their apparatus. Owing to the lack of shipping and banking facilities and the fact that we have encountered the splendid competition of such countries as England and Germany, this lack of recognition abroad has been rather a misfortune than a fault, but now or never is the time to cure whatever is wrong.

Reference has been made to banking facilities. I believe it is fairly well understood here that one of our difficulties has been the fact that generally Americans do not extend long credit in international commerce. If I am correctly informed, English or German electrical apparatus, particularly the latter, has been sold on twelve to eighteen months' time, and I have myself known of cases where twelve months has been a usual period in the West Indies. Such conditions do not coincide with American methods of the turn-over of capital. But we may have to meet this problem instead of trying to collect cash before the goods are shipped. The German method seems to have resulted in such financing of manufacturing concerns that the banks have literally owned them and have possibly tried to operate them. This can hardly be for the good of the manufacturer in the long run, but it has certainly assisted Germany in the wonderful expansion of her foreign trade that has marked the last twenty-five years. There seems to be danger in it, and it also seems possible for an American financial and manufacturing genius to find a better way out. To our friends in Latin America we have at least shown that we have no selfish ambitions as to the acquisition of territory. But we do want their trade on some reciprocal basis, and they undoubtedly will help us to find the way.



## The Export Trade in Electrical Machinery and Apparatus of American Manufacture

During the twelve months from July 1, 1912, to June 30, 1913, American electrical manufacturers exported to the markets of the world electrical machinery and apparatus to the value of over \$26,000,000. This included generators, motors, fans, lamps (both incandescent and arc), telephone and telegraph instruments and appliances, and such miscellaneous articles as household appliances, switchboard apparatus, meters, etc. Canada received from the United States electrical goods to the value of nearly \$9,000,000. Great Britain

TABLE I—VALUE OF AMERICAN ELECTRICAL EXPORTS TO COUNTRIES NOT AT WAR (FROM JULY 1, 1912, TO JUNE 30, 1913)

Country	Motors and Generators	Fans	Lamps, Arc and Incandescent	Miscellaneous, Including Telephone and Telegraph Apparatus
Denmark	\$2,175			\$9,451
Ecuador	4,686			7,759
France	600	\$9,000	\$135	5,131
Germany	68,238	1,860	2,137	121,783
Holland	4,111	387	110	41,960
Norway	2,156			13,787
Sweden	1,568			9,037
Spain	62,930	579	420	308,065
Switzerland	5,976	121		5,795
United States	365			1,315
Turkey				3,219
Costa Rica	14,632	266	4,690	64,448
Guatemala	6,929	131	1,420	28,042
Honduras	3,226	65	751	14,801
Nicaragua	3,702		420	8,280
Panama	354,890	1,483	12,956	1,017,298
Salvador	1,254	218	8,196	25,405
Venezuela	607,543	5,591	175,935	1,209,233
Cuba	370,109	6,818	50,800	754,667
Dutch West Indies	90			2,097
Dutch West Indies	1,771		60	2,606
Haiti		201	908	9,245
San Domingo	6,211	620	3,744	158,646
Argentina	99,044	53,300	47,371	376,070
Bolivia	5,458	43	116	5,942
Brazil	286,253	20,339	134,419	2,499,453
Chile	120,074	426	92,955	305,715
Colombia	20,725	844	8,108	124,494
Ecuador	3,537	85	5,344	32,037
Dutch Guiana			10	27
Paraguay				307
Peru	192,101	234	16,327	171,896
Uruguay	19,508	6,493	5,733	50,399
Venezuela	13,064	255	7,675	95,807
China	20,636	24,613	7,084	67,909
Japanese China	1,561	200		22,315
Korea	13,641	14		35,587
Dutch East India				1,961
Japan	1,248,750	10,171	4,783	1,102,828
Siam	4,113	847	55	9,047
Philippines	62,658	8,281	12,383	368,240
Portuguese Africa	4,292		2,251	16,400
Lebanon	760	600		1,623
Libania				1,351

and Ireland took almost \$1,500,000 worth, and France took about one-fourth as much. The exports to Germany were over \$200,000. In fact, the exports to the countries now at war were somewhat more than \$2,225,000, or, in other words, one-tenth of our total electrical export trade. We, therefore, export to the countries not at war, as well as to the colonies of those countries now at war, nine-tenths of the electrical goods which leave our shores.

This goes to show that the American electrical manufacturer has established his firmest market in ports that are at present either neutral or distant from the scene of fighting. To those markets, therefore, shut off from the countries at war, we must supply not only the same volume of exports as formerly but also the additional trade which they have been accustomed to expect from Europe but which they now lack.

If a study of the accompanying tables is made, it will be seen that we send to the ten South American republics—Argentina, Bolivia, Brazil, Chile, Colombia Ecuador, Paraguay, Peru, Uruguay and Venezuela—annually close to \$5,000,000 of electrical goods, or two-tenths of our total electrical export trade, or more than twice the value of electrical exports to the European countries at war, or approximately one-fourth of the export trade of the world at peace and the colonies of those countries at war.

Considering now the Central American republics, including Cuba, it is found that the electrical exports to our southern neighbors amounted to slightly more than \$5,750,000, or over two-tenths of our total exports. This figure, it will be noticed, exceeds the value for South America by more than \$750,000. This, of course is to be expected, with railroad facilities into Mexico and with the construction of the Panama Canal.

Thus it will be seen that the exports of American electrical manufacture to the remainder of the American continent amount to approximately \$19,750,000

TABLE II—VALUE OF AMERICAN ELECTRICAL EXPORTS TO COLONIES OF COUNTRIES AT WAR (FROM JULY 1, 1912 TO JUNE 30, 1913)

Country	Motors and Generators	Fans	Lamps, Arc and Incandescent	Miscellaneous, Including Telephone and Telegraph Apparatus
ENGLAND:				
Ceylon				\$118
Bermudas	\$477	\$130	\$1,933	18,617
British Honduras	1,150			4,298
Canada	1,618,356	131,848	160,715	6,784,614
Newfoundland	22,167			5,218
Barbados				5,660
Jamaica	3,241	406	1,967	26,325
Trinidad	2,495	195	1,007	9,532
Other British West Indies	927	139	416	4,166
British Guiana	3,826	82	1,650	10,671
British China				
British India	108,111	36,965	2,135	317,421
Straits Settlements		529		3,772
Other British East Indies	5,807	2,093		3,629
Hong Kong	12,355	9,393		28,535
Australia and Tasmania	382,026	6,211	41,688	684,950
New Zealand	9,393	37	3,975	203,323
Other British Oceania				366
British West Africa	81,556	2,448	19,070	2,762
British South Africa				271,425
British East Africa				53
FRANCE:				
French West Indies	88		107	239
French Oceania	318		22	7,496
French Africa	4,168			466
GERMANY:				
German Oceania	262			423

or more than three-quarters of the total electrical exports.

That we should have the bulk of our foreign trade with our neighbors is to be expected. Transportation charges are less, thus giving the American manufacturer the upper hand in competition, and the American goods, being nearer, could be delivered more quickly especially in the case of Canada and the Central American republics. But the surprising fact is that but one-quarter of our electrical exports find their way across the ocean.

Exports to countries not at war have a yearly value of very nearly \$12,500,000. These figures do not include the colonies of the countries now participating in the great European strife. It is thus seen that approximately one-half of our electrical goods are sent to ports which are now neutral. These ports, of course

are scattered all over the world, from China to Italy, from Sweden to South America.

The yearly exports to the colonies of the countries now at war have a value of over \$11,000,000, which is indeed very close to the amount exported to the neutral ports. In fact, our electrical commerce might be broken into two parts which are very nearly equal, one being that with the belligerent nations and their colonies and the other being that with neutral nations.

English colonies stand first in amount of electrical machinery and apparatus taken from this country by the colonies of the warring nations. The exports to British colonies have a yearly value of over \$11,000,000, which is practically the entire amount of the exports to the colonies of Germany, England and France. French colonies take electrical goods to the value of over \$13,000, and German colonies take less than \$1,000.

Such figures can convey but one meaning in the light of present conditions. Germany has always been keen to develop the export trade to her own colonies. It has been one of Germany's ambitions to supply German colonies with goods of German manufacture. Germany at present is not able to furnish protection to German goods on high seas. Her navy is not sufficient to

TABLE III—VALUE OF AMERICAN ELECTRICAL EXPORTS TO COUNTRIES AT WAR (FROM JULY 1, 1912, TO JUNE 30, 1913)

Country	Motors and Generators	Fans	Lamps, Arc and Incandescent	Miscellaneous, Including Telephone and Telegraph Apparatus
Great Britain and Ireland	\$497,739	\$20,083	\$22,782	\$933,379
Germany	54,630	702	2,309	157,715
Austria-Hungary	5,138	465	20	18,040
France	102,189	300	5	279,281
Italy	10,382		468	46,622
Spain	3,453	465	7,143	142,266

cope with the combined navies of England, France and Russia, both as fighting machines and as protectors to shipping. Her navy must be used purely for meeting the enemy and defending her harbors. As a consequence her foreign trade, which by the way was Germany's big asset, necessarily was stopped. Her vessels remain idle in neutral ports.

However, this is a time of progress. Wars cannot stop the commerce of the world as long as a neutral nation exists. The United States must take up Germany's trade. The American manufacturer must supply the world with the goods which Germany formerly supplied it.

The present crisis does not offer the same opportunity to acquire the English or French export trade, for the reason that these countries are capable of affording their commerce adequate protection on the seas. Their volume of trade, however, will be materially lessened inasmuch as their home industries will not be able to keep up the supply.

Germany, aside from being unable to export what she has on hand, will with her immense mobilization be unable to keep up the output of her factories.

German and English goods have so far met with the best success in South America. It is there that the American electrical manufacturer will probably strike his first blow for the worldwide supremacy of American goods.

Subsequent issues of the *Electrical World* will contain tables showing the trade of the belligerent countries with their colonies and the countries not at war.

Mr. Coster on Present Export Trade Conditions

Mr. Maurice Coster, manager of the foreign department of the Westinghouse Electric & Manufacturing Company, discussed with a representative of the *Electrical World* conditions arising from the European war. He said that if competitive manufacturers of electrical apparatus in Germany were handicapped by the war there would necessarily be a substantial and lasting advantage to American manufacturers in this industry. There is no reason to believe that those markets in the world which have been served by German electrical manufacturers will refrain altogether from consumption during the disturbance in Europe. The needs of these consumers cannot be supplied anywhere else under present conditions than from the United States.

So far as the United States is concerned, one of the definite results of the war is that the people generally, the bankers and the leading executives of manufacturing companies of all classes, are aroused more thoroughly than ever before to the very grave importance of developing a future export trade for this country. The steps taken by the National City Bank of New York and others promise to provide the financial means for carrying on an export trade from this country to Central and South America. Without the effective co-operation of the bankers the manufacturers are powerless to market their goods. Without the co-operation of the government the manufacturers will not find it possible to transport their goods in the present crisis from this country to those Central and South American countries which now furnish a natural market for American manufactures.

Mr. Coster referred to the strength of the banking connections between Central and South American nations and the large countries of Europe. He said that information concerning the invoices of American manufacturers had been given by German banks to the government of Germany and then transmitted by the government to German manufacturers. The disadvantage which this put upon American manufacturers will, of course, be ended under existing conditions.

Great promise for the foreign trade is seen by Mr. Coster in the organization of the Foreign Trade Council, which has been formed to promote the export interests of manufacturers in this country. As indicating the growing interest in the opportunities to develop export business, he referred to the organization of a new luncheon club in the financial district of New York, to be called "India House," which is designed for exporters, shippers and bankers especially interested in foreign commerce.

In referring to the need of government interest and co-operation, Mr. Coster said that the ways and means of shipment of goods to foreign countries had always formed a handicap to American manufacturers. Now for the first time the authorities at Washington see the importance of furnishing facilities to develop the merchant marine. The fact that the importance of this is appreciated by the authorities is in itself a long step in the direction of freeing American manufacturers from dependence on foreign shipping facilities. Temporarily the main countries of Central and South America will be crippled, Mr. Coster believes, by the European war. Heretofore most of the capital for enterprises in those countries had been furnished by Great Britain, France and Germany. The war will draw so heavily on the resources of the European coun-



tries that they will not be able to finance nations in Central and South America as freely as before, and those nations will have to look to the United States for capital. It will assist our bankers materially in developing close relations with countries to the south if the government will co-operate in every way to protect and promote the financing of South and Central American countries, also of legitimate enterprises. If bankers, for instance, should finance a South American country and have control of the import duties of that country given to them in order to protect their investment, the United States, in the opinion of Mr. Coster, should stand behind them in order to see that they have fair treatment.

Both Brazil and Mexico are very seriously embarrassed financially at this time. The rate of exchange is so high in those two countries that it is almost prohibitive for those who want to remit money. Enterprises in those two countries that under ordinary conditions showed handsome profits find to-day that if they try to send money to this country the cost is so heavy that their profits are turned into losses. If assistance is rendered by this country to place those countries on a sound basis financially in co-operation with the banks here, it will secure the good will of the people of those countries and at the same time be a material help to American manufacturers and exporters. Almost without exception it is the rule that the financial supporters of a country have its trade, and this government should do its part to strengthen the avenues of distribution for our manufacturers.

While Europe has always furnished a limited market for the products of electrical manufactures and some of the Central and South American countries will be affected so seriously by the European war that they will not be buyers for a time, yet there is a promising future in export trade for which this country should make careful and earnest preparation on a large scale.

Another point mentioned by Mr. Coster is that in case of armed conflict the government of Great Britain insures ships sailing under its flag against the risks of war. The premium demanded by marine insurance companies at the present time for such insurance is almost prohibitive, and this government should lose no time in stepping into the breach and doing for American manufacturers what Great Britain has always done for its manufacturers in case of war.

In emphasizing the work of the Foreign Trade Council and the systematic efforts which are being made at this time to promote export trade Mr. Coster spoke particularly of the work of Mr. J. A. Farrell, president of the United States Steel Corporation.

### Effect of War on Western Electric Company

The operations of foreign companies associated with the Western Electric Company are naturally affected by the war. The factories in Belgium and France are closed because the employees have joined the war forces. The plant in England is still in operation and, so far as can be foreseen, it will continue in business. Although the company has connections of one kind or another in almost every nation of Europe, information as to the condition of the other plants has not been received.

The principal market for products of the Western Electric Company in foreign countries has always been in Europe, and the demands have been met in large part by the plants established in the various countries there. Telephone development has been very slow in Central and South America, and the amount of business transacted with consumers in those parts of the world

has therefore been small. Owing to the close affiliations of some of these countries with European nations through the use of banking and shipping facilities their trade has gone mainly to those nations. It is the general expectation that some time will be required to re-establish the markets and banking facilities which were interrupted on short notice by the war.

The Western Electric Company will not suffer because of interruption to supplies of raw material. It is not dependent on foreign countries for any of its supplies of major importance.

### A Traveler's Impressions of Electrical Conditions in Europe Just Before the War

Mr. E. W. Lloyd, general contract agent of the Commonwealth Edison Company and first vice-president of the National Electric Light Association, reached his home in Chicago, accompanied by Mrs. Lloyd, on Aug. 10, after two months spent in Europe and on the sea. Mr. and Mrs. Lloyd were among those who returned on the *Mauretania*, which put into Halifax, instead of New York, owing to wartime apprehension. They were glad to get back home, traveling at the last amid wars and rumors of wars and having difficulty in securing accommodations. Mr. Lloyd was welcomed enthusiastically by his associates in Chicago, and a great armful of roses supported in a tall vase on his desk, gave notice of his return. Everybody was talking war at the time the *Mauretania* sailed from Liverpool, and the travelers felt that they got away just in time.

Mr. Lloyd attended the recent Philadelphia convention of the N. E. L. A. and sailed from New York on June 6. He visited Paris, Cologne, Berlin, Munich, Venice, Milan, Ugene, Berne, Strassburg, London, Newcastle, Edinburgh and Glasgow. To a representative of the *Electrical World*, who asked him what impressed him most during his trip, from the electrical point of view Mr. Lloyd said that possibly he was most interested in the electric taxicabs in Berlin.

#### Electric Taxicabs of Berlin

In the German capital there are 600 of these electric cabs compared with 1600 gas-driven cabs and 2500 horse-drawn cabs. The electric cabs are regarded with favor by municipal authorities, owing to their speed, convenience and cleanliness. They can make 25 miles an hour. The city is issuing no more licenses for gas or horse-drawn cabs. Three horse-cab licenses may be exchanged for one electric-cab license. The batteries in these vehicles are owned and maintained by the Accumulatoren-Fabrik Aktiengesellschaft, from which fresh batteries are obtained by the owners of the cabs. The storage-battery company maintains large garages. When a chauffeur finds that his battery is nearly exhausted he drives up to one of these garages. Passing through the gate, his taximeter is read and he pays in the cash called for. He is then given a ticket, for which, in another department, he obtains a newly charged battery. The whole transaction can be carried out in two minutes, and thus the driver is not detained long from the street. Cab traffic is rigidly supervised by the city and all vehicles are carefully inspected. Electrical energy for charging the cab batteries is sold to the storage-battery company by the Berlin Electricity Works, the local central-station company. The average price paid at one garage is 1.4 cents per kw-hr. Strangely enough, there are few electric commercial vehicles in Berlin, and practically no private pleasure cars. The specialization has been all in the direction of taxicabs, and in the matter of using other electric vehicles Berlin has something to learn from Chicago and

other American cities. Mr. Lloyd noted the fact that the constant-potential system of charging storage batteries, comparatively new in Chicago, has been in use in Berlin for some time. The electric-cab system of Berlin possesses many interesting features, and Mr. Lloyd collected a mass of interesting information, which he has turned over to Mr. George H. Jones, of the Commonwealth Edison Company who is chairman of the electric-vehicle committee of the Association of Edison Illuminating Companies. Mr. Jones is preparing a paper on the subject for the Edison convention to be held at White Sulphur Springs, W. Va., on Sept. 14-17. This paper will contain data of interest to American electrical and electric-vehicle men.

#### Exposed Interior Wiring

Another subject to which Mr. Lloyd devoted considerable attention while in Europe was interior wiring, particularly the wiring in use where open work is permitted. The visitor noted the satisfactory use of Kuhlo, Stannos and similar brands of wire for this purpose. He had had the impression that these inexpensive types of wire were used only in fireproof buildings but such is not always the case. The use of these exposed, unobtrusive kinds of insulated wire is very common in all places where electric wire is open to ready inspection or is not subject to dampness. The use of these types of wire is not new, of course, but Mr. Lloyd thinks that central-station companies of the United States ought to co-operate with the underwriters to see if the two interests may not work together in some way to make safe wiring very much cheaper in this country. Reference is made to all cases where exposed wiring is permissible.

Ingenious schemes that have been developed by the foreign central-station companies to take care of small dwelling-house customers are worthy of careful study by American electrical men. Mr. Lloyd referred to this subject in his conversation with the interviewer, and praised the article on the subject by Mr. S. E. Doane, of Cleveland, entitled "Handling the Small Consumer in Europe," and printed in the *Electrical World* of May 23, 1914. However, it was pointed out that these expedients may need some modification for adaptation to American conditions and standards of living.

#### Varied Applications Where Europeans Are Ahead

In relation to electric heating and cooking appliances, Mr. Lloyd remarked that some of the foreign manufacturers, particularly in Germany, have shown progress in developing certain appliances of larger size, as bake ovens, kettles, large coffee urns, etc. The returned traveler also praised the artistic appearance of many of the electric heating and cooking appliances he encountered. The tasteful and pleasing appearance of conveniences or ornaments for the home adds to their desirability. Americans are excessively utilitarian, and their wares of this description contrast unfavorably with those made by those who know how to combine utility with some regard for art.

In foreign countries it was noticed that the gas-filled tungsten lamp is being pushed in smaller sizes than are usually seen in the United States.

Mr. Lloyd was impressed with the extensive use of electric furnaces in connection with the manufacture of ferro-alloys and steel. He concluded that the Europeans are far ahead of us in this industry. In Uginé, France, Mr. Paul Girod has two plants of this description which are very large, interesting and businesslike. Electrical energy is obtained from water-power, Uginé being at the foot of the French Alps. While Mr. Lloyd was in this place he was permitted to witness the casting of electric-steel breeches for guns and shells used with large high-power rifled guns.

#### Oldfield Bill Favorably Reported

The Oldfield bill for the revision of the patent laws was favorably reported to the House of Representatives on Aug. 12 by the House committee on patents.

The present bill is confined to three distinct abuses of the patent system: First, delayed applications in the Patent Office; second, the evils arising from the vendors of patented articles imposing on the purchasers thereof restrictions affecting the use of the articles or the price at which they must be resold to the public; third, the evils arising from owners of patents suppressing the same or prohibiting their use in order to prevent competition with other patented or unpatented articles sold by themselves.

#### Provisions of the Bill

The bill prevents patent applications from being drawn out to delays of fifteen years or so by providing that after the enactment of the measure applicants will be allowed only two years within which to present their cases to the Patent Office. Attention was called to the fact that by delaying answers to simple letters for months at a time applicants for important patents have obtained the protection of the "patent pending" law and have blocked competitors.

According to the Oldfield bill it will not be an infringement of patent laws for a dealer to sell a patented article at a price less than that prescribed by the manufacturers. In this respect it places patented articles on the same footing as unpatented articles. Should there be a dealer who disposes of his patented articles at a cut price, the manufacturer can no longer under the Oldfield bill bring suit for patent infringement. He will have to sue in a State court for breach of contract.

Hereafter a manufacturer will be compelled to grant licenses to anyone who wants to operate under a patent which the manufacturer has owned but not used for a period of three years. According to the committee many large concerns in the past have "shelved" patents in this way to prevent competition.

#### The Parcel Post and Electric-Vehicle Delivery

To central-station executives in the fifty largest cities of the United States the committee on parcel-post delivery of the Electric Vehicle Association of America, of which Mr. James H. McGraw is chairman, has sent detailed data showing the magnitude of the parcel-post traffic in each such city for a recent fifteen-day period. The combined figures for the fifty cities (which have a total population of over 25,000,000) show that nearly 11,000,000 parcels were mailed out from these fifty post offices during the interval from Oct. 1 to Oct. 15, 1913, while 3,500,000 parcels were received for local delivery during the same period. The average weight per parcel was 1 lb. 11 oz., and the average postage paid per parcel was 10 cents. Almost three-quarters of the total number of parcels handled were delivered by regular carriers without additional expense, while about 350,000 parcels (approximately 10 per cent) were handled by automobiles of one kind or another, at a total cost of \$17,653, or about 5 cents per parcel. In the fifty cities for which figures were obtained one inhabitant in every seven received a package through the parcel-post service during the two-week period named. Besides the work already referred to, the committee is going ahead and collecting additional data on parcel delivery, the dates on which local transportation contracts expire, and the disposition of the local post office authorities toward the utilization of electric vehicles in the service.



### Further Progress in Trust Legislation

The United States Senate, now considering the administration's proposed anti-trust legislation, has not been immune from interest in the war situation, and it is stated in Washington that the date for adjournment, which was put as probably Sept. 1, is likely to be postponed again. Discussion of the trust legislation may drag along for some time.

The latest report is that Congress will probably take a recess in the late summer or fall, certainly by October, and come back to finish the business before it by the opening of the new session in December.

Both the House and Senate have been obliged to consider a number of emergency measures in connection with the war in Europe. The necessity for the passage of these has prevented the Senate during the past week from discussing the two trust bills awaiting action. They are out of committee and ready to be taken up at any time, but the Senate has not been able to get to them. These are the Clayton anti-trust bill, passed by the House, and the Rayburn railroad security bill, also passed by the House.

When the Senate passed the Newlands federal trade commission bill last week it retained Section 5, relating to unfair competition, as amended by Senator Cummins, providing for a court review of decisions and orders of the trade commission in regard to unfair competition. An amendment was also incorporated in the bill, offered by Senator Pomerene, providing that all persons or corporations shall have the right to appear and be represented by counsel before any court in which the orders of the commission are sought to be enforced.

Two Democrats voted against the bill, Senators Thomas, of Colorado, and West, of Georgia. Twelve Republicans voted for the bill, as follows: Senators Brady, Idaho; Bristow, Kansas; Clapp, Minnesota; Crawford, South Dakota; Cummins, Iowa; Fall, New Mexico; Gronna, North Dakota; Jones, Washington; Kenyon, Iowa; Norris, Nebraska; Perkins, California, and Sterling, South Dakota.

The federal trade commission bill is now in conference between the House and Senate. The conferences began Wednesday, and members of the committee state that a week's time will be necessary for consideration of the measure. It is understood that the House conferees intend to make a strong effort to alter materially amendments to the bill made by the Senate. For one thing, the House objects to Section 5. That question was thrashed out in the House when there was such a bill there.

It is also expected that when the bill finally does become law there will be a contest over the appointment of the five members of the proposed new commission. They will all have to be confirmed by the Senate, and it is expected that the views and records of possible appointees will be subjected by the Senate to an inquiry at least as searching as that accorded to the views and records of members of the Federal Reserve Board. The bill gives the appointment of the five commissioners to the President.

### Chicago Electric Garage Owners Organize

A new organization has been established in Chicago to promote the use of the electric vehicle. It is the Electric Garage Owners' Association of Chicago, the present membership being said to consist of about forty owners of electric garages, manufacturers of electric automobiles or their representatives, and manufacturers of storage batteries or their representatives. The object of the new association is to promote the

use and sale of electric vehicles from all points of view. The Chicago Garage Owners' Association embraces men interested in both gasoline and electric vehicles. It has three divisions—one relating to gas cars, one to electric vehicles and one to motor liveries. The men interested in the new association say that they are not opposed to the old organization, but that the interests of the electric vehicle can be furthered to better advantage by a separate association devoted exclusively to the electric vehicle rather than by a division or section of an organization serving both the gas and electric vehicle interests. The dues of the new association are \$12 a year and meetings are held monthly at the Lexington Hotel. It is declared that 85 per cent of the electric garage owners of Chicago are members of the new organization. At present the membership is recruited almost entirely from men interested in electric passenger vehicles. However, commercial-vehicle men are welcome, although the number of commercial-vehicle garages is small.

The officers of the association are: President, Mr. H. S. Kesner, Royal Garage; vice-president, Mr. Harry Salvat, Fashion Garage; secretary, Mr. John E. Rhodes, Jr., Elite Garage, and treasurer, Mr. Otto A. Suttmueller, Hyde Park Hotel Garage. Subjects discussed at the meetings relate to a closer association of all interests connected with the electric vehicle, the legitimate charges to be made to owners, and the elimination of "cut-throat" competition in business. Standard flat rates recommended to be paid by owners are \$35 a month for the smaller chain-driven electric passenger cars and \$40 a month for the larger axle-driven cars of recent type.

### Electrical Education for Window Trimmers

Mr. A. J. Edgell, who is in charge of the display-service bureau of the Society for Electrical Development, Inc., delivered an instructive talk on store-front and window illumination before the International Association of Display Men, formerly known as the International Association of Window Trimmers, at the Congress Hotel, Chicago, Aug. 5. Following the election of officers, it was announced that Mr. Edgell had been chosen second vice-president of the organization and also made a member of the educational committee. It is expected that through the latter office the campaign of electrical education for window trimmers which has been started will be vigorously continued.

### Cincinnati Contract Extended Temporarily

The City Council of Cincinnati is considering a situation which arises from the operation of the Diamond Light Company without a franchise in some of the suburbs. An investigation is being made of the business of the Union Gas & Electric Company with the object of securing a change in rates. The city has extended its contract with the Union Gas & Electric Company for three months pending the results of the investigation.

### Petition for Rehearing in Springfield Case Denied

The Missouri Public Service Commission has overruled the petition of the Springfield Gas & Electric Company for a rehearing of the electrical rate case. Mr. W. F. Woerner, a member of the commission, dissented from the conclusion of the majority. On reconsideration of the case he entertained grave doubts whether, all things considered, the commission has allowed the company sufficient valuation and an adequate return.

## PUBLIC SERVICE COMMISSION NEWS

## Illinois Commission

The city officials of Evanston, Ill., have complained to the commission that the prices for gas and electricity charged in that city by the Public Service Company of Northern Illinois are too high. The commission has ordered the company to submit an invoice and valuation by Sept. 15. Action on the complaint will be taken about the middle of October.

## Ohio Commission

An answer filed to the Cleveland Electric Illuminating Company's appeal from an ordinance passed by the village of Lakewood requiring a 3-cent rate states that Cleveland now has an ordinance providing for this rate and that the village is by contract entitled to the same.

## New York Commissions

Following weeks of careful work on the part of Mr. William McClellan, special engineer, and Mr. Daniel V. Murphy, special counsel to the Public Service Commission, Second District, in the investigation of the New York Telephone Company's metropolitan rates, the commission has announced its program of procedure.

Hearings will be resumed on Sept. 22 in the New York City offices of the commission. The commission has refused to assent to the plan of the New York Telephone Company, which involved the valuation of much property outside of the limits of New York City, and through a letter from Mr. Seymour Van Santvoord, chairman, has notified the company that it will not countenance delay which will put a final decision of the matter beyond Feb. 1, 1915. If necessary, the commission will hold continuous sessions in this matter after Sept. 22.

It has finally been determined by the commission that the investigation shall start with New York City alone and shall involve only those parts of the company's business outside the city which the actual investigation reveals from time to time as necessary for consideration in arriving at an equitable adjustment of the New York City rates.

The Second District Commission is rapidly cutting down the number of pending cases on its calendars. There were 948 formal and informal complaints pending before the commission on March 16 last. Despite the fact that 899 new cases have been filed since that time, the commission has decided 1177 formal and informal cases up to July 31, so that there are now pending but 670 cases of a formal and informal nature, or 278 cases fewer than on March 16. The commission disposed of 115 cases in the six weeks from June 16 to July 31.

## Washington Commission

On the ground that the company enjoyed an exclusive franchise and that it is incumbent on it to furnish gas in all portions of the city of Seattle without an excessive charge, the Seattle Lighting Company was ordered by the Public Service Commission to extend its mains in West Seattle so as to reach the complainant in the case. The company originally protested against making the extension, declaring it would cost more than the derived revenue would warrant. It refused to serve the complainant in the case unless he paid \$25 toward the cost of extending the gas main. An appeal to the commission was the result.

## California Commission

An application has been filed by the Pacific Gas & Electric Company with the California Railroad Commission for a rehearing in the case involving electrical rates in Antioch.

## Indiana Commission

In the summary of the work of the Public Service Commission of Indiana for its first fifteen months, ended July 31, it is shown by the chairman, Mr. Thomas Duncan, that 913 regular proceedings and 1727 informal proceedings took place. More than 20,000 schedules of rates and tariffs were filed. Of the regular proceedings 220 involved rates, 113 stock and bond issues, 40 station facilities and 29 the purchase and sale of utility properties. The chairman said one of the greatest tasks practically has been completed—the compilation of a complete list of the utilities under the commission's jurisdiction.

The forthcoming first annual report of the commission, which will be published soon, will show that rates of these utilities vary greatly. The summary of the report, made by the chairman, declares that the rates are grossly discriminatory. The prices for water range from 6 cents to 60 cents per 1000 gal.; electric energy, from 5 cents to 15 cents per kw-hr.; gas, from 55 cents (Indianapolis) to \$1.50 per 1000 cu. ft. The chairman's summary said:

"More than \$36,000,000,000 is invested in public service corporations in the United States. This is over one-fifth of the wealth of the nation. Those operating in this State represent an investment of over \$2,000,000,000. Even in one state the control and regulation of these properties is a momentous task. The immediate future presents increasing difficulties. The steam railroads have had on file since Nov. 3, 1913, schedules increasing freight rates 5 per cent on all tonnage. The Interstate Commerce Commission has granted practically all of this increase. To determine properly whether this increase shall be granted or not in this State will require a great deal of information and a great deal of labor. The situation of the large telephone companies is very complicated. More than 2000 smaller utilities will require investigation and consideration.

"The regulation of public service corporations is neither unusual nor unjust. To establish a maximum rate of earnings on investment in utility properties is no more arbitrary than to establish a maximum rate of earnings for the money lenders of the State. Yet to prevent usury has always been deemed a proper exercise of legislative power. The people of the State have no more vital interest in any subject than in the public service corporations that provide the necessities of life and the means of communication and transportation.

"Every state in the Union but two has some form of commission for the regulation of public service corporations. No state that has ever enacted such a law has ever yet repealed it. The necessity of the law is not only for the protection of the public from the extortions of the utilities themselves, but it is of great value to the utilities themselves, in that it seeks to secure friendly co-operation between the utilities and the users of their service. It is not the object of the law to injure or destroy the utilities or the railroads, but, on the contrary, the sole purpose of those whose duty it is to administer the law is to do justice between the contending parties."

## Idaho Commission

As a sequel to the hearing by Commissioner Standrod, of the Public Utilities Commission, on the complaint of the Idaho Millers' Association against the Utah Power & Light Company at Pocatello, the commission gave the company permission to put a new schedule of rates for motor service for millers into effect. The new rates are tentative, remaining in effect until Dec. 1.



## Current News Notes

"BREEZES ALL DAY FOR A NICKEL."—The Public Service Company of Western Kentucky, which owns and operates the electric plant at Fulton, Ky., is using much local newspaper space in popularizing the electric fan. "Breezes all day for a nickel" is one of the striking phrases used in its advertising.

\* \* \*

OPENING OF THE PANAMA CANAL.—According to the announcement of the Secretary of War the Panama Canal is to be opened to interoceanic traffic on Saturday of the present week. Conditions at the Cucaracha slide limit the use of the canal for the present to vessels drawing 30 ft. or less, but this restriction will affect none of the vessels regularly plying on the Panama route.

\* \* \*

ELECTRIC TRUCKS FOR NEW ORLEANS DOCKS.—The New Orleans Dock Board has closed a contract for central-station energy to charge six electric trucks which will be used for haulage service on the local waterfront. The decision to use electric trucks followed after an actual demonstration of the speed and convenience with which these vehicles could be loaded and unloaded. The docks are also to be equipped with an electric conveyor system.

\* \* \*

SAFETY FIRST AT SALT LAKE CITY.—The Utah Light & Railway Company, Salt Lake City, Utah, arranged a special meeting of all its employees for Aug. 12, when Mr. E. M. Bagley, the company's claims attorney; Mr. L. E. Abbott, commissioner of safety for the Oregon Short Line Railroad, and members of the Utah Light & Railway Company's safety committee were to give illustrated talks and demonstrations on the "safety first" movement. Two sessions were necessary in order to accommodate all of the company's employees.

\* \* \*

COMMITTEE ON AWARDS, ELECTRICAL DEVELOPMENT SOCIETY PRIZE-STORY CONTEST.—Messrs. Edmund L. Pearson, editor of publications, New York Public Library; F. J. Urquhart, assistant editor Newark (N. J.) *Sunday Call*, and J. M. Wakeman, general manager of the Society for Electrical Development and former vice-president and general manager McGraw Publishing Company, publisher of the *Electrical World*, have been named as the committee on award in the prize-story contest of the Society for Electrical Development. Competition in the contest, which closes Sept. 1, is open only to employees of members of the society, and prizes of \$250 to \$10 are offered.

\* \* \*

ELECTRIC-LIGHTED MAP SHOWING WARRING EUROPEAN FORCES.—A large electrically illuminated map showing the positions of the forces engaged in the European war has been erected on the Herald Building, New York City, where it can be seen by everyone reading the war bulletins displayed by that newspaper. The map is painted in colors and is illuminated by three pairs of lamps provided with separate bulletin-board reflectors suspended in front of the canvas. Cities which have become of unusual interest since the conflict started are spotted on the map, and small silk flags representing each nation at war are stuck in the map to indicate where the various naval and military forces are located.

\* \* \*

"VACATION COMFORTS."—The Society for Electrical Development, Inc., 29 West Thirty-ninth Street, New

York City, has prepared an attractive 4-in. by 9-in., twelve-page booklet entitled "Vacation Comforts," in which are described the summer electrical conveniences proffered for the comfort of those vacationists who stay at home as well as the ones who seek seashore and mountain delights. Electric fans, heating and cooking appliances and motor applications are described and pictured, and emphasis is laid on the fact that electric service is to-day available in many hotels and boarding houses, so that the electrically equipped summer traveler need not be denied the comforts of his own well-appointed home.

\* \* \*

SOMETHING NEW IN SAFETY VALVES.—The following instructive reference to the subject of engine design is quoted from an editorial entitled "A Safety Valve for an Engine—Free Speech for a People," in a recent issue of the New York *Evening Journal*, copyrighted, 1914, by the Star Company. "A little boy invented the safety valve for engines. It was his business to watch the steam pressure and let the steam off when the pressure got too high. But he wanted to play at marbles and other games free from worry. And he invented the safety valve, the whirling apparatus on the top of the steam engine, which, by the power of centrifugal force, wedges apart the two revolving balls and lets the steam escape automatically when the pressure gets too high."

\* \* \*

TOWN DARK; CROPS SAVED.—The town of Jewell, Ia., is in temporary darkness as a result of the record crops waiting to be threshed in that section, according to the Waterloo (Iowa) *Times-Tribune*. The tractor engine which has been furnishing power to operate the electric-light plant was needed last week in the wheat fields, so the owner drove the machine away from the station, leaving the housewives to resurrect coal-oil lamps and hunt supplies of candles. Some time ago the engine at the electric plant broke down and the tractor was then temporarily pressed into service while the station equipment was undergoing repairs. The threshing season came on, however, before the new building was finished, and Jewell's electric-light plant had to be motored away to more lucrative work than grinding out kilowatt-hours.

\* \* \*

### SOCIETY MEETINGS

NEW YORK SECTION, E. V. A.—A New York Section of the Electric Vehicle Association of America is to be formed at a meeting scheduled for Aug. 20 in the auditorium of the New York Edison Company, Irving Place and Fifteenth Street, New York City.

\* \* \*

CONVENTION OF SOUTHEASTERN SECTION, N. E. L. A.—As noted in our issue of July 25, the annual convention of the Southeastern Section of the National Electric Light Association will be held at the Isle of Palms, near Charleston, S. C., Aug. 19 to 21. Mr. A. A. Wilbur, Columbus, Ga., is secretary of the association.

\* \* \*

INDIANAPOLIS JOVIANS ENTERTAIN CELEBRITIES.—James Whitcomb Riley, the "Hoosier poet," Governor Samuel M. Ralston of Indiana and Mayor Joseph E. Bell of Indianapolis were the guests of Indianapolis members of the Jovian Order at a luncheon held Aug. 3 at the Hotel Severin, Indianapolis. Mr. Thomas A. Wynne, vice-president of the Indianapolis Light & Heat Company, presided as toastmaster, and there were addresses by the guests, the talk by Mr. Riley being the first which the invalid poet has delivered in five years.

## Single-Unit 5000-kw Steam Plant at Alton, Ill.

**Prime-mover apparatus added to the system of the East St. Louis Light & Power Company—Water-power substation tying in with plant at Keokuk—Application of rotary condensers**

AT Alton, Ill., there has just been completed another link in the growing chain of electrical properties served by the great hydroelectric station at Keokuk, Ia. (described in the *Electrical World*, May 31, 1913). Unusual interest attaches to the Alton relay steam plant and substation, not only by reason of its connection with the world's largest low-head hydroelectric development, but also on account of the engineering features which the local station itself contains. Even its location makes it interesting, for the buildings have been erected in a stone quarry bordering the Mississippi River and are so concealed behind the bluffs that the casual visitor might pass within a few hundred feet of the plant without observing even the top of its stack.

The plant consists of a steam station, substation and terminal house. The substation is designed to receive 6000 kw from the 66,000-volt lines of the Mississippi River Power Company. Operating in parallel with this substation is the single steam turbo-generator with a full-load rating of 5000 kw at 80 per cent power-factor. Plant and substation in turn operate in parallel with the Stanley steam station of the East St. Louis Light & Power Company through the latter's Lake Avenue substation at East St. Louis, 27 miles distant, connection being made through tie-lines carried on steel transmission towers.

From this system the East St. Louis Light & Power

Company supplies energy for lighting, motor and railway service at Alton, East St. Louis, Belleville and intermediate points.

### A Turbine Station with a Single Generator

Foundations of concrete, walls of red pressed brick, and floors and roof of ferro-inclave concrete construction make the steam station fireproof throughout. All the windows have steel sashes and practically all the doors are of steel.

The station is divided into two compartments, an engine room and a boiler room, each being provided with a basement beneath. The engine room measures 42 ft. by 112 ft. and the boiler room 57 ft. by 96.5 ft. In the engine room is a 6250-kva, 6600-volt, twenty-five-cycle General Electric generator driven by a five-stage horizontal Curtis turbine operating at 1500 r.p.m. This machine, the neutral of which is grounded, is connected to a three-phase, 3125-kva auto-transformer, stepping the potential up to 13,200 volts. Thus the generator may be paralleled through a three-phase, 300-amp, 15,000-volt oil switch to the 13,200-volt bus in the substation. This 6250-kva machine at present represents the entire alternating-current generating equipment. However, the station is designed for an ultimate rating of 10,000 kw, and with but slight changes the plant can be arranged to give an ultimate capacity of even 20,000 kw. Practically two-thirds of the remainder of the



FIG. 1.—GENERAL VIEW OF THE STEAM PLANT, SUBSTATION AND TERMINAL HOUSE, EAST ST. LOUIS POWER & LIGHT COMPANY, ALTON, ILL.



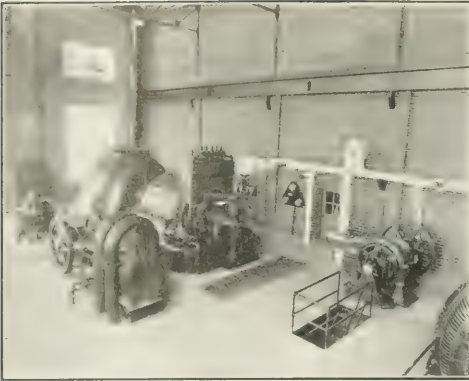


FIG. 2—NORTHWEST CORNER OF TURBINE ROOM, SHOWING 5000-KW TURBINE

engine room is occupied by a synchronous condenser, two frequency changers, two synchronous converters, two motor-driven exciter units, a steam-driven exciter, a 30-ton electric traveling crane, switchboards and control apparatus.

#### Variable-Speed, Vertical, Motor-Driven Pump for Circulating Water

An Alberger 8200-sq. ft. Spiroflo surface condenser is placed directly beneath the turbine and is connected to it by a 52-in. by 17-in. expansion joint. Circulating water supplied through a closed-siphon system is lifted from the Mississippi River by an 18-in. vertical centrifugal pump driven by a 100-hp, 250-volt direct-current variable-speed motor on the engine-room floor. This pump has a capacity of 9000 gal. per minute against a total head of 16 ft. when operating at 395 r.p.m. The speed of the motor may be varied from 350 r.p.m. to 700 r.p.m. as may be required by the load on the turbine or the stage and temperature of the river water. Since the channel of the stream at this point in the river is free from sandbars and other obstructions, the 18-in. intake pipe is fitted with flexible joints and laid directly on the river bottom. To prevent foreign matter entering the piping, the end of the

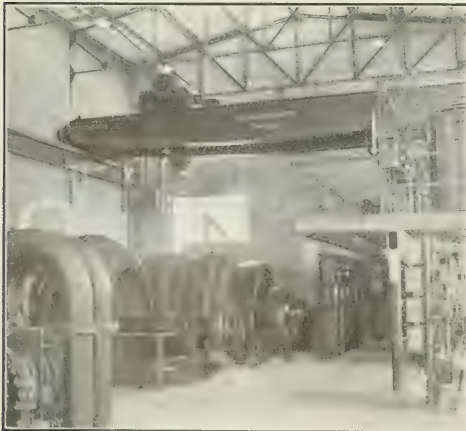


FIG. 3—SYNCHRONOUS CONDENSER AND FREQUENCY-CHANGER SET

intake is provided with a coarse screen and a twin strainer is placed inside the station.

The non-condensable vapor in the condenser is handled by a 12-in. by 30-in. by 18-in. rotative dry-vacuum pump, while a turbine-driven centrifugal hot-well pump removes the condensate from the condenser and lifts it to the overhead feed-water storage tank in the boiler room.

Since it was desired to use 250-volt direct current for motors driving the circulating pump, the coal-weighing hopper and the traveling crane, the exciter units installed are three-wire, 125-250-volt direct-current machines. There are three 75-kw exciter sets. Two are driven by 220-volt, three-phase, twenty-five-cycle induction motors, and the third is operated by a steam engine. Double exciter buses have been installed, so that a portion of the machines may be excited from one bus while the others receive their excitation from the other bus. In addition to supplying 125-250-volt energy for the direct-current motors and excitation for the larger machines these units furnish energy for the emergency station lighting. A storage battery, provided for oper-



FIG. 4—PEDESTALS AND SWITCHBOARD

ating the remotely controlled oil switches, also automatically supplies current for switchboard lighting when the voltage of the station falls below a predetermined limit.

#### Synchronous Condenser to Improve Power-Factor

The electrical apparatus in the station, aside from the turbine, exciters and necessary switchboards, might properly be termed substation equipment. However, since this apparatus is all installed in the steam-station building it will be described as a part of the contents of that structure.

The synchronous condenser already mentioned is a 13,200-volt machine connected to one section of the ring bus for the double purpose of maintaining constant potential and improving the power-factor. Frequency changers, rated at 500 kw and 1000 kw, are used for supplying sixty-cycle energy for motor service and lighting in Alton. Of the two 500-kw synchronous converters to be used for supplying the 600-volt direct current used for the railway service in Alton, only one is installed at the present time.

The switchboard of the station is divided into five sections controlling respectively the twenty-five-cycle,

13,200-volt and 66,000-volt equipment, the sixty-cycle, 2300-volt equipment, the direct-current 600-volt equipment, the arc-lamp circuits, and direct-current excitation equipment. In addition to these there is a twenty-five-cycle, 220-volt panel for the low-tension alternating-current circuits to the motor-driven auxiliaries.

Because of its marked departure from standard practice, the twenty-five-cycle switchboard controlling the 66,000-volt and the 13,200-volt equipments is of interest. This equipment represents a step beyond the "peek-a-boo" benchboard in that each panel is an individual pedestal, separated from its neighbor by a distance of approximately 4 ft. Seven of these pedestals with the synchronizing post have been installed. A post at the end of the row of pedestals supports a swinging bracket carrying a synchroscope, a frequency indicator and two voltmeters. One of the latter instruments can be connected to any section of the twenty-five-cycle buses, while the other can be plugged to any machine or to the outgoing lines. Switchboards for the sixty-cycle alternating current, the 600-volt railway feeders, the direct-current exciters and the synchronous condenser face the pedestal switchboard.

A balcony over these switchboards supports the oil



FIG. 6—OIL-SWITCH COMPARTMENT IN SUBSTATION

fan driven by a 12-in. by 30-in. Corliss engine will assist the chimney in its work. This fan will deliver 100,000 cu. ft. of air per minute when running at 100 r.p.m.

#### All Water Used Is Weighed

A gravity system delivers the boiler-feed water from a storage tank under the roof to a Hoppe exhaust-steam feed-water heater with 625 sq. ft. of heating surface. Ordinarily the water from this heater is pumped to the boilers by a 17-in. by 10-in. by 17-in. Worthington duplex pump of the outside-packed type. In case of light load or emergency, however, a 9-in. by 15-in. by 10-in. pump of similar type performs the work. This smaller pump during ordinary operation is used only for boiler washing. The feed piping is arranged so that the water may be fed to the boilers directly or through the economizers.

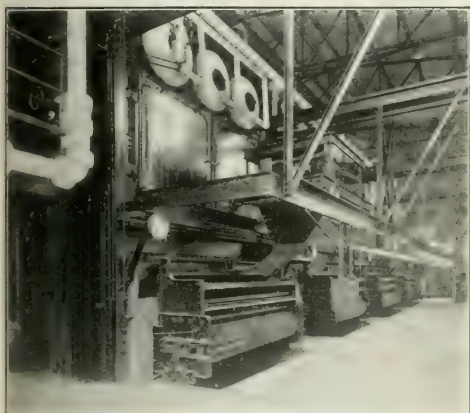


FIG. 5—BOILER ROOM, SHOWING COAL CONVEYOR

switches for the sixty-cycle, 2300-volt feeders, which are controlled from the switchboard beneath. This balcony also accommodates the transformers and switching equipment for the series-arc lighting and incandescent circuits.

#### Combining Natural and Induced Draft for Boilers

Four 440-hp Babcock & Wilcox boilers equipped with superheaters comprise the steam generating equipment of the station. This equipment is designed to operate at 100 per cent overload, thus making the total boiler rating 3520 hp. These boilers and superheaters deliver the steam to the header at 175 lb. gage pressure with 100 deg. superheat. All steam-driven units of the station are supplied from this header, so that all operate on superheated steam. Each boiler is equipped with chain-grate stokers driven by 3-hp, 220-volt, three-phase, twenty-five-cycle individual motors.

Two economizers having 4018 sq. ft. of heating surface each are so arranged that ordinarily the gases from two boilers will go through each economizer. The feed-water piping is connected so that the economizers operate in parallel. Under light loads a 12-ft. by 150-ft. concrete chimney will furnish the draft, but for heavier loads and quick firing a 18.5-ft. by 6-ft. induced-draft



FIG. 7—HIGH-TENSION OIL SWITCHES IN SUBSTATION



All of the boiler-feed water is weighed before entering the storage tank by means of Hammond water meters. A 4-in. meter having a capacity of 75,000 lb. of water an hour takes care of the condensate from the turbine and a 3-in. meter weighs the make-up water.

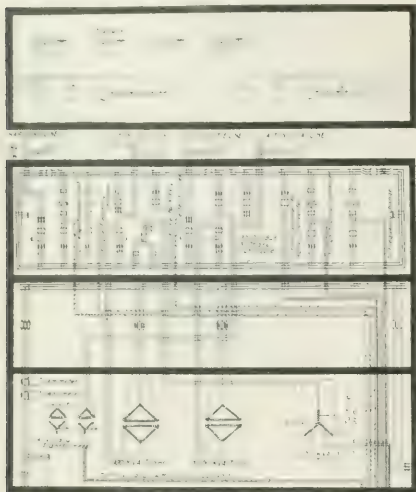


FIG. 8—DIAGRAM OF ELECTRICAL EQUIPMENT

Under ordinary operating conditions the make-up water is supplied by the cooling water from the turbine bearings and the dry-vacuum pump jacket. Provision is made, however, so that water from the house-piping system will automatically cut itself in through this 3-in. meter if the water in the storage tank falls below a certain level.

#### Provisions for Keeping Coal Records

Coal is delivered over the Chicago, Peoria & St. Louis Railroad to the company's double siding, which provides one track for cars of coal and one for the empty cars. By the grading of these tracks the full cars can be moved over the track hopper by hand without difficulty, and when empty the cars are allowed to roll onto the end of the track, being thence switched back onto the "empty" coal-car track to await the switch engine. Coal is received in dump-bottom cars and discharged into the track hopper, from which it is picked up by a flight conveyor and carried through a motor-driven crusher or direct to a bucket elevator, if the fuel is sufficiently fine. It is elevated into a 300-ton steel, concrete-lined storage tank placed just outside the station at the end of the boiler room. From this storage tank the coal runs by gravity into a 2-ton traveling weigh hopper driven by a 2-hp, 250-volt, 1250-r.p.m. direct-current motor, the control of which is effected by means of chains suspended within reach of a man walking on the boiler-room floor. This hopper travels on an overhead track in front of the boilers and discharges the coal into the stoker hoppers. Weighing apparatus attached to this hopper automatically records the amount of coal dumped into the stoker hoppers, thus keeping a record of all coal burned.

The fine coal and ash from the chain-grate stokers are carried by a chain-drag conveyor and bucket elevator to separate hoppers supported on the same steel structure with the coal-storage bin. The fine-coal bin is placed so that this coal can be discharged into the coal-weighing hopper and again fed to the stokers, while the ash hopper is placed above a track so that a coal car may be placed underneath it to receive the ashes.

#### A Boiler Test Every Day

It has been said of this station that no good reason can be given why a boiler test—or, for that matter, a complete plant test—should not be made every day. As stated above, all coal and water used are weighed. Thus knowing the output of the turbine and the coal burned it is very easy to check up the efficiency of the plant at all times. Besides these features numerous other instruments are provided to keep close check on the operating conditions of the station. Each furnace is fitted with an Ellison differential draft gage, while a combination indicating and recording draft gage is piped so that it may be connected to any or all of the furnaces.

Recording instruments have been installed to record the temperatures of the water from the storage tank, water from the exhaust heater (temperature of water to the economizer), water from each economizer, gas to each economizer, gases from each economizer, superheated steam at turbine throttle, exhaust steam from turbine, condensate from condenser and circulating water from condenser. The chart for the exhaust-steam thermometer is a combination temperature and vacuum chart. The temperature of circulating water entering the condenser is determined by an indicating thermometer since this temperature varies but little in a day's time.

#### Separate Substation Receives Energy from Keokuk

Erected at the west end of the steam station is a substation of the same general construction as the main

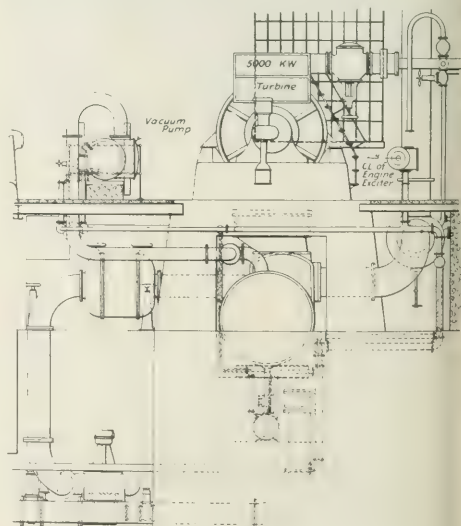


FIG. 9—CIRCULATING-WATER SYSTEM FOR CONDENSER

building. Incoming and outgoing 66,000-volt lines and the outgoing 13,200-volt lines terminate here. The outgoing 66,000-volt line is carried over steel towers to the company's substation at East St. Louis. However, the line is brought through the Alton substation so that it

f the 66,000-volt energy which the company receives from the Mississippi River Power Company may be assured. There are two 13,200-volt, twenty-five-cycle lines connecting this station with the East St. Louis substation, while two 13,200-volt, twenty-five-cycle lines saving this station connect with local points. Of the local 13,200-volt lines only one is installed at present.

The substation itself is divided into three rooms—the transformer room, the 66,000-volt switch room and the 3,200-volt switch room. Lightning arresters for both the incoming and outgoing 66,000-volt lines and the outgoing 13,200-volt lines are installed on a balcony above the 13,200-volt switches. Two three-phase, twenty-five-cycle, 3000-kva transformers, a three-phase, twenty-five cycle, 3125-kva auto-transformer, and two 3,200 220-125-volt auxiliary transformers, with the potential and series transformers for the 66,000-volt metering equipment, compose the apparatus in the substation. In the 66,000-volt switch room a 66,000-volt oil switch connects the incoming line with the 66,000-volt bus, while one 66,000-volt oil switch connects this bus to the 66,000-volt outgoing line to East St. Louis and a 66,000-volt oil switch is provided for each of the two 3000-kva transformers.

The remotely controlled oil switches are all installed in the 13,200-volt switch room. By dividing the ring bus into four sections, two on each side of the room, and supporting these in concrete compartments, it has been possible to effect quite a saving of space. As will be seen from the cross-sectional view of the substation, the room containing this apparatus is but 13 ft. from wall to wall, yet the alleyway down the center is 3.66 ft. wide. The oil switches are located in the lower concrete cells, while the solenoid-operating mechanisms which control these switches are mounted on the front walls of the concrete compartments containing the buses.

#### Terminal House for Outgoing Lines

A terminal house in connection with a station of this size is in itself unique. All of the local 2300-volt, sixty-cycle feeders, the 600-volt direct-current railway feeders and the alternating-current arc-lamp feeders are carried in tile conduits from the steam station to a 14-ft. terminal house which has been erected about 30 ft. from the substation. From this building, which houses the lightning arresters for these feeders, the lines rise to a steel tower erected directly over the terminal house, and from this point are carried on steel towers over the bluff, where they connect with the circuits of the city. The local 13,200-volt line is also carried on these towers.

The station at Alton was erected by the E. W. Clark Company Management Corporation and will be operated by the East St. Louis Light & Power Company. Mr. K. B. Ward was construction superintendent during the erection of the station, having been assisted by Mr. G. W. McIver, electrical engineer, and Mr. H. H. Bailey, mechanical engineer.

#### Pole-Line Construction in the Philippines

Since few woods can withstand the tropical climate of Manila, the transmission-line poles used there and in other parts of the Philippines are preferably made of concrete or of some native close-grained wood. Among the native woods tried for this purpose only one, known locally as "ipil," seems to give satisfaction, or the others either decay or are eaten by white ants. Treated American cross-arms begin to show signs of weakness at the end of the first year's service and in two years are usually entirely rotted away. Creosoted poles from the United States last from six to eight years.

Ipil is a hard, close-grained wood heavier than water. Although hard to handle, it is very reliable and exceedingly strong. When free from sap rot, it will last from twenty-five to thirty years. Posts of this wood fifty years old can still be found supporting houses. A 30-ft. ipil pole costs \$18 and is hard to get even at that price as the trees are very scarce. For this reason concrete poles are now being employed to a considerable extent in Manila. The most satisfactory concrete pole for that locality, as determined by tests, measures 12 in. square at the bottom, 6 in. square at the top and 30 ft. long, and is made of a 1:2:3 mixture reinforced with four 5/8-in. twisted rods. Poles of this construction cost \$11.50 each and have given satisfaction.

#### Steel Mill to Use Central-Station Energy

A contract was recently signed by the Trumbull Public Service Company and the Western Reserve Steel Company, both of Warren, Ohio, by the terms of which the steel company is to be supplied with central-station energy for operating its entire equipment, the total rating of which will amount, in round numbers, to about 2000 hp. The installation will be started as a six-stand sheet mill and will be later increased to eight stands. It is, moreover, confidently expected that within two years the load will be doubled, and, in fact, such a contingency is provided for in the terms of the contract. Complete galvanizing, corrugating and metal-lath departments will be maintained, and at the start the company will employ between 500 and 600 men.

Several features of the electrical installation are unique. The main motor, connected to the roll train through a single herringbone reducing gear, will be a Westinghouse 1500-hp, 2200-volt, sixty-cycle machine operating at 210 r.p.m. In addition to this unit there will be about 200 hp in crane motors and 200 hp in miscellaneous motors of the three-phase, 220-volt type. It is estimated that the average demand will be 1000 kw and the yearly energy consumption 6,000,000 kw-hr., producing 2750 tons of sheet metal a month.

The main motor controller used will be of the Westinghouse liquid type. The motor when started with all resistance in its secondary winding will give full-load torque, taking about one and a quarter times full-load current. With the mill in operation the controller is so arranged that as the load exceeds a predetermined value the electrodes of the controller moving in their electrolyte will automatically increase the slippage of the motor, allowing the attached flywheel to carry both the load and the motor over the peaks.

Coincidentally with the acceptance of this contract the Trumbull Public Service Company has practically rebuilt its station, taking out all of the old apparatus and installing two 4000-kw turbines of the new high-speed type recently brought out by the General Electric Company. These machines are among the first large units to operate at 3600 r.p.m. To insure uninterrupted service to the steel mill all feeders to the plant will be in duplicate.

The Western Reserve Steel Company is closely identified with the Thomas Steel Company, Niles, Ohio, and the Brier Hill Steel Company, Youngstown, Ohio, both of which have been strong adherents of the cross-compound steam engine as a prime mover, so that the competition between the steam and electric men on the job was keen. In closing the contract Mr. C. G. Thomas acted for the steel company and Messrs. W. J. Marshall and R. A. MacGregor acted for the Trumbull Public Service Company. Mr. C. G. Thomas is president of the Western Reserve Steel Company, Mr. F. W. Thomas is operating superintendent, and Mr. W. W. Lewis is secretary.



## Determination of Wave-Length in Radiotelegraphy

The relation that should exist between the length of wave, size of antenna and current produced therein in order to obtain maximum transmission. By A. S. Blatterman

WHEN the size of aerial and available power are fixed the selection of wave-length has an important effect on the range of the station. It is well known that the radiation component of the aerial resistance is greater for short waves. Yet short waves suffer greater absorption than long ones, and the question therefore arises as to how we shall compromise in the selection of the proper wave-length so as to obtain considerable radiation and yet use a wave which is not highly absorbed. In short, what is the wave-length which will be most effective with the power and the antenna at hand?

Besides the variation with wave frequency in radiation and in absorption, another factor influencing the choice of wave-length is the similar change in the antenna current. The aerial current with a given potential maximum is greater for short waves. However, if attention is confined to the aerial current alone, without respect to potential, this can, with properly designed inductances, be made to be practically constant throughout a large range of wave-lengths. When the power in the condenser circuit is invariable the aerial current is affected only by the total equivalent resistance of the given aerial circuit. It is independent of an added self-inductance, altered wave-length or capacity, and the effect of the addition of any foreign element into the circuit, such as an inductance for the purpose of raising the wave-length, must be judged solely by its ohmic resistance.

The fourth influencing fact in the selection of wave-

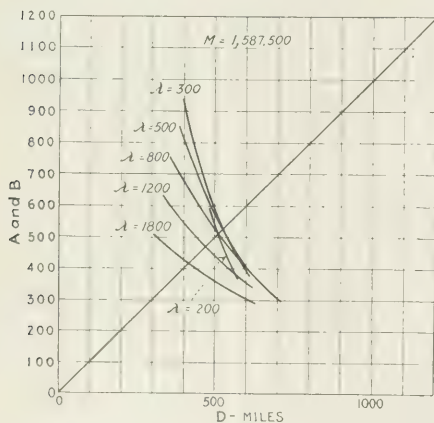


FIG. 1—SIGNALING DISTANCE FOR DIFFERENT WAVE-LENGTHS WITH FACTOR  $M = 1,587,500$

length is the distance over which transmission is to be effected. Both theory and practical experience point to the necessity of using long waves for long-distance transmission; but when comparatively short distances are to be covered on low power the use of a long wave presents no advantage whatsoever and, as has been

shown, may even result in a weakening of receive signals.

It is proposed here to investigate the empirical equation worked out by Austin for daylight transmission over sea-water with a view of determining the best wave-length to use for transmission over a given distance for a given antenna and a given aerial current. Conversely, the curves hereinafter presented can be used to determine the range of a station when the wave-length, antenna height and current are known.

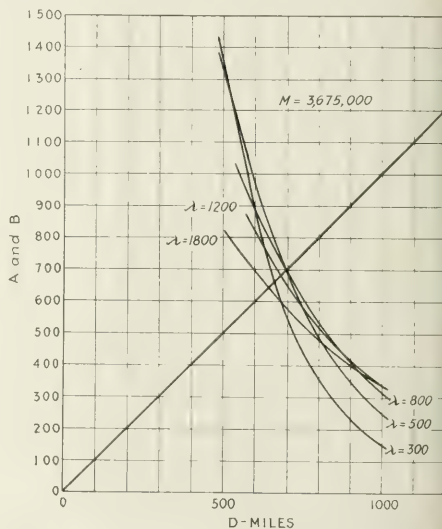


FIG. 2—SIGNALING DISTANCE FOR DIFFERENT WAVE-LENGTHS WITH FACTOR  $M = 3,675,000$

An interesting paper<sup>1</sup> by Prof. A. H. Taylor has recently appeared in which experimental data are presented showing that a distinct optimum wave-length does exist. For the 1-kw station with which his experiments were made this wave-length was approximately 460 and was the minimum at which the station could be efficiently operated. It is interesting to compare his practical results with those which could have been predicted by the use of a method such as that quoted in the present paper. Considering the fact that his experiments were carried out over dry prairie land the agreement seems very good. The equation stated<sup>2</sup> by Austin is:

$$I_r = KI_s \frac{h_1 h_2}{\lambda d} \epsilon^{-ad \sqrt{\lambda}}$$

where

$I_r$  = current received through 25 ohms equivalent distance (amp).

<sup>1</sup>"Optimum Wave-Length in Wireless Telegraphy," by A. Taylor, *Physical Review*, Vol. 4, No. 4, April, 1913, pp. 321-325.  
<sup>2</sup>Austin, L. W., *Bulletin Bureau of Standards*, 1911, Vol. V No. 3, pp. 315-363, "Some Quantitative Experiments in Long Distance Radiotelegraphy."

$I_s$  = sending aerial current (amp).  
 $h_s$  = height of sending aerial (kilometers).  
 $h_r$  = height of receiving aerial (kilometers).  
 $\lambda$  = wave-length (kilometers).  
 $d$  = distance between stations (kilometers).  
 $\alpha$  = an absorption coefficient.  
= 0.0015 for transmission over sea-water.

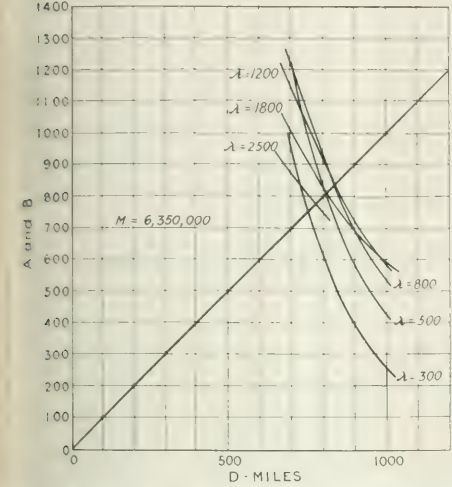


FIG. 3—SIGNALING DISTANCE FOR DIFFERENT WAVE-LENGTHS WITH FACTOR  $M = 6,350,000$

The constant  $k$  has been determined by Austin to be 4.25 for the flat-top aerials on the cruisers used in his experiments.

As far as I am aware, there have not yet been collected and published any adequate data from which the values of  $\alpha$  and  $k$  for overland transmission could be determined, though it is proposed to make experiments for this purpose at Washington University, St. Louis, Mo. As Taylor points out, it seems likely that transmission takes place according to the same general law of variation with distance over land as over sea.

The units of Austin's original expression are inconvenient for practical computations, and I am therefore giving the expression with its coefficients modified so that  $h_s$  and  $h_r$  may be measured in feet,  $d$  in miles,  $\lambda$  in meters,  $I_r$  in microamperes, and  $I_s$  in amperes. These are the units commonly used in this country in the measurements of the respective quantities.

$$I_r = \frac{635 I_s h_s h_r}{\lambda d} e^{-0.00762 d \sqrt{\lambda}}$$

An investigation of this equation shows, first, that there is a certain wave-length for a given value of antenna height and current, which will give maximum range in transmission. But, besides this, this best wave-length can be determined, and with it the concomitant values of antenna current and elevation for any given distance.

The first step is to solve the equation for distance; but, since this factor enters both as a coefficient and as an exponent, there is no explicit solution and graphics must be used to evaluate  $d$  in terms of the other quantities.

\*Hogan, J. L., Jr., Elec. World, June 21, 1913, pp. 1361-1366. "Quantitative Results of Recent Radiotelegraphic Tests Between Arlington, Va., and U. S. S. Salem," and Proceedings, Institute of Radio Engineers, July, 1913, pp. 75-102, "The Heterodyne Receiving System, and Notes on the Recent Arlington-Salem Tests."

The equation may be written:

$$d - \frac{M}{\lambda e^{0.00762 d \sqrt{\lambda}}} = 0 \tag{1}$$

where

$$M = \frac{635 I_s h_s h_r}{I_r}$$

and is evidently a parameter involving arbitrary constants.

The equation (1) is now of the form

$$A - B = 0$$

where

$$A = d$$
$$B = \frac{M}{\lambda e^{0.00762 d \sqrt{\lambda}}}$$

The variables  $d$  and  $\lambda$  can now be assigned different values and  $A$  and  $B$  calculated.  $A$  and  $B$  thus determined can be plotted on the same scale as ordinates against  $d$ . The plot  $A$  to  $d$  gives a straight line (since  $A = d$ ). The plot of  $B$  to  $d$  gives a series of curves having parameter  $\lambda$  which intersect the straight line graph of  $A$  to  $d$ . At the points of intersection of the straight line and the  $B$  curves

$$A = B,$$

and hence the distance  $d$  read off at this intersection is a solution of the general equation for any particular value of the parameter  $\lambda$ , as was shown by Hogan in the papers quoted.

The curves of Figs. 1, 2, 3, 4, 5 have been worked out in this way for different values of  $M$ . In calculating  $M$  it is necessary to know the value of receiving antenna current  $I_r$ . Austin has determined that this is about 10 microamperes for signals of just readable strength on ordinary apparatus and about 40 microamperes for fairly strong signals which can be read through moderate interference. It is likely that with modern apparatus these figures are conservative.

A glance at these curves of Figs. 1, 2, 3, 4, 5 shows that for each given value of  $M$  the solution for  $d$  in-

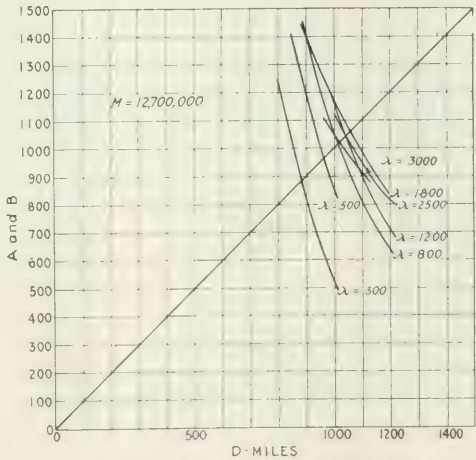


FIG. 4—SIGNALING DISTANCE FOR DIFFERENT WAVE-LENGTHS WITH FACTOR  $M = 12,700,000$

creases with the wave-length up to a certain point; but beyond this point further increasing wave-length is accompanied by a decrease in distance.

If now the solutions for  $d$  at the different wave-lengths are read off and these values of  $d$  plotted against the wave-lengths to which they correspond a series of



curves are obtained having parameter  $M$  which exhibit distinct maxima of distance corresponding to a particular wave-length. See Fig. 6, which is drawn in this way.

For instance, if the value of  $M$  for a certain station is 3,675,000, which is true when  $h_s = h_r = 100$  ft. and  $I_s = 5.8$  amp for each 10 microamperes required in the

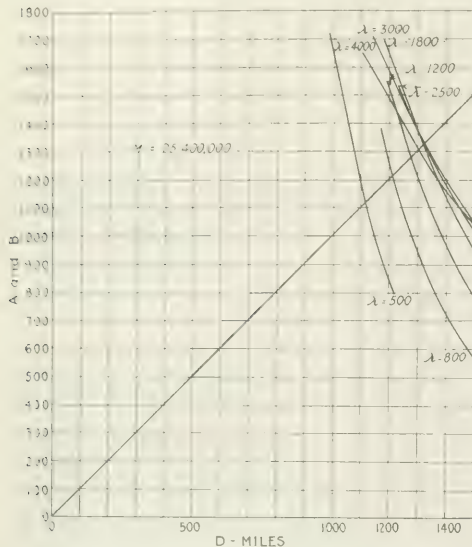


FIG. 5—SIGNALING DISTANCE FOR DIFFERENT WAVE-LENGTHS WITH FACTOR  $M = 25,400,000$

receiving antenna, then Fig. 6 shows that the best wave-length to use is 700 m; and for the assigned signal strength at the receiving station corresponding to 10, 20 or 40 microamperes in the receiving aerial which was used in calculating  $M$  the maximum range is 700 miles.

It will be noticed that as  $M$  increases—that is, as higher power and higher aerials are used or the signal strength at the receiving station becomes less—in other words, as the distance increases, the wave-length which gives maximum transmission becomes less sharply defined. The curves become flatter and almost any wave for a considerable distance either side of the maximum will do almost as well as the optimum wave for maximum distance. A practical verification of this is found in some of the very long-distance tests which have been made in the past. Marconi has found that waves of 5000 m and 7000 m are about equally effective between his high-power transatlantic stations in Nova Scotia and Ireland, about 2000 miles apart.

The wave-lengths for which  $d$  is maximum at the different values of  $M$  in Fig. 6 can now be plotted against the respective values of  $M$  and the curve marked "wave-length" in Fig. 7 obtained. This curve shows the best value of wave-length to use for different values of  $M$ . Similarly, the maximum distances of Fig. 6, at different values of  $M$ , which can be obtained by the proper selection of wave-length can be plotted to  $M$  and the curve marked "distance" obtained, as in Fig. 7.

These curves of Fig. 7 can be used to determine the proper wave-length for transmission over any distance up to 1300 miles, and corresponding to this distance and wave-length the value of  $M$  required; or if  $M$  can be calculated from the dimensions of the sending and receiving aerials and the currents therein, the curves

can be used to determine the greatest distance which can be covered with the assigned value of  $I_s$ , and simultaneously the wave-length which is proper to this distance and the power at hand. As an example of the first case, suppose that the maximum distance to be covered is 1000 miles. The "distance" curve (Fig. 7) shows that  $M$  must be  $10.6 \times 10^6$ . But the desired distance, 1000 miles, can only be covered with this value of  $M$  when the wave-length used is that read from the wave-length curve (Fig. 7) corresponding to this  $M$  ( $= 10.6 \times 10^6$ ), namely,  $\lambda = 1550$  m. A wave very much shorter or very much longer than this will reduce the range.

For any value of  $M$  a choice of antenna height and received signal strength immediately fixes the sending aerial current  $I_s$ , and this is a direct index of the power to be used in the sending station. If the antenna chosen is low, then a high value of  $I_s$  is necessary, whereas a smaller value of antenna current will have the same range if produced in a higher aerial. In other words for the same range of transmission there are two alternatives, either higher tower and lower power, or higher power and lower tower. The choice lies between the initial outlay and running expenses, although for safe and handier operations, and freedom from occasional break-down of apparatus, smaller power with higher tower would be preferable. The question is one of economy according to actual circumstances.

Figs. 6 and 7 show a peculiar fact of practical importance. This is that the wave-length giving extreme range does not necessarily produce the strongest signal at shorter distances. At distances below the maximum at which signals are just audible, the minimum value of  $M$ , and hence the greatest  $I_s$ , occurs at a shorter wave length than that used for the maximum distance. This has been at least partially verified by Professor Taylor and reported by him in the above-mentioned paper.\*

For a given pair of fixed stations the factor  $M$  is

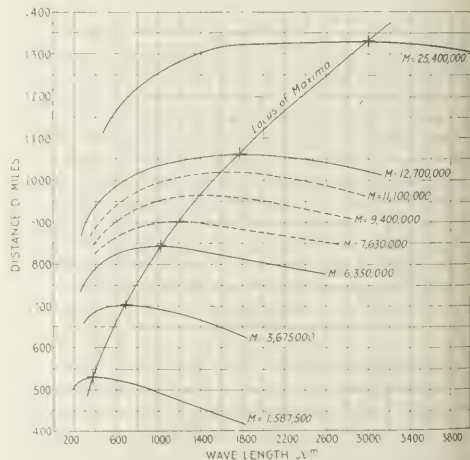


FIG. 6—DISTANCE AS A FUNCTION OF WAVE-LENGTH WITH DIFFERENT VALUES OF  $M$

constant, for  $h_s$  and  $h_r$  are invariable and a change in the current in the sending aerial produces a proportional change in that at the receiver. The wave length which will allow communication with the least power is read from Fig. 7 and the sending aerial current required is calculated from the corresponding

\* A. H. Taylor, loc. cit.

value of  $M$  by assigning to  $I$ , the value 10 microamperes, which is Austin's figure for bare audibility of signal, or a larger value if louder signals are needed.

As an example, we may work out the extreme range and proper wave-length for a station with 12 amp aerial current, which corresponds to a moderately effi-

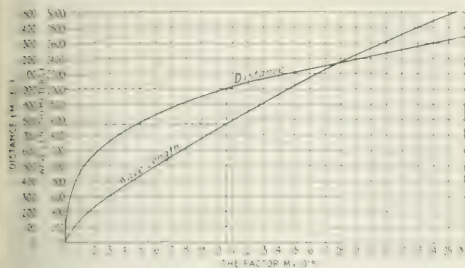


FIG. 7.—PROPER WAVE-LENGTH TO USE AND VALUE OF FACTOR  $M$  FOR TRANSMISSION OVER A GIVEN DISTANCE

cient 2-kw set, and flat-top antenna 100 ft. high, sending to a similar receiving station.

$$M = \frac{635 \times 12 \times 100 \times 100}{10} = 7.63 \times 10^6.$$

Referring to Fig. 7, the best wave-length for this station and the maximum distance which can be reached in daylight over sea-water when this wave is used are respectively 1200 m and 900 miles. However, any wave between 800 m and 1600 m would seem to give almost as good results (Fig. 6), and this fact might be used to advantage when it is desired to avoid interference without appreciably reducing the range of the station.

The dotted curves of Fig. 6 have been interpolated by drawing the curve marked "locus of maxima" and the use of Fig. 7. The blanks for other values of  $M$  can be filled in a similar way, and these curves will then show the effect on range of changing from the theoretically best wave-length given in Fig. 7.

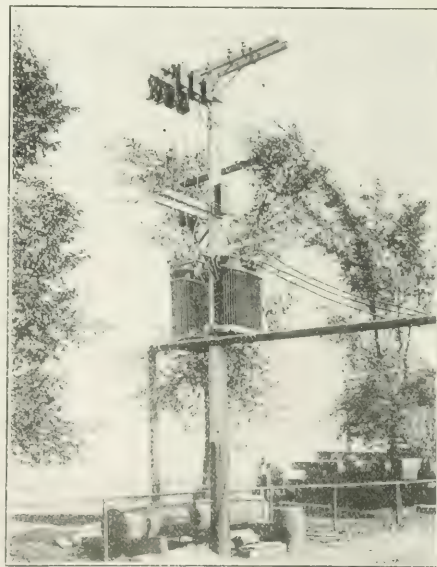
In conclusion, the graphical method of solving the Austin-Cohen equation, and particularly the curves of Fig. 6, show the great advantage of long waves for transmission over great distances, and at the same time the great disadvantage of long waves when only comparatively short distances are involved. These results are borne out qualitatively in practical experience, and they also agree with the rational equations of Sommerfeld<sup>4</sup> and others which show that long waves must be used to cover great distances. The most important conclusion, however, is that though the optimum wave-length for a station does not appear to be a very accurately determinable quantity, yet for a given aerial and given power there is a certain wave-length which will give maximum transmission, and hence in designing and adjusting a transmitter it may be of importance properly to correlate the wave-length with the size of the antenna and the current produced therein.

### Electrical Construction of Water-Intake Tunnel

Replacing all of the steam-driven machinery used in constructing the new Linwood Avenue reinforced-concrete water intake in Milwaukee by electrically operated machinery is an interesting example of the "survival of the fittest." This tunnel will supplement one already in operation at McInley Park. It will be 12 ft. in diameter and 4000 ft. long when completed and will receive its water supply from Lake

Michigan in the vicinity of Lake Park. The contract for constructing the intake was awarded to Joseph Hanreddy, contractor, Chicago. When the work was started it was intended that steam-driven machinery would be used. Since then several machines have been discarded until now all that remains to give evidence of steam motive power is a scrap heap on top of the hill near the scene of the work where steam-driven air compressors, fans, hoists, etc., are piled in readiness to be carried away to some job where electricity is not known. In their place the construction company has erected a substation which receives energy from the Milwaukee Electric Railway & Light Company and distributes it to different parts of the grounds where machinery has to be driven.

Electricity is delivered to the substation over a 2300-volt transmission line coming from the north, which receives its energy from two different lines owned by the Milwaukee Electric Railway & Light Company, thus reducing the possibility of interruption to service. The substation terminal of this line is shown herewith. The pole at which this line terminates also supports two outdoor-type three-phase, 2300 220-volt transformers having ratings of 60 kw and 75 kw respectively. These are arranged symmetrically on each side of the pole, and are connected in multiple on both the high-tension and low-tension sides. The transmission line supplying them with energy consists of three No. 2 copper conductors. Service drops from these lines pass through Matthews fuse switches and through a Wright demand meter installed on the pole and connect with the high-tension terminals of the transformers. The secondary leads of the transformers are tied together,



TRANSFORMERS SUPPLYING ENERGY FOR CONSTRUCTION OF WATER-INTAKE TUNNEL

and three 500,000-circ. mil cables connect them with the switchboard buses inside the substation. The neatness of appearance and the comparative safety with which linemen can work on this pole are noteworthy features.

The substation is a temporary affair, being built of wood, and contains a small electrically driven machine

<sup>4</sup>Sommerfeld, *Ann. d. Phys.*, Vol. XXVIII, 1909.



shop and a 150-hp motor-driven Ingersoll-Rand air compressor which supplies high-pressure air for operating the drills used in tunneling. The motors installed are three-phase wound-rotor induction motors and are controlled by General Electric starting panels having six contactors. The 150-hp motor drives its compressor by means of a belt and is automatically started and stopped by a pressure-regulating device installed on the starting panel. The pressure tank into which the compressor delivers its air is placed outside the plant beneath the pole shown. In addition to the starting panels there is a main distributing switchboard in the substation, which was manufactured by the Koschin Company of Milwaukee. On it are mounted the main service switch, a wattmeter, and eleven three-blade knife switches, three of which control the air-compressor motors, while the remainder control an electric pump, a concrete mixer, a motor-driven hoist, and the lamp circuits and small motor equipment.

Four three-phase circuits delivering energy to apparatus in the tunnel and along the lake shore are supplied with energy from the main switchboard. Inside the substation they are supported on insulators fastened to cross-arms hung from the ceiling. The wires pass through the east wall of the building, and from that point they are carried on wooden poles down the bank which skirts the lake shore to the apparatus which is operated by electricity in the head-house over the shaft and in the tunnel.

An electric hoist for raising excavated material from the water intake tunnel is installed near the mouth of the shaft leading to the tunnel. The hoist was manufactured by the Lambert Hoist Company, of Newark, N. J., and was designed for operating on steam power, but it was remodeled on the job and connected to a 37.5-hp General Electric wound-rotor induction motor. While a concrete head-house was being constructed over the shaft the hoisting had to be done by a steam engine installed on a high bank above the shaft opening. The hoisting cable extended from the cable drum on the top of the bank down to a pulley at the base of a stiff-leg on the lake shore, thence along the boom and over another pulley and down into the shaft. The simplicity of the electric hoist as compared with this arrangement can only be appreciated by one who has actually witnessed the conditions under which work had to be performed. All hauling in the tunnels was done by mules.

As construction material such as crushed rock, cement, steel forms, etc., has to be unloaded on top of the bank about 60 ft. above the level of the lake, some means had to be provided for conveying this material down to the place where it was needed. All of the material had to be lowered and practically none had to be raised, so that the method of lowering did not require any large power unit. An inclined double track was constructed up the slope of the bank, and an air-driven engine was installed at the top to convey the cars carrying the material from the place where they are loaded to the top of the incline, from which they descend of their own weight, the engine acting only as a brake to prevent too rapid acceleration when descending.

At the bottom of the incline is a motor-driven concrete mixer, into which the crushed rock and cement can be dumped from the inclined railway cars. This mixer is operated by an induction motor rated at 15 hp, the starting compensator and fuses being installed in a weatherproof box above the concrete mixer. The inclined track is illuminated by a string of incandescent lamps controlled and fed from a circuit at the top of the incline.

For clearing the drills when they are in operation water under pressure has to be supplied. This is fur-

nished by a Jeanesville horizontal double-suction volute pump directly connected to a 35-hp motor running a 1800 r.p.m. The pump is capable of delivering 750 gal per minute. A reserve supply of water is furnished by a Cameron duplex pump operating on air.

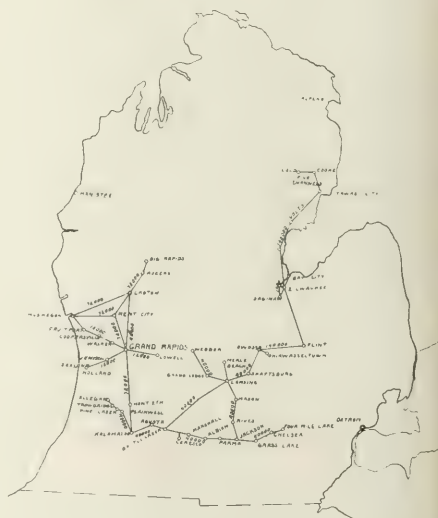
When blasting it is necessary to remove smoke from the tunnel to prevent the fouling of air. A motor driven Garden City fan has been installed for this purpose. The motor is rated at 15 hp and operates a 1200 r.p.m.

The tunnel is lighted by electricity, and as the tunnel is extended more lamps are added. Instead of putting in booster feeders which would maintain a constant voltage throughout the length of the tunnel, the company employed lamps of different voltage ratings.

Using electricity exclusively for construction operations on a job of this kind where interruption to service might mean fouling of air in the tunnels is a tribute to the central-station company supplying the energy. Construction operations have been carried on night and day, and it is asserted that the automatic starting panels used on the compressor motors will pay for themselves in six months by eliminating the services of an engineer.

### An Extensive Transmission System in Michigan

In general the hydroelectric plants of Michigan serve limited areas, but the Commonwealth Power Company is a notable exception. It owns sixteen water-power plants, of which fifteen, aggregating 68,000 hp, together with numerous steam-operated stations, are tied together by the transmission lines of the Au Sable Electric Company. The highest rating of any station on the system is 15,000 hp, the average head of those stations submitting statistics being 25 ft. The maximum head employed is 45 ft. and the lowest head is 12 ft. The accompanying map indicates the extent of



TRANSMISSION SYSTEM OF AU SABLE ELECTRIC COMPANY, JACKSON, MICH

this transmission system, showing the towns and cities served thereby as well as the transmission-line voltages. The 140,000-volt line from Au Sable to Flint and Owosso was described and illustrated in the *Electrical World* of April 13, 1912.

# Central Station Management

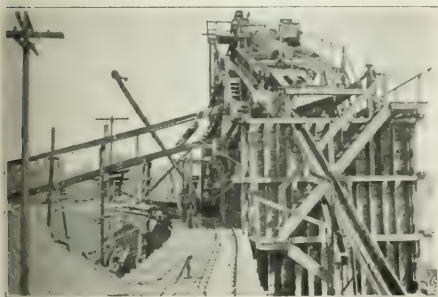
Devoted to Discussion of Administrative Policies, Commercial Methods and Current Practice Among Successful Utilities

## Aftermath of a Flatiron Sale

On June 9 the appliance-sales department of the Union Electric Light & Power Company, St. Louis, Mo., under the direction of Mr. C. E. Michel, disposed of 2402 standard 6-lb. household irons at a reduced price—\$2.85—(*Electrical World*, June 27, 1914). Naturally it might have been expected that the iron sales for the remainder of the month of June would fall off considerably, but the fact was that 309 irons were sold during the remainder of that month at the regular price—\$3.50—making a total of 2711 irons sold in June.

## Electrical Gravel Washing on the Illinois River

With its 100 hp in motors, a sand and gravel company operating just across the Illinois River from Peoria, Ill., furnishes a profitable load for the Central Illinois Light Company of that city. Barges, each capable of holding from 100 tons to 150 tons of rocks and gravel, are towed up the river 16 miles to the company's 40-acre pit, filled by a steam dredge boat, and then towed down stream again to the washery, each barge making a round trip to the pit once a week. At



MOTOR-DRIVEN GRAVEL WASHER

the washing plant the gravel is unloaded into a hopper by means of a crane and grab-bucket operated by a steam hoisting engine. A 75-hp motor belted to a bucket conveyor, crusher and set of pumps then lifts the gravel to the top of the washery, where it is screened, the large gravel and rock being conducted through a crusher and the finer material going to the washer. Inclined rotating screens of conical shape, which are driven by a 25-hp motor, sort the gravel according to size while streams of water played into the screens remove the dirt and sand. From the screens the washed gravel travels by gravity directly to the storage bins. Chutes extending over a spur railroad track allow the gravel to run from the bins to the cars beneath. A view of the 100-kw, 2200/220-volt transformer installation, the revolving screens and the 25-hp motor housing at the top of the washery is shown in the illustration herewith.

## Civil-Service Methods in Selecting Motor Salesman

At present considerable attention is being given by the new-business department of the Toledo (Ohio) Railways & Light Company to securing motor customers on existing lines, and when Mr. R. A. MacGregor, who is conducting the motor-service campaign, wanted a man to handle small-motor work he decided to pick one from the company's lighting solicitors. The selection was made on a competitive basis by giving the lighting solicitors, at their own option, an examination covering the work they had been doing. Practically the entire force elected to take the examination, and after answering the questions put they were so well pleased with the manner in which new points of information were brought out that they have petitioned for similar tests to be held at regular intervals.

## The Human-Interest Note in Central-Station Advertising

Operating a number of electric-service properties throughout the Middle West from Ohio to Oklahoma, the Light & Development Company, of St. Louis (Mo.), found itself face to face with a difficult problem of public policy as soon as it contemplated circularizing its distant customers with letters under the home-office letterhead. The average man does not like to think that the electric-light company to which he pays his monthly bill is owned by capitalists in a distant city, so to obviate this antagonistic feeling and to bring about a closer understanding between his company and its customers Mr. William A. Smith, vice-president of the company, in charge of new-business affairs, originated a series of circular letters written according to the following plan: The name "Bill Smith" in script was used as the heading for all the letters, first, because it is "about the commonest name in the world," and, second, because the letters were really written by "Bill Smith" to the companies' electric-service customers. And just these doubtless lay the real secret of the success of the entire series, for each part of every letter, from its heading to its signature, related a fact or true incident.

The first paragraph usually described some happening in the life of the real William Smith as he grew from boyhood to the estate of middle age. The second paragraph gave his honest recommendation of electric appliances which had been tried in his home and found successful. And not only did such recommended appliances first have to prove themselves successful, but it had to be demonstrated that each device to be mentioned in the letters was something which the average family uses often. For, said Mr. Smith, it is unwise to induce persons to invest money in electric devices that they seldom if ever use.

To illustrate the interesting manner in which the letter series was worked out, a copy of the first, minus the name of the prospective-appliance customer and the date, is reproduced herewith. The second letter began as follows:

"Did you ever read 'The Harvester'? It is a beautiful



story, strong, pure and sweet. It brings you in touch with Mother Nature, taking you close to her heart of hearts. To the tired desk worker it brings a breath of out-of-doors. Get it and read it. You will then thank Bill Smith for the suggestion."

The second paragraph of this letter suggested the advantages of an electric vacuum cleaner and ended significantly, "Mrs. Bill Smith has one and would not be without it," signed, "Your friend, Bill Smith."

#### Flower Seeds—Stealing the Congressman's Thunder

One week later, when thoughts of spring were in the minds of Bill Smith's readers, he wrote them a letter saying: "Recently, while visiting for the first time one of our Southern towns, I asked an old darky to direct me. The information was readily given, and I had crossed the street when the darky called, 'Say, boss, don't yer reckon spring's on t'other side of der fence?' I replied that I thought it was. 'Well, boss, I sure's glad, 'cause I's tired ob winter.'"

"Spring is here. The robins have come. The bluebirds are again twittering their love song from the apple tree. 'Tis the time to plant that we may later reap. I therefore inclose a little package containing flower seeds. Plant in a two-foot space and watch them grow, or give the commission to some of your little friends, telling them that Bill Smith would like to know what success they have."

The second paragraph recommended the purchase of an electric stove and told how Mrs. Bill Smith, seated at the breakfast table, had broiled the spring's first mess of mushrooms and served them on delicious "electric" toast.

Returns from this letter were gratifying, for not only were many electric stoves sold but the flower seeds sent out with the letters grew. And later in the month Bill Smith began receiving scrawly letters in childish script telling of flower gardens that bloomed in many a little city in the Middle West. Most of these were answered in a kindly spirit that made the parents fast friends of the Light & Development Company.

Later, under the date of May 28, when the season was right, Bill Smith took occasion to discredit the popular belief that "puffballs" are poison. He said: "As a small boy I often brought my bare foot down on a little ball, found in the meadow, to see the cloud of brown dust that it sent up. 'Devil's snuffboxes' we called them. Last fall, on a trip back to the old farm to see the dear father and mother, still fond of their firstborn, I wandered over the meadow and gathered a number of the same puffballs, just up from the rich soil, took them home, peeled them as you would a potato, sliced the firm, white interior and fried them in butter. Father said 'poison,' but, as I survived, he, as well as the mother and others, ate and enjoyed the next lot. Puffballs just up, peeled, sliced and fried in butter, are delicious. No danger in puffballs, even for the novice. Try them and you will thank Bill Smith for many nice messes of mushrooms."

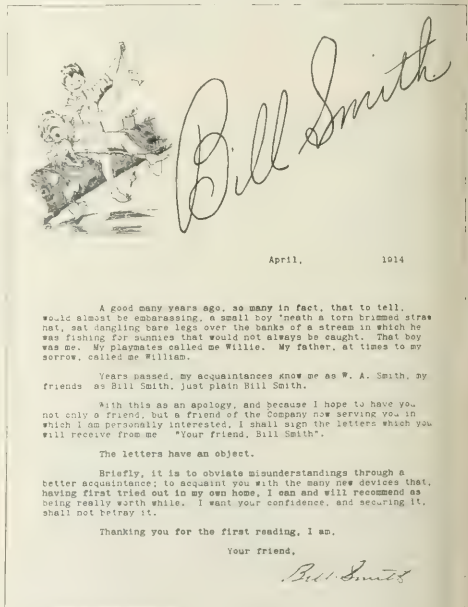
Following this bit of advice came the thoughtful hint that the warm spring and summer days might be rendered entirely comfortable by the use of an electric fan—"a device which in operation is so inexpensive that it may be allowed to run all night to bring restful sleep to the tired worker."

#### "Much Fire No Good, Heap Burn, No Cook"

Vacation is the thought uppermost in many minds when the middle of June arrives each year. Under the date of June 12 Bill Smith wrote: "It was my good fortune to spend several weeks in the wilds of Canada, having as a guide a Canadian Indian. The delight of the day was the noonday meal, consisting of coffee,

flapjacks, boiled potatoes, and fish. The Indian was an expert camp cook, and it was ever a marvel to me how he could cook so much on so little fire, which was usually made with a few twigs and a handful of sticks. His explanation was, 'Much fire no good, heap burn, n cook.' The secret was in the knowing how. How much needless worry, work and trouble the knowing how saves us! How much labor, sorrow and regret the not knowing causes! On your vacation trips build small fires and always put them out when the need for them is over.

"To be absolutely consistent in my letters to you, I find out the real value before giving you my opinion. I purchased and had installed in my home an electric range, taking out and disposing of the gas stove. We are now depending on it entirely for our meals, and it is a real delight. Takes a little more time to star things boiling, possibly four or five minutes, but the regulation is perfect. The steaks and meats broiled o



LETTER NO. 1 OF THE "BILL SMITH" SERIES

cooked in the oven are delicious, and for baking cake, bread, pastry or making biscuits the oven simply cannot be beat. I have to pay for energy used for cooking 6 cents per kw-hr., and it will cost me about one-third more than gas. As you have a 4-cent rate it will cost you only two-thirds as much as it does me. The kitchen is cool, no smoke, grime or dirt. It is the ideal way and cheap at twice the price. Have the electric company install one on trial. Use it and you will say, like the Indian, 'Heap fire no good, little fire great.' I recommend the Hughes electric range. Won't you take my word and try it?"

But in point of human interest the letter of June 2 probably capped the climax, when Bill Smith allowed himself to write a couple of verses signed, "Your little friend, Bill Smith, Jr., per Daddy," for just a few days before a new baby had come to the home of Mr. and Mrs. Smith and, as stated in the letter, "it weighed 9.25 lb. and caused a happy father to tread on air."

With the consistency that marked all the other letters, this missive was concluded with a short paragraph recommending a washing machine which "would do the entire family wash (including the baby's) with very little work."

For those who would like to know the dollars-and-cents value of this type of advertising it may be said that during the first five months of 1914 the company has been able to do \$70,000 worth of appliance business, and it is confidently expected that the total sales for the year will aggregate from \$225,000 to \$250,000. It goes without saying that the load on the various plants belonging to the company has increased by a corresponding amount.

### Economical Shoe-Repairing Methods

Operating a Fleming No. 9 shoe-repairing machine driven by a 3-hp, 220-volt, single-phase, sixty-cycle motor running at 1800 r.p.m., an electric-service customer of the Central Illinois Public Service Company has learned that proper operation of the outfit saves considerable money. This customer's bills over a period of one year vary from 15 kw-hr. to 46 kw-hr., and he says that although trade varies somewhat with the seasons, this difference is in main part due to the different methods of various workmen, some of whom use three times as much energy as others in doing a specified amount of work. Two-thirds of each month's energy bill can be saved, according to this customer's statement, if all shoes are first made ready for the machine and then put through the machining processes as rapidly as good workmanship will permit.

### District Heating in Toledo

When the Toledo Railways & Light Company was formed by the consolidation of the railway, gas and electric-lighting plants in the city and vicinity, a district heating equipment was necessarily included as it formed an important element of the electric-lighting plant. It should be understood, therefore, that the Railways & Light Company did not put this plant in as an off-peak-load proposition or as a means of increasing the thermodynamic efficiency of its power stations. It was inherited, so to speak, and while the inheritance may not have been particularly welcome, it was considered to have money-making possibilities. The present company has developed and extended the heating system and has endeavored to put it upon a paying basis. The details of the service have had careful study and the users are satisfied with the results. There is, in fact, a demand for more service than the company is at present prepared to furnish and plans for extension are being considered.

Heating service is given by means of both steam and hot water, about 80,000 sq. ft. of radiation being supplied by the former and 1,000,000 sq. ft. by the latter. The principal source of heat is the exhaust steam from three power plants, the largest of which is the Detroit Avenue station. This contains three Westinghouse steam turbines, two of 1000 kw and one of 3000 kw. Of these the smaller ones only are connected with the heating system, but the large one will probably be so connected eventually. The steam is exhausted into closed heaters at 5 lb. per sq. in. back pressure, in zero weather, reducing the electrical output of the generators to somewhat more than 80 per cent of their rated capacity. The heaters are similar to surface condensers ex-

cept that the steam is condensed on the inside of the tubes. The turbines are supplied with steam by batteries of two 300-hp Stirling boilers with Jones underfeed stokers, five 400-hp Stirling boilers with Murphy furnaces and extended "Dutch ovens" and two 650-hp Stirling boilers with Jones stokers. In addition there is a 200-hp boiler used for direct heating of the water or for supplying live steam for steam heating. This station contains two centrifugal circulating pumps driven by 135-hp Terry turbines.

The smaller plants are primarily for heating, their electrical output being a by-product. These are situated in the center of the heating district on Floyd Street and Twenty-second Street respectively. Each contains a 600-hp Corliss engine direct-connected to a 425-kw, 550-volt direct-current generator. All exhaust steam from engines and auxiliaries is utilized in the heating system.

There are at present more than 1400 buildings connected with the stations, requiring 60 miles of single pipe for supply and return. The pipe ranges in diameter from 12 in. down to 1½ in. The pipes are laid in triple wooden boxes of 1-in. plank with ½-in. air spaces between boxes. The lumber is treated with crude oil, and the shavings which are packed around the pipes are similarly treated. The water is maintained under a pressure of 50 lb. to 70 lb. per sq. in., and from 20 deg. to 30 deg. Fahr. difference between the temperatures of incoming and outgoing water is maintained. The temperature of the outgoing water is varied to suit atmospheric conditions, its value in zero weather being 208 deg. In warmer weather it may be as low as 80 deg. One million gallons of water is required to fill the system. This water is circulated at approximately ½ gal. per hour per square foot of radiation. The leakage at present is practically negligible, amounting to but one-sixth of 1 per cent of the water circulated. A small steam pump drawing water from an artesian well supplies the make-up water.

In combined power and heating plants of the nature of those described it is difficult to determine an equitable division of costs between the two branches of the service. In the present case the heating service is credited with ¾ cent per kw-hr. for alternating-current energy turned out and 1 cent for direct-current energy. Heat is sold on a flat-rate basis for the heating season, and the demand is calculated from an empirical formula which gives satisfactory results. This is

$$R = d \left[ 75 \left( \frac{W - G}{h} + G \right) + C \right]$$

Where  $R$  = equivalent square feet of radiation,  
 $d$  = temperature constant, from table,  
 $W$  = exposed wall area in square feet,  
 $h$  = wall constant, from table.

Tables of these constants are given in Carpenter's "Heating and Ventilating" and other standard works. The value of  $d$  for a 70-deg. room temperature is 0.0082 and that of  $h$  for average walls is 5.

The net rates per square foot determined from the above formula are: Not over 500 sq. ft., 18 cents per square foot; 500 sq. ft. to 2000 sq. ft., 17 cents; 2000 sq. ft. to 5000 sq. ft., 16 cents; over 5000 sq. ft., 15 cents. On this basis heating costs consumers somewhat more than coal, but when the additional cost of attendance is considered the excess is not serious. It is easily offset by the convenience and uniformity of the heat from the central station. Mr. A. C. Rogers, superintendent of heating, seems to have no great difficulty in convincing prospective customers of this fact. He is enthusiastic over the operation of a district heating plant in conjunction with lighting and power plants.



## Illumination and Wiring

### Alternating-Current Distribution at Rotary-Converter Voltage

An installation recently completed at Nankin, Ohio, a village of about 200 inhabitants, employs a distributing potential of but 365 volts. Lighting of the town is to be furnished from the lines of the Cleveland Southwestern & Columbus Railway Company, and in order to save the expense of extra high-voltage transformers the electrical energy has been used as it is taken from the traction-line transformers for the rotary converters at 365 volts and a frequency of twenty-five cycles. Secondary circuits operate at the standard potential of 110 volts.

Mr. Thomas R. Woulfe, manager of the light and power department of the railway company, says that of the fifty houses and stores in the village forty-eight have been wired for electric service. Twenty-four-hour service is being rendered, and the maximum rate is 10 cents per kw-hr., with a minimum charge of \$1.

### High-Efficiency Illumination of Municipal Swimming Pool

Fairgrounds Park in northwest St. Louis is the site of the city's 4,000,000-gal. swimming pool, wherein the owner of a bathing suit may play in the water free of charge while others must pay one cent for the rental of a bathing suit and another cent for a towel. Of circular shape, the huge concrete bowl has been so divided that the swimming pool proper, which is 12 ft. deep at the center, occupies a segment of the circle measuring approximately 560 ft. by 310 ft., while the remainder comprises a shallow wading pool for children.

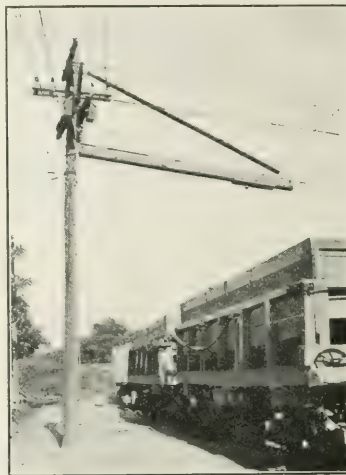
To supply adequate and efficient illumination for night bathing in the pool was one of the problems confronting the city's engineers, Messrs. A. I. Jacobs and Ralph Toensfeldt. At first flame-arc lamps were tried, but when illumination measurements were made over the surface of the pool it became apparent that the difficulties of seeing, of which the life guards had complained, were quite real. Directly beneath the lamps the illumination was intense, but between lamps there were dark spots, rendered less evident perhaps by the glare of the lamps themselves on the water.

With the recent rehabilitation of the lighting system, ten high-efficiency 1000-watt tungsten lamps and two mercury-vapor lamps were installed, producing results

which are much more satisfactory. The large tungsten lamps, in General Electric closed outdoor fixtures, are placed on steel poles spaced about 100 ft. apart and set about 40 ft. from the edge of the pool. The lamps hang 31 ft. above the water. At the center of the pool two Cooper Hewitt mercury-vapor lamps are mounted on a single standard and hang 27.5 ft. above the water. Although this new installation effects a saving in both first cost and expense of operation, it is said that guards are now easily able to see swimmers in any part of the pool.

### Joint Pole-Line Construction

It has been aptly said that the engineer is a man who can do more for \$1 than the average man could do for \$2, but it is often the economical line foreman who will be found working his tools and materials to the limit of their usefulness. An example of what is sometimes



POLE DOING HEAVY DUTY

accomplished along this line is afforded by the accompanying illustration. Here is shown a 25-ft. pole which is not only doing triple duty as a telephone-cable pole, a lighting-circuit pole and a trolley-wire support, but is doing it in an unusual manner. For the messenger wire supporting the telephone cable has been



LIGHTING OF MUNICIPAL SWIMMING POOL, ST. LOUIS, MO.

called upon to play an important part in the trolley-bracket construction. Where a less thrifty man might have used an iron trolley bracket, the crafty line foreman has utilized the wooden insulation about the telephone cable which would have been necessary in any event, on account of the proximity of the trolley wire.

### The Illumination of Small Show Windows

By H. B. WHEELER AND J. A. HOEVELER

Although the owners of large stores have paid much attention to proper and economic illumination of their show windows, and this fact has resulted in the development of highly efficient window-lighting equipment for large windows, the small store owner has been more or less content to illuminate his windows in a haphazard, and in many cases most inefficient, manner. There is no adequate reason why the small store owner should not obtain the maximum of results from his window

order that the lamps may be as nearly concealed as possible, they should be placed at the ceiling. A very common type of equipment which is used in windows of this character is a symmetrical reflector of the concentrating type. A one-piece silvered-mirror reflector having these characteristics is shown in Fig. 1. It gives the light distribution shown when used with the 60-watt lamp.

The angle intercepted by the line of trim in the plane perpendicular to the glass front is approximately 46 deg., whereas the reflector distributes the light flux over an angle of 110 deg. Thus, quite a large percentage of the light flux is lost through the glass front and may be considered wasted in so far as the lighting of the window is concerned. A slightly greater percentage might be confined to the window by tilting the reflector at a slight angle, but this would expose the lamps to view from within the store, which, of course, is objectionable.

By employing a reflector with a specularly reflecting

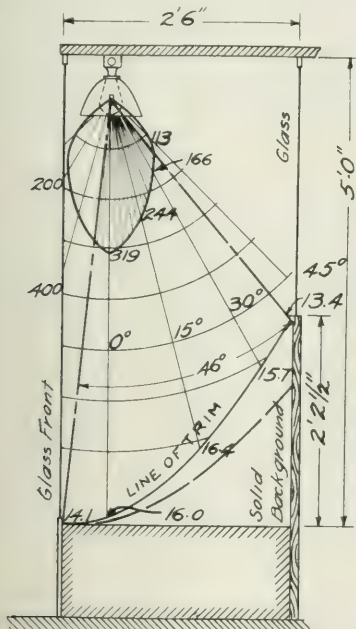


FIG. 1—SYMMETRICAL SILVERED MIRROR REFLECTOR INSTALLED IN A TYPICAL SMALL SHOW WINDOW

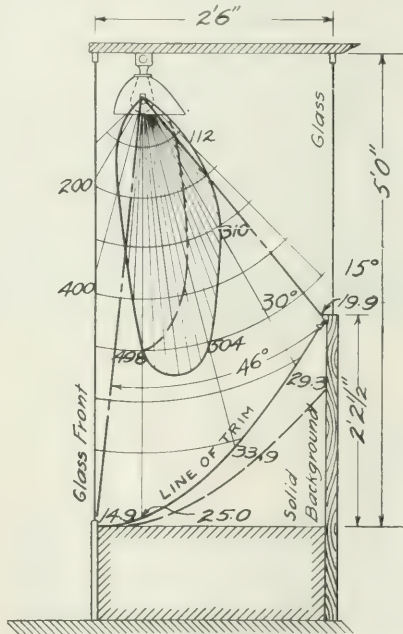


FIG. 2—NON-SYMMETRICAL SILVERED MIRROR REFLECTOR INSTALLED IN A TYPICAL SMALL SHOW WINDOW

lighting. In fact, he should be more keen to eliminate all possible waste than his big competitor, who may depend for business to a large extent on his very "bigness."

A type of window that is typical of the small jewelry store, cigar store and shoe store is shown in cross-section in Fig. 1. The average dimensions of these windows are as indicated. The line of trim in the case of the shoe store is approximately as shown by the heavy black line, whereas for jewelry stores and cigar stores it is usually somewhat lower and more flat, as indicated by the heavy broken line. The solid background usually extends up slightly less than half way from the floor to the ceiling.

In order that sufficient light may be directed to the front faces of the vertical objects, the lighting units must be placed near the front of the window, and in

surface, which permits the greatest degree of light control and concentration, similar to the silvered-mirror surface of the reflector of Fig. 1, and designing it with a non-symmetrical contour like that shown in Fig. 2, a large percentage of the wasted light flux may be confined within the window. This reflector (Fig. 2) is designed for use with the 60-watt tungsten lamp. The light distribution in the plane perpendicular to the glass front is asymmetrical, as indicated by the heavy black curve, whereas in the plane parallel to the glass front it is symmetrical, as indicated by the heavy broken-line half-curve. The light flux is nearly confined within the 46-deg. angle, giving the high candle-power values indicated. The normal illumination values in foot-candles as calculated for the various points along the line of trim are shown in Figs. 1 and 2 for a single unit. A comparison of these values will indicate the effective man-



ner in which the reflector of Fig. 2 concentrates the light flux along the line of trim.

The percentage of the total light flux of the lamp concentrated on the surface along the line of trim in the case of the symmetrical reflector of Fig. 1 has been found to be 29.7. It is estimated that the non-symmetrical reflector of Fig. 2 will deliver approximately 40 per cent on this surface, which in round numbers means that this reflector will deliver one-third more light flux onto the trim for the same power consumption.

### Large Motion Sign in New York

Erected over a building on Broadway near Forty-ninth Street, New York, is a large electric sign containing 1750 10-watt lamps which is kept lighted until 2



FIG. 1—BROADWAY'S LATEST-RUNNING SIGN

a. m., probably later than any other sign in that city. The operation of the sign is as follows: The circle around the letter "P" lights, whirling as it does so, and is followed by the illumination of each of the remaining circles, which rotate in succession, giving the

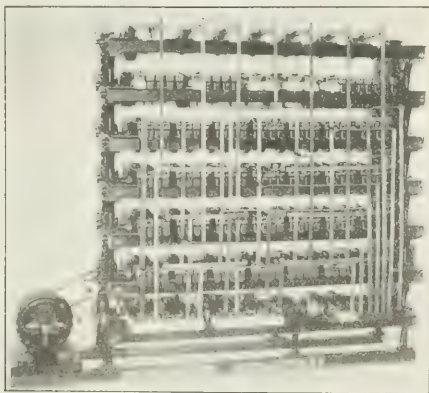


FIG. 2—LARGE FLASHER MECHANISM EMPLOYED WITH MOTION SIGN

appearance of a hoop rolling from left to right across the sign. All lamps are then extinguished and the hoop appears to roll backward. Following this effect each circle is illuminated one after the other until all

are on, when they are again extinguished. All hoops then flash on together and are extinguished.

The next effect is to light each circle with its inclosed letter, the circle meanwhile rotating. The border legend then lights up, one word at a time, until all are on, after which the border decoration lights up for a short time. The building up of these effects requires eleven seconds. The entire sign is lighted in forty-three seconds and is dark six seconds, one minute being required for a complete cycle.

The sign is 48 ft. high, 72 ft. wide, weighs approximately 11 tons and contains 4500 ft. of open-wire construction. The letters of the main text are inclosed in a black border to contrast against the open sky on a bright day. The letter "P" is 15 ft. high and the inclosing circle 20 ft. in height. The other letters grade off in size to 7 ft. high.

The flasher, in order to furnish the effect of a hoop rolling from the left to the right and back again, is unusually large, being 6 ft. long and about as high. The contactors, of which there are about 159, are arranged in seven tiers one above the other with the spindles connected by gears. The flasher is installed at the middle of the back of the sign in a sheet-metal cabinet so that the wiring is reduced to a minimum. The sign was designed and built by the Federal Sign System (Electric), and the flasher was furnished by Betts & Betts, New York.

### RECENT TELEPHONE PATENTS

#### Telephone Lock

Mr. J. W. Harvey, of Sunset, Tex., has invented a telephone lock. This consists of a link chained to the base of the instrument, a hasp piece, which loops over the hook switch, and a padlock for so securing the hasp and the link that the hook switch lever cannot rise.

#### Switchboard Systems

Usually as soon as a telephone call is established the line signals of both the calling and called lines are out of circuit and the cord signals are substituted. The line signals cannot be operated again until the plugs are removed or the connection is taken down. In a system patented by Mr. E. E. Corvin, of Chicago, either subscriber may control his line signal irrespective of plugs. The relays are so arranged that the subscriber may restore his cut-off relay at will. This restores the line signal.

Mr. W. A. Fricke, of Chicago, has also invented a manual switchboard circuit system. Use is made of a two-wire jack and cord. The talking and signaling battery is fed to the lines through relays acting as retardation coils. No battery is connected to the cord circuits. Mr. Fricke's patent has been assigned to the Monarch Telephone Manufacturing Company.

An automatic system employing jacks and plugs has been invented by Mr. F. S. Coulter, of Livonia, Ind. The jacks are arranged upon a hollow cylinder in horizontal rows. The plugs are mounted within radial arms which are spring-driven by a control shaft. Each pair of plugs is wired to a particular line. When a connection is desired the plugs are stepped opposite to jacks of the desired line, whereupon the plugs of the calling line are forced out from their sockets in the radial arms and into the jacks. This is done by an electromagnet riding upon the arm. The shaft may be moved as required, as the arm in use is locked by the jacks and the spring connection with the shaft is sufficiently flexible so that no harm results. One arm is used for each line, and each arm is presented to the jacks of every other line in one of its angular positions

# Letters to the Editors

## Emergency Radio Apparatus

*To the Editors of the Electrical World:*

SIRS:—I have read with a great deal of interest the articles in your issue of Feb. 7, 1914, entitled "Emergency Service Radio Apparatus" and "Government Radio Supervision," and while I most heartily indorse the sentiments expressed therein, feel that a statement which might lead a layman, or one not acquainted with the development of radio communication, to believe that such conditions exist on all steamships leaving the United States or foreign ports should not remain unchallenged.

From the time that radiotelegraphy demonstrated its usefulness as a communicating medium, especially in the matter of safety of life at sea, it has been—and it is to-day—the United Fruit Company's policy to keep abreast of the times, and to this end each of its vessels has been equipped with the most modern and efficient radio apparatus obtainable either at home or abroad. This company also maintains a separate department the duty of which it is to supervise the installation and operation of this equipment and to see that it meets not only the requirements of the law but the company's rules and regulations, which are even more exacting than those of the government.

The difficulty which Mr. Marriot, the government inspector, experienced with certain installations mentioned in your article could not possibly occur on a United Fruit Company's vessel, for the reason that the 10-in. coil, or "plain aerial" emergency equipment, was discarded in June and July, 1913, and storage batteries were installed on each boat sufficient to operate the regular 2-kw radio equipment as well as to furnish energy for a system of emergency lamps on all decks and passageways and in the vicinity of lifeboats.

The radio apparatus of each ship is installed in such a manner as to permit of its being operated from either the ship's main or the storage batteries, and, in case of an accident to the generator, the radio apparatus can be connected to operate from the storage batteries by merely throwing a switch.

Recent tests of the storage-battery equipments demonstrate that they are not only capable of furnishing energy for twenty-five or thirty emergency lamps on the decks and in the passageways but will also operate the radio apparatus for from twelve to thirteen hours with a minimum range of communication of 250 miles under average atmospheric conditions, and will operate the radio apparatus on full power for a period of seven hours, permitting a range of communication of from 450 to 500 miles in daylight under adverse atmospheric conditions; that is, with a medium amount of static. I might mention here that the average daylight range of communication of the United Fruit Company's ships is 600 miles under average atmospheric conditions, and during the storage-battery tests it was demonstrated that a ship could maintain this range, handling its ordinary business, throughout a voyage of twenty-one days, transmitting on an average 300 words per day.

On the United Fruit Company's 10,000-ton steamships *Pastores*, *Tenadores* and *Calamares* two complete radio equipments have been installed, one a 2-kw set and the other a 1-kw set, both of the latest quenched-spark type and arranged to be operated from either the ship's mains or the storage batteries. The government inspectors at New York—and in fact all radio engineers who have visited these ships—have stated on various occasions that these three had the best radio equipment of all ships afloat, and in these circumstances it

is obvious that our ships should not be included in the category of those mentioned in your article, as it is self-evident that their emergency or auxiliary apparatus "is really worthy of the name," a fact which has been recognized by the Department of Commerce and to which the government radio inspectors have willingly testified.

As a matter of interest I would also call your attention to the fact that the United Fruit Company was the first steamship company to recognize the value of a complete storage-battery equipment in connection with the operation of ship radio apparatus in the matter of safety of life at sea, and was the first to install such equipment as well as to provide for emergency lamps operated by the storage batteries, arranged so that there will be ample light on each deck remaining above water in case of an accident. Neither of these precautions is necessary in order to comply with the letter of the law.

In furtherance of its policy of keeping abreast of the development of radio apparatus, the United Fruit Company some time ago arranged for the installation, on the *Pastores*, for test and demonstration purposes, of the Marconi-Bellini-Tosi radio direction finder, which, it is claimed, will enable a navigating officer of a ship to take bearings of radio ships and stations with the view to finding the position of his ship or avoiding collision with other ships in fog. If this apparatus is satisfactorily demonstrated it will be added to the radio equipment of the United Fruit Company's vessels, and its use will tend to prevent collisions in fog such as that which occurred between the *Nantucket* and the *Monroe*.

New Orleans, La.

GEO. S. DAVIS.

## The "Half-Watt" Lamp in Photography

*To the Editors of the Electrical World:*

SIRS:—In your issue of July 18, 1914, there appears an article entitled "The High-Efficiency Tungsten Lamp in Photography," by Mr. M. Luckiesh, and also an editorial entitled "The 'Half-Watt' Lamp in Photography." In the editorial I notice the following: "In many places it would be very convenient to employ incandescent lamps on account of their extreme steadiness and the ease with which they are used on alternating current, the mercury-vapor lamps requiring special adaptation for this purpose."

Allow me to call your attention to the facts that mercury-vapor lamps are as steady in operation as incandescent lamps and that no adaptation is required when these lamps are run on alternating current. Alternating-current mercury-vapor lamps have been on the market for the past six years and their photographic value is the same as that of the direct-current lamps. Therefore I feel that the statement which has been made in this respect is eminently unfair and would ask that you kindly make correction accordingly.

WILLIAM A. D. EVANS,

*Commercial Engineer, Cooper Hewitt Electric Company,  
Hoboken, N. J.*

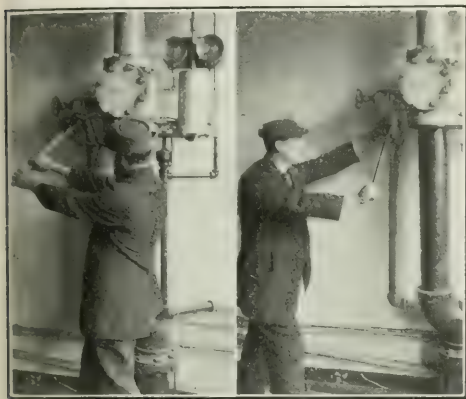
[We certainly have no intention of reflecting on the usefulness of the mercury-vapor lamp. It is, however, true that the ordinary incandescent lamp not only is extremely steady—probably the steadiest of all artificial illuminants—but that it is absolutely interchangeable on direct and alternating currents. As our correspondent indicates, the mercury-vapor tube is not interchangeable, although a special form of it has been, we are glad to emphasize, very successfully adapted to use with alternating current.—EDS.]





### The Right Way to Hold a Pipe Wrench

One who has more confidence in his pushing than his pulling power may regret his failure to develop the latter if he has much occasion to use a pipe wrench and has skinned his knuckles when the wrench slipped or the pipe suddenly responded to the force tending to turn it. The accompanying illustrations show the



FIGS. 1 AND 2—THE SAFE AND UNSAFE WAY TO USE A PIPE WRENCH

right and the wrong way of using such a wrench. The man loosening a pipe in the manner shown in Fig. 2 would be likely to bruise his hand severely if the wrench slipped. But with the wrench held as shown in Fig. 1 there is no danger of injuring the knuckles even if the wrench should fail to hold. These illustrations are among the series which have been used by the Rochester (N. Y.) Railway & Light Company to educate its employees in avoiding accidents.

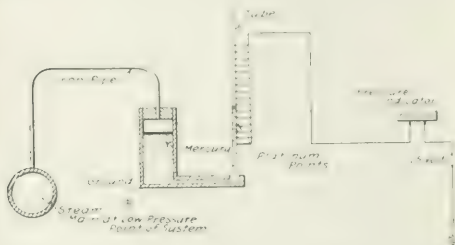
### Recording Pressure Gage for Steam-Heating System

Desiring a closer check upon the steam-heating system in his city, Mr. Thomas F. English, manager of the Muncie (Ind.) Electric Light Company, recently endeavored to purchase a meter which would indicate in the station the pressure which was being maintained in the steam pipe at some distant point known to be the point of lowest pressure on the system. At that time there was no such device on the market, and the instrument shown in the accompanying illustration was designed by Mr. English to meet this particular condition.

Referring to the illustration, a  $\frac{1}{8}$ -in. iron pipe from the steam main admits steam to the larger cylinder of a mercury cup, and as the mercury rises and falls in the tube attached to the mercury cup it makes contact with the platinum points at the terminals of the adjacent resistance. A variation of 1 lb. in the pressure in the steam main moves the smaller mercury column 2 in. A single-wire circuit with ground return leads from the resistor to a 125-volt source of energy and to an indicating voltmeter in the station. The scale of the voltmeter in the station is calibrated to read directly in pounds and ounces of steam pressure, so that as the mercury column moves along the platinum points varying the amount of resistance in the circuit, the scale of the voltmeter tells the station operator what the steam pressure is at the point of low pressure, 1500 ft. from the station.

With this system there need be no time when the engines are delivering excess steam to the heating system, and by the proper manipulation of the load the Muncie company estimates that it can effect a saving of 20 lb. of steam per hour for every kilowatt of load that it is possible to transfer from the engine unit to the turbine.

A further advantage of the instrument is found in the fact that when complaints of low pressure are received the trouble-man can rest assured that he will find the fault on the customer's premises and save himself con-



STEAM-PRESSURE INDICATOR FOR HEATING SYSTEM

siderable time by making the building of the complainant his first objective. The greatest saving is effected, of course, on moderate days when the turbines can advantageously take over the greatest part of the load from the heating engines.

### Causes of Honeycomb on Flue Sheets

What is the cause of the honeycomb structure sometimes formed on flue sheets? Can this formation be avoided by the proper selection of fuel? A. J. W.

The formation of honeycomb is doubtless contributed to by the presence of excess ash material and sulphur in the fuel. In this connection it is interesting to note that the fine material produced in the ordinary process of mining has a higher percentage of both ash and pyrites (iron sulphide) than is present in lump coal taken from the same mine. In a series of tests conducted by Prof. S. W. Parr of the University of Illinois on samples of coal from seventy-five mines in that State, each mine being represented by one sample of screened lump coal and one of screenings, the results showed an almost uniform ash percentage in the screenings, at least double that of the ash in the lump coal. In run-of-mine coal the product is somewhat deceiving, having the appearance in the mass of being very largely lump material. Of course, it is possible for occasional car loads of run-of-mine coal to be fully equal to the best screened lump from the same mine, but the fine material must sooner or later come along somewhere in the output. After the blast and the breaking down of the coal at the working face the miners enter and clean up the rooms by sending out first the coarse or lump material. At the clean-up, which is made before the new drill holes are started, that part of the underlying floor which has been more or less pulverized and loosened in the various processes is shoveled up and sent out along with the coal. In this way it is evident that the fine material will be much higher in ash and will moreover contain mineral constituents which usually are in themselves higher in sulphur. Therefore, in run-of-mine material there will often occur exactly those physical conditions of fineness of division and high content of iron pyrites which are productive of pasty particles that can be made to grow by small accretions, finally forming a honeycomb structure on the flue sheets.



# Digest of Current Electrical Literature

## Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

### Generators, Motors and Transformers

**Cascade Induction Motor.**—L. J. HUNT.—A paper read before the Manchester Section of the (British) Institution of Electrical Engineers. The author describes step by step the development of the cascade motor and also deals with two-speed and three-speed motors.—*London Electrician*, July 17, 1914.

**Transformer Construction.**—A note on a recent British patent (No. 11,539, 1913) of R. Arno. The specification describes a method of obviating the possibility of leakage through the iron cores from the high-tension windings to the low-tension windings. The respective windings are made upon separate cores which are insulated from one another by thin sheets of mica or other material. To compensate for the increased reluctance, the section of the cores is considerably enlarged at the joints. As an additional safeguard the cores on the low-tension side may be grounded.—*London Elec. Eng'ng*, July 16, 1914.

### Lamps and Lighting

**Electrolytically Produced Luminosity.**—L. H. WALTER.—A brief note on a recent Royal Society paper entitled "Application of Electrolytically Produced Luminosity, Forming a Step Toward a Form of Telectroscopy." The author has investigated the conditions under which it should be possible to make practical use of the luminosity of anodes of alloyed aluminum forming parts of a "valve" cell arrangement. The alloy known as "duralumin" is found to give the best results, and, with sodium tungstate solution as electrolyte, corrosion is practically eliminated when this alloy is used as the anode. The difficulties with immersed anodes led the author to employ anodes which are completely dry, except for the front surface, which is kept wet by a layer of electrolyte flowing down it in a continuous stream, the flow being distributed by a transparent crape screen which clings to the anode surface. The anode being, in this way, dry at the back, electrical connection can be directly established there, without the great care as to insulation otherwise needed. This arrangement permits of the construction of an apparatus having a multiple anode comprising a vast number of equal units in quite a small compass, each such unit being capable of being rendered luminous in any order or sequence desired and at a speed of some hundreds of times per second. In the author's experimental apparatus there are over 5000 such separate units in a space the size of a cabinet photograph—a number which it would hardly be possible to obtain by other means. Such an apparatus is capable of being employed as a receiver for photo-telegraphy for the reproduction of pictures, etc., especially where these are received as electrical impulses. It constitutes a step toward one form of telectroscopy, the luminous reproduction at some receiver of an object visible at some distant, electrically operated transmitter.—*London Electrician*, July 10, 1914.

**Mercury-Vapor Lamp.**—F. A. EBERT.—An illustrated article on mercury-vapor lamps especially designed for photographic purposes, for making blue-prints, etc.—*Zeit. f. Beleucht.*, June 10, 1914.

### Generation, Transmission and Distribution

**Differential Equations of Long-Distance Transmission.**—GEORGE R. DEAN.—The first part of a mathematical paper in which the following problems are considered: (1) General equations and solutions for a single-phase line under steady conditions; (2) solution for line of infinite length with generator of given impedance, the frequency for such voltage being a simple advancing wave; (3) solution for line of finite length, open at receiver end; (4) solution for line of finite length short-circuited at receiver end; (5) solution for line of finite length, with known impedance at receiver end. In the present instalment the first two problems are dealt with.—*London Electrician*, July 17, 1914.

### Traction

**Rail Feeders for Electric Railways.**—HENRY M. SAYERS.—An illustrated article in which the author considers the use of rail feeders for electric railways, resistance being used to obtain equal drop, as compared with the use of boosters. Calculations are given for two cases using the resistance method, and it is shown that in some cases the latter may give a slightly lower cost than the boosters. The method is, therefore, worth considering, but has certain disadvantages.—*London Electrician*, July 17, 1914.

**Albtal Single-Phase Railroad.**—NOELDECKE.—An abstract of a paper on electric traction on the Albtal railroad near Karlsruhe. The single-phase system is used, the pressure being 8800 volts and twenty-five cycles, while in the city of Karlsruhe single-phase energy at 700 volts is employed. Considerable trouble was experienced on account of the induction effects produced on telephone lines in the neighborhood.—*Elek. Zeit.*, July 9, 1914.

### Installations, Systems and Appliances

**Rate Schedules of Different Countries.**—G. SIEGEL.—The first part of an article in which the author points out that the rates in use in different countries depend on the local commercial, climatic and geographic conditions of the country and that the nature of the rate also indicates the extent and the importance of electricity supply in the country. From these viewpoints the author discusses rates in use in various European countries. In Germany a great variety of rates are in force; the majority of these allow discounts according to the amount of energy sold. Of 250 stations, 118 stations use such a discount system in selling lighting service, and 122 use it for motor service. Discounts, depending on the number of hours of use of electricity, are allowed by forty stations for lighting and forty-three stations for motor service. Double-rate schedules are in use in sixty-three stations for motors and in forty-four stations for lighting. Separate flat rates for lighting and for motor service without further discounts are charged by forty stations, most of them in very small towns. The average price for lighting was 17.5 cents per kw-hr. up to 1896, the unit of that time being the hecto-watt-hour, instead of the kilowatt-hour. From that time until 1902 or 1903 the average price for lighting was reduced to 15 cents per kw-hr., and it has

since decreased with few exceptions to 12.5 cents or less. The prices for motor service have varied to a smaller extent. The rate of 6.5 cents per kw-hr. which was introduced in the beginning is still employed in some cases, although most stations have now a fundamental rate of 5 cents. Stations with still lower base rates are in the minority. In Austria 64 per cent of the number of all stations, with an aggregate rating of 50 per cent of the rating of all stations, use totally or partly water-power. This suggests the reason why flat rates are common in Austria. Out of 736 stations, 240 use a flat rate, 142 a combined meter and flat rate, 179 a meter rate without discount, 167 a meter rate with discount, and eight a double rate for lighting. The prices for lighting vary from 4 cents to 21 cents, the average being 15 cents per kw-hr. The prices for motor service vary from 2 cents to 15 cents, the average being 6.75 cents per kw-hr. Switzerland has a greater variety of rates than any other country. Not only are different types of meter rates employed but flat rates are also applied in great numbers and with numerous modifications. Out of 233 stations, fifty-six use flat rates, fifty-nine meter rates and 118 both flat rates and meter rates. In the case of flat rates for lighting, different schedules are charged according to the probable hours of use and also according to the nature of the rooms to be lighted. In the use of a flat rate for motor service the rate depends on the kilowatts connected and the probable hours of demand. With respect to the latter point a distinction is usually made between the following three classes: First, motors for factories, in which the working hours are restricted by law to eleven hours per day; second, motors for use during the day only; third, motors which can be used continuously. Discounts are often allowed, depending on the size of the motor. For instance, according to one rate commonly used, the price per kw-hr. is 2.5 cents for motors from 1 hp to 3 hp, 2.4 cents from 3 hp to 10 hp, 2.3 cents from 10 hp to 20 hp, 2.1 cents from 20 hp to 30 hp, and finally 1.5 cents from 100 hp to 200 hp. A distinction is also made in the prices of service taken in the summer and in the winter. In France the prices for electrical energy are relatively high, and for this reason electricity supply has not yet reached the same commercial importance as in other countries. Of 2020 towns, seventy-three towns pay more than 20 cents per kw-hr. for lighting, 351 towns pay 20 cents, 617 towns pay 16 cents to 20 cents, 873 towns pay 12 cents to 16 cents, and only 106 pay less than 12 cents per kw-hr. The article is to be completed.—*Elek. Zeit.*, July 16, 1914.

#### Electrophysics and Magnetism

*Production of Very Soft Roentgen Radiation by the Impact of Positive and Slow Cathode Rays.*—J. J. THOMSON.—An abstract of a British Physical Society paper. Roentgen and his pupils had always held that light waves were identical in nature with electrical waves produced by mechanical means, but there existed a gap (on which very little work had been done) between the longest infra-red radiation and the shortest electrical wave that could be mechanically produced. Roentgen believed the investigation of this gap to be essential to the proper study of the constitution of the atom. The work already done on X-rays had demonstrated the existence of two separate rings of electrons in the atom, one within the other. These rings were responsible for the K and L types of radiation respectively. The L radiation was so much softer than the K type that if a third ring of electrons existed the radiation from which was proportionately softer than that of the L type, this radiation would fall well within the gap already mentioned. In the first experiment described a special form of discharge tube was employed.

The positive rays passed through a tubular perforation in the cathode and impinged obliquely on a metal target. A photographic plate of the Schumann type was situated at the further end of a branch tube in such a position that no solid obstacle interposed between the target and the plate. When the discharge passed between the electrodes the photographic plate was affected. The application of an intense transverse electrostatic field between two metal plates situated between the cathode and the target completely stopped the effect, showing that the latter was not due to stray radiation reflected from the target, since, while charged particles would be swept to one side, radiation would not be affected by the field. Hence the passage of positive particles from the cathode to the target was essential. On the other hand, a strong transverse electrostatic field in the branch tube had no effect, showing that radiation was passing between the target and the plate, which was not, therefore, merely affected by positive particles rebounding down the side tube after impact on the target. The properties of this radiation were intermediate between ordinary X-rays and Schumann waves. They were susceptible to reflection by metal surfaces, and their penetrating power was very small. They were completely stopped by the finest collodion film obtainable. It was shown that the quality of the radiation did not depend on the energy of the moving particles which gave rise to it, but on the velocity. Hence equally soft rays should be produced by cathode particles if these were traveling as slowly as the positive rays. A discharge tube was constructed in which the cathode rays, leaving the cathode with the ordinary velocity, could be subjected to a retarding electrostatic field of variable strength before impinging on the target. In this way the velocity of impact could be varied over a large range, and radiations were obtained varying in quality from ordinary X-rays to the so-called Schumann waves. It was hoped by the study of these radiations to be able to determine not only the number of rings of electrons within the atom but the number of electrons in each ring.—*London Electrician*, July 17, 1914.

#### Units, Measurements and Instruments

*Measuring Time Constants of Low Resistance.*—F. WENNER, E. WEIBEL AND F. B. SILSBEE.—An abstract of an American Physical Society paper describing two new methods for measuring the time constants of low resistances and giving the results of tests made with these methods. All values heretofore obtained for the

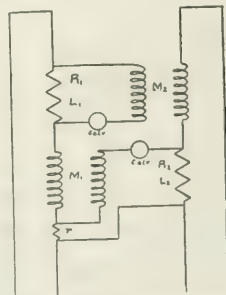


DIAGRAM OF CONNECTIONS

residual inductance of "non-inductive" standards of low resistance have been based upon the calculated inductance of some conductor. This calculation of the inductance from dimensions involves serious assumptions as to current distribution, inductive effects in potential leads, etc. The first method described by the authors



gives primarily the sum of the time constants of the two resistances used. By using three resistances three sums can be measured from which each time constant can be obtained, without calculation of the inductance of a resistance standard. In applying this method the resistances are each connected in series with a mutual inductance, as indicated in the cut, and are excited by alternating currents substantially in quadrature. The constants of the circuits are then adjusted so that no current flows in either galvanometer. It can easily be shown that the following relations then hold:

$$RR' = \mu M M' \quad (1)$$

and

$$\frac{\mu L}{R} = \frac{\mu L'}{R'} = \frac{\mu M}{R R'} \quad \text{or} \quad \frac{f}{\mu M} \quad \text{very closely,} \quad (2)$$

where  $p = 2\pi \times$  frequency. The first of these equations can be used in the absolute measurement of resistance and the second gives a measure of the sum of the phase angles of the two resistances. This method requires (1) that the mutual inductance be pure, i.e., give emfs in exact quadrature with the primary current, (2) that the frequency be held very constant during the measurement, and (3) that the current be sinusoidal or that the detectors be sufficiently selective to the fundamental frequency. The second method makes use of a standard whose resistance can be changed without changing its inductance. This can be done, for example, by using a copper standard whose temperature can be varied. Then, if the observed decrease in phase angle be  $d$  and the corresponding proportional increase in resistance be  $a$ , we have

$$\frac{\mu L}{R} = \frac{1+a}{a} d.$$

This method requires merely an accurate measurement of the change in the phase angle.—*Phys. Review*, July, 1914.

#### Telegraphy, Telephony and Signals

**Loading Duplex Telephone Lines.**—A note on a recent British patent (No. 8185, 1914) of H. B. M. Pleijel and A. H. Olsson. The present practice of loading overhead lines is to employ double coils for each pair of lines. The stray fields produced are undesirable, as they give rise to eddy-current losses in the metal casings, with consequent damping. When these lines are duplexed special duplex loading coils are necessary. The above specification describes a method of loading whereby no extra duplex loading coils are required. The double coils for each pair of lines are inclosed in a case made of non-conducting, non-hygroscopic material, such as glass, and the coils are made of a size sufficient to produce a considerable stray field. This stray field is utilized to produce the necessary self-induction for the loading of the duplex line, so that extra loading coils are unnecessary. Owing to the coils being inclosed in non-conducting cases, the eddy-current losses due to the stray fields are extremely small. Lightning arresters are fixed in each case.—*London Elec. Eng'ing*, July 16, 1914.

#### Miscellaneous

**Electrical Accidents.**—An abstract of the annual report of G. Scott Ram, the electrical inspector of factories in Great Britain. The electrical accidents are remarkably few in view of the large number of electrical stations now in operation. Although the number of accidents is greater than in the previous year, it is no larger than it was five years ago. In electric generating stations and substations there were 439 non-electric and ninety-four electric accidents. Of the latter forty-six occurred while men were cleaning or making repairs about live switchboards or other live conductors. Two of these accidents were fatal. A second table gives

the electric accidents in 1913 in places other than electrical stations, the number being 418, of which seven were fatal. A third table gives the fatalities due to electricity reported under the factory and workshop acts in 1913. No less than twelve of those fatalities were due to shock from alternating current at potentials probably not exceeding low pressure (440 volts or less).—*London Electrician*, July 17, 1914.

## Book Reviews

**THE YEAR BOOK OF WIRELESS TELEGRAPHY AND TELEPHONY.** 1914. New York: Marconi Publishing Corporation. 742 pages and map. Illus. Price, \$1.

A large amount of useful information is included in this volume, among which may be mentioned a chronological record of the development of wireless telegraphy from 1831 to the end of 1913, a full report of the international convention on safety of life at sea held in January, the laws and regulations regarding wireless telegraphy of the principal countries of the world, a list of all the land and ship stations of the world, and some valuable articles. A summary of the wireless telegraphy patents issued during 1913 and many other useful data are also given. The compilation has been well done.

**MUNICIPAL OWNERSHIP OF STREET RAILWAYS IN THE DISTRICT OF COLUMBIA.** New York City: The Bureau of Public Service Economics. 72 pages. Price, 50 cents.

This is an abstract of the testimony presented at hearings before the committee on the District of Columbia of the House of Representatives from May 13 to June 6, 1914, on the bill providing for public ownership of the electric railways in the District. Mr. William D. Kerr, director of the bureau, says in the preface to the booklet that the number of those who are interested in the subject is large enough and Congressional consideration of municipal ownership is important enough amply to justify an abstract which renders available a comprehensive summary of the entire record. The abstract is the essence of a published volume of 543 pages which contained the original testimony. It presents the municipal ownership issue as it stands now and will be of present and reference value to those who are interested in this question.

**THE PRACTICAL TELEPHONE HANDBOOK AND GUIDE TO THE TELEPHONE EXCHANGE.** By J. Poole. New York: Whittaker & Company. 624 pages, 535 illus. Price, \$1.50.

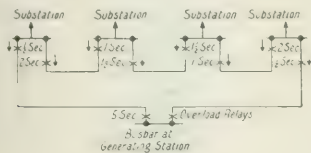
This is the fifth edition of this comprehensive handbook, which has long been recognized in many quarters as a standard. With the present enlargements fuller treatment is given to automatic and wireless telephony, the theory of artificial lines, recent exchange layouts, coin call boxes, the much-discussed "wired-wireless" telephone, etc. The thirty-five chapters cover nearly all phases of telephony, though there is no pretense that in the single volume the entire subject could be treated exhaustively. British practice is followed closely, and it is noteworthy that in many of the most important branches this is directly in line with American methods. The book opens with an introductory discussion of electrical principles, laws and elementary apparatus, whence the reader derives a bit of telephone history, being then led successively into descriptions of receivers, transmitters, substation apparatus, switchboard and signaling instruments, exchange layouts for both local and common-battery working, traffic and line studies, cables, and faults and measurements.

# New Apparatus and Appliances

## An Illustrated Descriptive Record of Recently Developed Manufactured Products of Interest to Electrical Readers

### Reverse-Power Relays for Ring-Type Systems

Reverse-power relays made by the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., are provided with definite-time-element characteristics by means of torque compensators, so that they can be used for protecting certain ring-connected distributing systems where differential relays with expensive pilot-wire connections would otherwise be required. The diagram



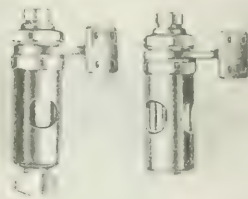
RING-TYPE SYSTEM

shows a typical system of this kind. The relays can trip only when the overload is in the direction shown by the arrows. Each relay is set for the definite minimum time indicated. If a ground occurs on either feeder or connecting line energy flows to that point from both ends. The relays nearest the fault on each side will trip first, thereby cutting out the defective line but not interrupting the supply of energy to the substations. In case of a heavy short-circuit near the substation the voltage may drop very low, but these relays, it is declared, are so sensitive that they will operate correctly even if the voltage drops to 2 per cent of normal.

### Automobile Lighting System.

A 12-volt lighting system for automobiles is being made by the Bosch Magneto Company, 223 West Forty-sixth Street, New York. The generator is a shunt-wound machine of waterproof construction regulated

externally. The reflectors of the head-lamps are designed so that abundant light, free from patches or blinding back-glare, is projected at a very wide angle.



FIGS. 3 AND 4 TAIL-LAMP AND DASHBOARD LAMP

enabling the driver to see both sides of the road and at the same time to have a clear view ahead for a considerable distance. The side-lamps are similar in design to the head-lamps except that the reflector is mounted on a frame which is not equipped with a door. Units of 25 cp are used in the head-lamps and 8-cp lamps in the side-lamps.

The tail and dashboard lamps manufactured for use with this system of automobile lighting are of tubular form, as shown in Figs. 3 and 4.

### Portable Electric Drill

The convenient electric drill illustrated herewith is made by the Independent Pneumatic Tool Company, of Chicago. It is equipped with a universal motor, and ball or roller bearings are used. The pinion on the armature shaft is removable and can be easily replaced when worn. Likewise the internal gear into which the

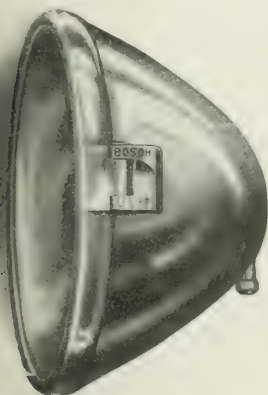


FIG. 1—HEAD-LAMP

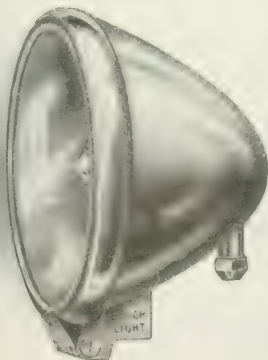
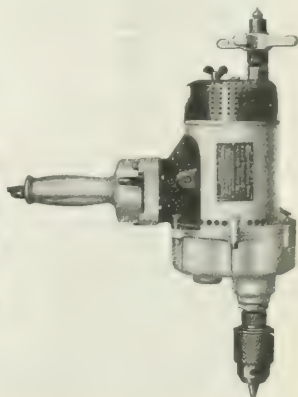


FIG. 2—SIDE-LAMP



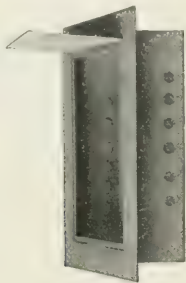
PORTABLE ELECTRIC DRILL



pinion meshes is replaceable. The gears are comparatively large in diameter, minimizing friction. The motor-brush cover may be removed easily, and the commutator can be cleaned, if proper care is exercised, while the drill is running. Ample provision is made for ventilation; the fan is keyed on the motor armature shaft. The manufacturer declares that this Thor drill is the most powerful machine for its weight of all on the market at the present time.

### Cutout Box

A flush-type cabinet for cutouts is being made by the Greater New York Metal Box Company, 60 Grand Street, New York. The trims of the cabinet are fitted



FLUSH-TYPE CUTOUT BOX

with an angle-iron frame, one leg of which acts as a rabbet around the door and the other extends inside the box, forming a frame around the edges of the box. The trim is fastened to the angle iron. The door is attached to the box by special hinges which are not riveted.

### Washing Machine with Swinging Wringer

A washer equipped with a pivoted wringer, which can be operated in three different positions, is shown in the accompanying illustration. The tub is corrugated and is made of cypress. A handle can be used in case the motor fails. The wringer is a two-roll reversible device in easy reach of the operator. By means of the swinging feature the wringer can be used with the washer, the rinse tub or the basket. The wringer may be used while the washer is in operation. This washing



WASHER WITH PIVOTED WRINGER

machine is being placed on the market by the Getz Power Company, Morton, Ill.

### Overload Series-Gap Lightning Arresters Utilized by Adding Resistance

By connecting carbon resistors in series with its formerly overloaded series-gap lightning arresters, the Wilmington & Philadelphia Traction Company, Wilmington, Del., has been able to utilize its old arrester equipment without subjecting the arresters to the danger of being destroyed by the flow of generator energy following a lightning discharge across the gap. The resistors used consist of 120-ohm carbon rods inclosed in weatherproof tubes of micarta or bakelite of large enough internal diameter to accommodate a filler

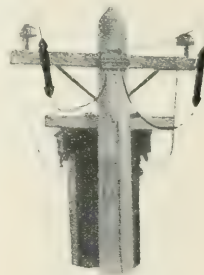


FIG. 1—GAP ARRESTER AND RESISTORS FOR TRANSFORMER INSTALLATION

of insulating compound. No. 8 rubber-insulated, flexible wires, passing through impregnated locust-wood caps inserted in each end of the tube, are attached to the ends of the carbon rod. The wooden caps contain counter-sunk holes for the wires and are fastened to the inclosing tube in a thoroughly secure manner by means of fiber pins.

One thousand of these resistor units are now being used by the company with entire satisfaction. As the cost is very low, it has been found practicable to place a series-gap lightning arrester so equipped at each transformer.

The accompanying illustrations (Figs. 1 and 2) show installations of these units which were furnished by the Railway & Industrial Engineering Company, Greensburg, Pa.

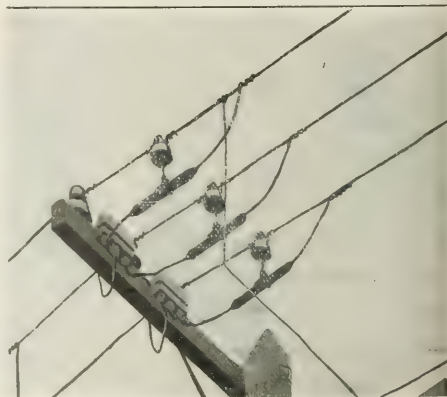


FIG. 2—POLE-TOP CARBON LIGHTNING-ARRESTER RESISTOR

### Semi-Fluid Lubricant

"Lesoyl," a semi-fluid lubricant containing suspended graphite particles, is being produced by the Lumen Bearing Company, Buffalo, N. Y. This product, which can be readily mixed with light or heavy oils or grease, performs two functions: (1) It distributes an excellent lubricant, graphite, over all parts of the bearing surface, and (2) it maintains an unbroken oil film thereon. According to tests made at the laboratories of Cornell University, lubricating oil containing 0.25 per cent of lesoyl permitted bearings to withstand an increased pressure of 50 lb. per sq. in. By mixing this product with oil it is declared that a thicker oil film can be maintained on bearings, scoring can be prevented if lubrication is interrupted, and oil consumption can be reduced more than 50 per cent. Lesoyl is made by mixing graphite with a fluid which has a strong capillary affinity for it and grinding the mass sufficiently to prevent the particles settling when mixed with oil.

### Wire-Stripping Pliers

Electricians' pliers designed to strip wire of cloth or silk-braided insulation are being manufactured by the Smith & Hemenway Company, 150-152 Chambers Street, New York City. The tool is modeled along the lines of



WIRE-STRIPPING PLIERS

the ordinary diagonal pliers, and the stripping device has been placed in the cutting edges so as not to interfere with wire cutting. Insulated wires as small as No. 22 B. & S. gage can be stripped with the new tool.

### Alternating-Current Indicating Instruments

Alternating-current voltmeters, ammeters and wattmeters which are declared to indicate accurately within 1 per cent, regardless of wave-form, frequency or temperature, are being manufactured by the Kernel Apparatus Company, Cambridge, Mass. The operation of the voltmeters and ammeters depends on the repulsion



HIGH-TORQUE ALTERNATING-CURRENT INSTRUMENTS

between magnetized pieces of steel, one stationary and the other movable. The wattmeters, which operate on the electro-dynamometer principle, are unique in that the magnetic circuit is part iron and part air. The moving elements in the potential and current-indicating instruments weigh only 1.5 grams and those in the wattmeters 4.3 grams. The ratio of torque to weight is very large in these instruments, 0.2 cm-gram being the torque in the ammeters and voltmeters for full-scale deflection.

For potentials up to and including 300 volts the voltmeters and wattmeters are self-contained, but for higher potentials an external resistance must be employed. The instruments are capable of withstanding temporary overloads of four times the full-scale value. About 1 watt is required to operate the ammeters of all sizes, while the series coils of the wattmeters require about 1.2 watts at full-scale reading. Voltmeters up to 150 volts have a resistance of 20 ohms per volt and higher-reading instruments 27 ohms per volt. Special voltmeters can be furnished, however, having a resistance of 50 ohms per volt. The damping vane in each of these instruments consists of a rectangular aluminum strip attached along its longer edge to the shaft and permitted to swing in an inclosed brass air chamber. The studs employed to hold these instruments to the switchboards are also used to carry the current to the series and potential coils.

### Operation Indicator for Manager's Office

An accurate and continuous record of the operations of any machine can be obtained and registered at any desired place with the electric "productograph" which is being manufactured by Slocum, Avram & Slocum, Inc., 30 Church Street, New York. The device may be placed in a private office where it cannot be tampered with, and records taken by it can be filed directly, thereby saving the clerical labor of copying reports. The apparatus consists of magnet-operated, needle-tipped pointers which draw lines on sensitized record sheets fastened to a cylindrical rotating drum. The drum is made to revolve by clockwork, the sheets being divided into hourly and five-minute divisions. Every tenth line or multiple thereof made by a needle is drawn longer than the rest to facilitate computations from the chart. Counters which record the number of lines drawn



MECHANISM RECORDING TEN SEPARATE OPERATIONS



are operated by the magnets simultaneously with the pointers.

The recording device is made in several sizes, depending on the number of operations which have to be registered. Portable sizes are made for use in mines and on construction jobs. As an adjunct to "safety-first" apparatus the productograph shows the exact time and sequence of related operations. Machines the operations of which are to be recorded are equipped with inclosed switches which actuate the needle pointers and counters. A 16-volt storage battery may be employed to operate the mechanism, but the manufacturers recommend using a small motor-generator set. The cost of energy for operating this apparatus is about 0.5 cent per day per needle at ordinary electric-service rates.

### Heat-Resisting Material with Low Thermal Conductivity

Zenitherm, a new heat-resisting and thermal insulating material for fireproofing buildings and insulating any hot or cold surface, which is marketed by the

TABLE I—WEIGHT AND HEAT CONDUCTIVITY OF ZENITHERM COMPARED WITH OTHER SUBSTANCES

Material	Weight Pounds per Cubic Foot	Thermal Heat Con- ductivity	Material	Density in Pounds per Cubic Foot	Thermal Heat Con- ductivity
Sp. C.	490	4.80	Cement mortar	117.5	4.71
Concrete	150-170	25-28	Brick	110	3.63
Asbestos	52	17	Board, normal	127	3.43
Sandstone	110-150	7-11	Board, dry	115	2.38
Slab	150-190	5-7.5	Sand, fine	100	2.15
Insulation	185	15-18.9	Oil	44-54	1.7
Ins. S. C.	150	9	Sl. C. concrete	34.2	1.3
Insulation	115	4-16	Asbestos	36	1.27
Marble	160-180	3.5-9	Asbestos	29	1.06
Asbestos	136	5-24	Ins.	28	1.12
Terra cotta	130	4-84	Shut wood	22.4	0.95
Terra cotta	114	3-63	Mineral wool	12.5	0.81
Water	62.4	4	Air space, 1 in. hor.	0.075	0.80
Plaster	105	3-6.5	Zenitherm	30	0.56
Plaster	88.5	2-42	Zenitherm	10	0.32

Zenitherm Company, Newark, N. J., consists chiefly of finely ground and screened cork treated with various chemicals and held together by a binder. Since no glue, oil or vegetable matter is used, no decay is possible, and the material is not attacked by vermin.

TABLE II—RESULTS OF FIRE AND HEAT TESTS OF ZENITHERM

Time in Minutes	TEMPERATURE OF SPECIMEN, DEG. FAHR.		Actual Temperature Rise, Deg. Fahr.
	Under Side	Upper Side	
0	98	68	0
5	603	68	0
10	1146	68	0
15	1249	69	1
20	1401	70	2
25	1573	74	6
30	1720	78	10
35	1732	84	16
40	1744	91	23

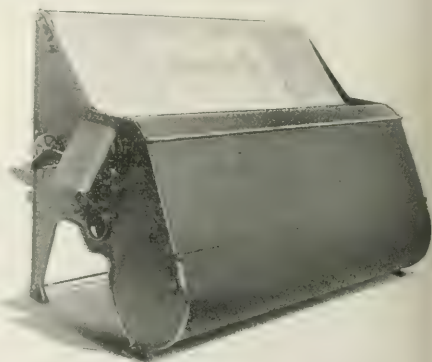
Table I shows the heat conductivity of zenitherm compared with other substances. The figures given represent the rate of heat flow in pound-Fahrenheit units

per hour through 1 sq. ft. of material 1 in. thick for every degree Fahrenheit difference in temperature between the two faces of the material. Table II shows the actual temperature rise of the unheated side of a specimen of zenitherm 12 in. square and 2.5 in. thick placed over a gas-crucible furnace. Flame tests also made on this material show that temperatures as high as 1700 deg. Fahr. lasting three hours only charred a groove where the flame was applied and did not affect the rest of the substance. Alternate boiling, freezing and thawing have been shown to cause no warping, cracking or other defects.

Zenitherm is ordinarily molded in slabs measuring 18 in. by 48 in. by 0.5 in. to 4 in. thick. As the heat conductivity of the substance depends on its density slabs are furnished ranging in density from 10 lb. to 50 lb. per cu. ft. Samples of average density have a crushing strength of 280 lb. per sq. in. and a tensile strength of 100 lb. per sq. in. The product is declared to cost not much more than hard wood and is furnished in rough or smooth-surfaced slabs which can take varnish or stain or can be grained to imitate wood. Its electrical resistance is also very high owing to the absence of moisture, the break-down voltage of 1 in. of zenitherm being 12,000.

### Compact Continuous Electric Blueprinting Machine

Continuous electric blueprinting machines only 5 ft. long by 2.5 ft. wide by 30 in. high are being marketed by Wickes Brothers, Saginaw, Mich. Prints up to 48 in. in width and of any length can be made in these machines, which take only 5 amp at 110 volts, including the power for the lamp and roll-driving motor. Light for exposing the paper is furnished by a mercury-vapor lamp and is transmitted through the tracing cloth to the sensitized paper without passing through any intervening glass. Since no forced ventilation is required to cool the lamp, the operating mechanism is very simple. Wrinkles and creases which may be present in the paper and tracing are eliminated before printing by passing both sheets through spirally fluted rolls. Gravity is employed to feed the paper into the rolls. The apparatus operates practically without any noise as



ELECTRIC BLUEPRINTING MACHINE

variable-speed friction-drive mechanism inclosed by a single housing is employed. Light-excluding compartments are provided for unexposed sensitized paper and for prints so that the machine may be operated in full daylight. All of the control mechanism is placed within convenient reach of the operator feeding the machine.

# Jobber, Dealer and Contractor

## Modern Methods of Milwaukee Jobber

Julius Andrae & Sons' Company, electrical jobber, Milwaukee, Wis., recently held a three-day conference of its sales organization to discuss problems involved in the marketing of incandescent lamps. The meeting took place at Pewaukee Lake, Wis., and about twenty-five salesmen were present. Particular attention was given to instructing the jobbers' representatives in the characteristics and uses of the new high-efficiency tungsten lamp, data on these lamps and other types being furnished by representatives of the Bryan-Marsh division, National Lamp Works of the General Electric Company. Among those who addressed the meeting were Messrs. Ward Harrison and F. J. Blaschke, engineering department of the National Quality Lamp Division, Cleveland; J. M. Smith and L. G. Hewins, of the Ivanhoe Metal Works, Cleveland, and J. S. Corby, manager of sales for the Bryan-Marsh Works, Chicago. Mr. H. P. Andrae, who was in charge of the meeting, is a firm believer in keeping up the efficiency of his selling organization by having all salesmen well informed on the subject of the merchandise they are handling, and the long conference on lamps was held that the salesmen of the company might become as well posted as any selling staff in the field.

A feature of the meeting was the presentation to Mr. Corby of a gold watch, testifying the high esteem in which he is held by its donors, the salesmen of the Andrae company. Mr. Otto Borchert made the presentation speech.

## Window Displays Well Worth While

A firm believer in the selling value of good "live" window displays, Mr. John J. Elliott, one of the proprietors of the North Avenue Electric Shop, 211 North Avenue, Chicago, changes the exhibits in his windows once every week. Moving displays and flashing effects seem to be most attractive, and in the past several designs



ELECTRICAL DEALER'S WINDOW DISPLAY, NORTH AVENUE, CHICAGO

have appeared at this little shop which have drawn crowds to the windows with the result of increased business.

One interesting and tactful display had for its centerpiece a miniature telephone switchboard rigged out with small lamps and cords. The fine wire lines radiating from the board stretched to various parts of the

window, and each terminated at some article representative of the stock of a nearby business man. For instance, a jeweler in the neighborhood was represented by a watch and silver spoon, and at the end of his line these articles were displayed, together with a card carrying his firm name and address. All of the signal lamps on the miniature switchboard were wired so that they flashed alternately, and two large dolls—the chief operator and her assistant—moved their heads and hands and carried on a graphic conversation by means of signs which were invisible except when illuminated by small lamps that flashed behind them. This display pleased the passing public and cemented the existing friendship between the proprietor of the shop and the local business men.

In addition to handling energy-consuming devices and electrical appliances, the North Avenue Electric Shop employs eight wiremen for its contracting work.

## Ordinance to License Electrical Contractors at Galveston, Tex.

An ordinance drafted by Mr. W. D. Masterson, city electrician of Galveston, Tex., requiring licenses for all electricians and contractors doing electrical construction work in that city, received general approval at a meeting of the electrical interests of Galveston in the city hall, and if accepted by the city commissioners will reduce the local insurance key rate by the sum of 4 cents.

Section 1 of the proposed ordinance enforces the rules of the National Board of Fire Underwriters for all electrical construction work. Section 2 relates to the issuance of permits to do electrical work. Section 3, covering the requirements imposed before a license shall be issued, reads as follows:

"That any company, firm, corporation or individual desiring to install or undertake a contract for the installation of any wire or wires intended to transmit electric current within any building, or on or attached to any building, shall before doing so obtain from the board of city commissioners a license to do electric wiring and the construction, installation and alteration of electric wiring, work, apparatus and fixtures.

### Requirements for License

"The applicant for this license shall state his name, business, residence and previous experience and qualifications, and the applicant shall be indorsed by two responsible contracting electricians or by the city superintendent of electricity, or both. After the approval by the mayor-president and board of city commissioners of the application for license, the city secretary is authorized to issue the license only after the payment of an initial fee of \$100, and an annual fee thereafter of \$2 shall be paid.

"This license, when issued, shall remain in effect and operation for one year from the date of its issuance, subject to the revocation by the board of city commissioners at any time that it shall be proved that the holder of the license wilfully violated any of the provisions of this ordinance. Licenses issued are not transferable."

Temporary permits will be issued for emergency work, but electrical contractors and electricians will be allowed to use their discretion in making hurried repairs after nightfall to restore customers' service, so that official red tape will not operate to prevent the prompt resumption of electric lighting and motor drive that have met with interruption from any cause.



# Industrial and Financial News

## Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

**Trade Reports.**—While *Dun's Review* reports the sale of electrical supplies satisfactory in Philadelphia, *Bradstreet's* reports that large orders are not being received by Boston electrical houses, and also that long terms of credit are being sought, with collections not so good as for the preceding week.

**Canadian Companies to Co-operate in Purchasing.**—A movement has been set on foot by privately owned electric light and motor-service companies to co-operate in the purchase of electrical equipment and supplies. These companies are members of the Canadian Electrical Association, of which the general office is in Toronto. The capital represented is over \$200,000,000.

**Difference Between American and European Public Utilities.**—The difference between the American public utility and the European public utility, according to the head of one of America's largest public utilities, is that the American companies stay ahead of the public, providing facilities before the need of them is discovered. Abroad they have waited until there grew up an insistent demand for service before supplying it.

**Tractor for Lumber Company.**—A two-wheel-drive detachable 3-ton tractor was recently purchased by the Curtis & Pope Lumber Company, Boston, Mass., from the Eldridge Manufacturing Company of Boston. Three lumber wagons have been converted into trailer wagons, and in the near future three more wagons will be made over, as the tractor is designed to haul six trailers. This tractor is the third unit bought by the above company, the other two being four-wheel-drive machines designed to haul loads of from 5 tons to 7 tons.

**May Exports.**—*Commercial America* reports May exports of electrical machinery and appliances as follows: Batteries, \$57,311; generators, motors and transformers, \$739,943; fans, \$28,306; insulated wire cable, \$91,528; interior wiring supplies and fixtures, \$54,983; lamps, \$20,798; telegraph instruments, \$5,069; telephones, \$202,979; other apparatus, \$839,803. The value of electric locomotive exports in May, 1914, was \$52,368, as against \$9,964 for May, 1913. Steam locomotives, however, showed a falling off in exports; the value for May, 1914, was \$251,646 and that for May, 1913, was \$396,284.

**Engineers' Permanent Exhibit.**—On Sept. 1 Mr. H. R. Nicholson will open at 40 West Thirty-ninth Street, New York City, rooms for the permanent exhibition of steam valves, fittings and specialties, and electrical goods and appliances. The project has been started with a view toward furnishing a place where engineers may see the apparatus and have its working application explained by an unprejudiced corp of experts. Since the idea was first projected, a week ago, the firms which have contracted for exhibits are the Fairbanks Company, New York, valves; the Patterson-Allen Engineering Company, New York, lap-joints and iron fittings, and the Nason Manufacturing Company, New York, steam traps and specialties.

**New Electric-Vehicle Garage.**—The Electric Garage Company, Louisville, Ky., was organized recently and will maintain and operate a garage for electric vehicles. This company is said to be the first of its kind in Louisville. The company will also act as agent for the Ohio electric vehicles in this district. Property has been bought on Third Street, plans have been completed for the garage, and salesrooms and contracts have been let. The company expects to get into the new building by the middle of August or shortly afterward. Mr. G. G. Bader, manager for the Ohio Electric Car Company in Louisville, Mr. F. S. Ouerbacher, president of the O. K. Stove & Range Company, and Mr. J. W. Button of the Louisville & Nashville Railroad Company are the in-

corporators of the new garage company, which is capitalized at \$25,000.

**Seven-Mile Transmission Line to Light Town.**—Rittman Ohio, a town of 2000 inhabitants, will soon be receiving electric lighting and motor service from the system of the Cleveland Southwestern & Columbus Railway Company over a 7-mile branch being built from the company's 22,000 volt, three-phase, twenty-five-cycle transmission line. The distribution system in the little city will be operated at 2200 volts, the potential being stepped down by means of an out door-type steel substation manufactured by the Delta-Stat Electric Company. A street-lighting contract signed with the city will require sixty 100-cp high-efficiency tungster lamps operated through a Packard series regulator. Rittman is a manufacturing town which has enjoyed a remarkably rapid growth of late, and it is expected that a considerable motor load will be developed.

**Electric Cooking for High-School Cafeteria.**—The board of education of Salt Lake City, Utah, has awarded to the Inter-Mountain Electric Company of that city the contract for the electric-cooking equipment for the cafeteria of the new East Side High School. The equipment will consist of two electric ranges, one of them to have two 15-in. disk stoves and the other to have one 10-in. disk, one 12-in. disk two 8-in. disks and two 6-in. disks. A complete assortment of lock-on cooking utensils will be used to fit on the various disks. In order to facilitate baking operations an additional oven has been ordered. A 3-gal. chocolate urn and a 6-ft. electrically heated steam table will also be employed. The electric-cooking equipment for this high school will be supplied by the Simplex Heating Company, Cambridge, Mass. The equipment is intended to serve 800 students at lunch.

**Mining Equipment Order.**—The Daly Reduction Company, of which the Hedley (B. C.) Gold Mining Company is a subsidiary, has purchased from the Canadian Westinghouse Company a 1250-kva., three-phase, sixty-cycle, 400 r.p.m., 6600-volt waterwheel-driven generator complete with direct-connected exciter, and switchboard, and electrolytic lightning arresters for both the mining company's generating station and the receiving end of the transmission line. The Morgan Smith Company received the order for a 1800-hp waterwheel. A 400-hp synchronous motor, which will be directly connected to a compressor purchased from the Canadian Ingersoll-Rand Company, has been furnished by the Canadian General Electric Company, which also supplied three 400-kw self-cooled transformers and a 400-hp induction motor to drive a compressor at present operated by steam. Greater motor-service facilities for the mining operations of the Daly Reduction Company have been rendered imperative on account of the company's steadily increasing gold output, and the present steam and small hydroelectric plant will be supplemented by the installation of the recently acquired equipment at a point on the Similkameen River, necessitating the construction of a three-mile transmission line between the new hydroelectric development and the mill. Mr. Gilbert McEachern is electrical superintendent of the Daly Reduction Company, and Mr. G. P. Jones is general manager.

**Building Operations on Louisville Electric Plant.**—Concentration of the electricity-manufacturing operations of the Louisville Gas & Electric Company is brought nearer by the rapid progress which is being made on the addition to the present plant on the water front. This is the station of the former Kentucky Electric Company, which was absorbed by the merger. The rating now is 5000 kw, but the improvements under way contemplate the installation of two 5000-kw turbines and other additions to the equip-

ment, which with the buildings will involve the expenditure of about \$500,000. Contracts have been let for the equipment. The building operations have progressed to the point where all is now ready for the steel work.

**Electrical Ore Separation for Utah Copper Plants.**—Mr. C. A. Hansen, specialist for the General Electric Company on electric-furnace methods and the electrical separation of zinc and copper, is in Salt Lake City, Utah, to study the works of the Utah Copper Company at Bingham and to determine the feasibility of applying electrical ore separation to the local processes. Managing Director D. C. Jackling of the Utah Copper Company, who is also president of the Utah Power & Light Company, which has a contract with the copper company for the supply of its electrical requirements for all smelting and mining work, is interested in the separation problem and is lending every assistance toward its solution.

**Central-Station Business in the Pacific and Mountain States.**—Returns for May received by the *Electrical World* from the central-station companies in the Pacific and Rocky Mountain States show, on the whole, a lower rate of increase over 1913 than for other sections of the country; and, although it is possible to find here and there in this great area the evidence of booming local industries and a "strong" condition of general business, it must be admitted that on the whole the demand for energy in the industries there is not increasing at a high rate. The readings on the energy meters should provide a trustworthy telltale of the industrial demand; and the only logical conclusion is that in most of the cities on the coast, and in many of the cities of the mining states, times are very far from good. The data presented herewith may be compared with those already published in the *Electrical World* of July 11 and June 13. It will be seen that the figures for May (the latest month for which the returns are generally available) show no improvement over those for previous months. Table I presents a comparison of the gross income of three of the largest Pacific Coast companies over a four-month period, February to May inclusive. The utilities in question are the Pacific Gas & Electric Company, the Southern California Edison Company and the Puget Sound Traction, Light & Power Company, the data having been taken from the statements made public by these three companies. It should be stated that the figures of gross income do not relate exclusively to the sale of energy, but represent the total from all sources. Strictly speaking, therefore, the published returns of the three companies may not be regarded as truly comparable, but it is

electric generating stations. One fact which is not brought out in this table, but which is probably of even greater importance than any figures of gross income, is that the Pacific companies in most cases are succeeding in curtailing their operating expenses. Net earnings, as a rule, are showing an increase over 1914, and there seems to be little danger of any reduction in the balance available for dividends. In the case of the Southern California Edison Company, for instance, the balance applicable to dividends on the common stock of the company should be at the rate of about 7.5 per cent for the complete year, provided the record of the first five months can be maintained or bettered. In more than one of the Pacific cities the utility companies for some time will have to continue to depend for a satisfactory showing upon a close curtailment of operating expense rather than

TABLE II—PACIFIC AND MOUNTAIN STATES—COMPARISON OF GROSS INCOME AND OUTPUT FOR APRIL AND MAY, 1914 AND 1913, OF FOUR LARGE COMPANIES IN PORTLAND, ORE., SPOKANE, SALT LAKE CITY AND DENVER

	GROSS INCOME FROM SALE OF ENERGY			TOTAL ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
April.....	\$706,970	\$638,697	7.3	56,674,961	47,598,643	19.0
May.....	688,251	639,560	7.1	56,326,838	52,511,172	7.3

upon any substantial increases in gross income. General satisfaction has been felt over the action of the California Railroad Commission in the recent case between the Pacific Gas & Electric Company and the city of Antioch; and the principle involved is of such great importance to the utilities that the decision is certainly worthy of consideration in balancing up the favorable and adverse factors in the electricity supply business on the coast. The vital feature in the case is the establishment of a wholesale rate for energy at the substations; and the decision establishes the highly important principle of allowing 8 per cent return on the full reproduction value, provided the property is in efficient operating condition. In the case under notice the commission decided that the plant of the company was in 100 per cent operating condition, and made a valuation of over \$26,000,000, excluding the electric distributing systems, the gas, water and street-railway systems, water rights and inoperative properties. Now that the refinancing plans of the Pacific Gas & Electric Company have been successfully carried out and the monthly statistics are showing that the increased gross is being accompanied by a decreased operating expense, the position of the company cannot be regarded as anything but extremely strong; and this Antioch decision, without any exaggeration of its importance, should certainly be held as another favorable factor. The figures in Table II may throw additional light on the condition of the electric utilities in the Pacific and Mountain States. A comparison is made therein of the gross income and the energy output of four large companies for April and May, operating in Portland, Spokane, Salt Lake City and Denver. Each of the companies handles gross monthly sales of over \$150,000, and the combined energy output of the four companies is nearly as great as that of the New York Edison Company. No conclusions should be drawn from the value of 19 per cent given as the rate of energy increase over 1913 in the month of April. This high value is the result solely of the returns from one of the four companies—a system which has assimilated many smaller systems during the last eighteen months, and the increase in output is the direct result of such assimilation. Probably 7 or 8 per cent represents the average rate of the increase of energy demand on the stations of these companies, and that rate very likely is a fair general average for the big cities of the Mountain and Pacific States. In Table III the results for May alone are given, and the conclusions to be drawn therefrom are interesting. It is seen that the returns from six large companies, handling between them \$1,000,000 of monthly sales of energy, show an increase of about 10 per cent on both in-

TABLE I—PACIFIC STATES—COMPARISON OF GROSS INCOME OVER FOUR-MONTH PERIOD OF PACIFIC GAS & ELECTRIC, SOUTHERN CALIFORNIA EDISON AND PUGET SOUND TRACTION, LIGHT & POWER COMPANIES

	Gross Income		Per Cent Increase
	1914	1913	
February.....	\$2,514,355	\$2,343,162	7.2
March.....	2,480,857	2,418,522	2.6
April.....	2,490,528	2,387,381	4.5
May.....	2,467,353	2,422,461	1.8

nevertheless believed that they provide a trustworthy indication of the amount of business which the electric utilities in these three coast cities are now handling. In the case of the Pacific Gas & Electric Company it is known that little more than one-half of the entire gross income is derived from the sale of electric energy; while in the case of Seattle undoubtedly a big percentage comes from street-car fares on the great traction system operated by the Puget Sound Company. It is seen that the combined figures for May for the three companies show a lower rate of increase over 1913 than for any other month in the four-month period. In that month the San Francisco system was the only one of the three to report any improvement in gross earnings over May of last year, and it is not known how much of its 4.5 per cent increase was due to an improved demand on its



come and output. In the belief that this rate was considerably in excess of anything which was being realized by the smaller utilities, the *Electrical World* collected figures from a number of additional companies, operating in cities of 25,000 and less, whose monthly business did not exceed \$20,000. It is believed that the totals for the eight smaller companies shown in Table III may safely be regarded as typical for cities of the class to which they relate, and it will be noted that the energy demand for 1914 shows a recession from last year. Of the eight utilities, one-half report a decreased output for May, 1914, as compared with last year; and the only conclusion is that in the far West the industries in the smaller cities are not at present as active as formerly. With few exceptions the larger cities are not expanding to a sat-

TABLE III.—PACIFIC AND MOUNTAIN STATES—INCOME AND OUTPUT FOR MAY, 1914 AND 1913, FOR (A) SIX LARGE COMPANIES AND (B) EIGHT SMALL COMPANIES

	GROSS INCOME FROM SALE OF ENERGY		Per Cent Increase	TOTAL ENERGY OUTPUT IN KW-HR.		Per Cent Increase
	May, 1914	May, 1913		May, 1914	May, 1913	
(A) Six large utilities...	\$1,041,265	\$918,778	10.9	99,775,427	90,812,066	9.9
(B) Eight small companies...	61,419	78,438	3.8	2,956,700	3,011,718	Decrease

isfactory extent, and the industrial demand on the central stations is not increasing at its old rate. Whatever the condition in the main industrial centers, the reports from the smaller communities indicate an even less encouraging state of affairs. It may be remembered that an exactly similar conclusion, as applying to the New England States, was developed by the *Electrical World* from the May data for that territory. Although the general summary for the Pacific and Mountain States must be somewhat unfavorable, yet it should be stated that among the reports coming from those sections are several notably satisfactory returns. The Utah Power & Light Company, with its subsidiaries, caters to a very large percentage of the industrial demand of the State of Utah, while the Montana Power Company and its subsidiaries distribute the major portion of all the energy transmitted in Montana. Both of these systems are in thoroughly good shape and reporting good monthly gains. It is probable that the European war will affect both of them for a time, owing to contraction in mining operations, but it cannot be doubted that when shipping arrangements to Europe are placed once more on a satisfactory basis there will be a substantial increase in the demand for energy throughout the mining States. This should be directly reflected in the returns from the utility companies in these States.

## Corporate and Financial

**Monterey, (Mexico) Railway, Light & Power Company.**—The directors have felt it necessary to postpone payment of interest due Aug. 2 on the first-mortgage debenture stock until it is possible to transfer the money on reasonable terms.

**Lincoln (Ill.) Railway & Light Company Receivership.**—Mr. James E. Hobit, cashier of the Lincoln State Bank, has been appointed receiver of the company as a result of suit to foreclose the mortgage securing the bonds. Mr. Hobit assumed charge on July 18.

**Ohio State Telephone Company.**—A syndicate of Ohio brokers is offering \$3,000,000 7 per cent cumulative preferred stock and \$900,000 common stock of the new company at \$1,000 for ten shares of the preferred stock and three shares of the common stock.

**Hamilton Gas & Electric Company.**—United States District Judge Hollister sustained in greater part the report of Referee H. H. Haines, levying an assessment of 100 per cent on \$300,000 of so-called bonus stock of the Hamilton (Ohio) Gas & Electric Company, issued in 1907. The court held that all creditors whose debts were created after the stock was issued, except those creditors who are holders of bonus stock, or who had knowledge of its issuance prior to the date of the creation of their debt, are entitled to share in the fund arising as a result of the assessment. The court also held that the trustee in bankruptcy of the company may bring a suit in equity to recover. The matter was referred back to Referee Haines with instructions to ascertain which of the creditors hold claims contracted since the issuance of the bonus stock, and with further directions to report his conclusions of fact and law in such a way that the court may either sustain or overrule his findings.

**Public Utility Securities.**—In a letter H. F. McConnell, Company, dealers in public utility securities, New York stated: "No quotations are obtainable, nor, in view of the many bank loans in various cities, is it wise to establish a price that in any way has a bearing on intrinsic value. Public utility securities have not acted in a way to cause alarm. Very little stock was offered down, and there seem to have been a buyer on every concession. The passing of the monthly dividend by the Cities Service Company has worried some of the stockholders but under the circumstances was the proper action to take. This act, however, shows the weakness of the international markets and add to the strength of those companies that have confined their financing to American institutions and the American public. During the past week the writer has interviewed the heads of practically all the large public utility companies and has been informed that no change in dividend policy is contemplated. Neither will there be any change in the price of their commodities. We feel this is a time for every security holder to figure on the intrinsic value of his investment holdings and add to them as circumstances will permit."

**Washington-Oregon Corporation Receivership.**—The company has been placed in the hands of receivers at Tacoma, Wash. The company was organized in Washington in 1910 to acquire and operate public utility companies. It took over by merger the Vancouver Traction Company, the Vancouver Water Company, the Twin City Light & Traction Company and the Haines Electric Power Company, and through stock ownership controlled the Kalama Electric Light & Power Company, the Clarke County Development Company and the Twin City Light & Power Company. The company operates generating plants in several Washington and Oregon towns, including Hillsboro, Rainier, Kalama, Vancouver, Chehalis and Centralia. Federal Judge Cushman appointed Mr. Elmer M. Hayden temporary receiver. The receivership was asked by the Fidelity Trust Company of Philadelphia, as trustee for a five-million-dollar bond issue. The officials of the corporation are: Mr. Isaac W. Anderson, Tacoma, Wash., president; Mr. H. G. Fleischauer, Portland, Ore., general manager, and Mr. Charles A. Johns, Portland, Ore., attorney. The action resulting in the receivership was brought about by the inability of the corporation to meet its obligations. The corporation for the year ended June 30, 1913, reported a deficit after charges had been met.

### NEW YORK METAL MARKET PRICES

Copper	Aug. 4		Aug. 11	
	Bid	Asked	Bid	Asked
Standard spot*	Selling Prices		Selling Prices	
	£	\$	£	\$
London, standard spot*				
Prime, ladle	12.75	to 12.87½	12.50	to 12.75½
Electrolytic	12.50	to 12.75½	12.25	to 12.50½
Casting	12.37½	to 12.50½	12.12½	to 12.25½
Copper wire, base	14.00	to 11.25	13.75	to 14.00
Lead	3.00		3.90	
Nickel	40.00	to 45.00	40.00	to 45.00
Sheet zinc, f.o.b. smelter	7.00		7.00	
Spelter, spot	4.90	to 5.00	5.40	to 5.50
Tin, spot*	to		to	
Aluminum:				
Forward delivery	19.00	to 20.00	20.00	to 21.00
Future	to		to	

### \*COPPER EXPORTS

Total tons to Aug. 11 6,008

\*From daily transactions on the New York Metal Exchange (Nominal).  
Note.—The New York Metal Exchange and the London Metal Exchange have been closed until further notice. No reliable quotations on old metals can be obtained for the present. There is no buying in this market.

## Business Notes

The Willard Storage Battery Company, Cleveland, Ohio, has arranged to build a plant on East 131st Street, near St. Clair Avenue, Cleveland, within the next three months. The building, which will be one story high and 200 ft. long by 135 ft. wide, will cost about \$35,000.

The Beacon Miniature Electric Company, 108 Duane Street, New York City, has opened a branch office at 11 South Desplaines Street, Chicago, Ill., from which all shipments for the middle and extreme West will be made. All correspondence and inquiries covering that territory will also be taken care of by the Chicago office.

Harry G. D. Nutting, public-utility expert and engineer, announces the opening of an office in the First National Bank Building, Milwaukee, Wis., for the purpose of furnishing to public-service utilities expert engineering, accounting and legal service as well as expert management. The purchase and sale of utilities is also included in the scope of his new business.

The Nordberg Manufacturing Company, Milwaukee, Wis., which has negotiated with Usines Carrels Frères, Ghent, Belgium, for the sole right to manufacture the Carrels-Diesel engines in this country, contemplates producing Nordberg-Carrels-Diesel stationary engines on a large scale. W. R. Haynie, 30 Church Street, New York, who was formerly American representative for Usines Carrels Frères, has been retained as special representative of the Nordberg company.

The New York Electrical School of Chicago has been established by the New York Electrical School, New York City. The headquarters of the new Western school are at 36-944 North Chicago Avenue, Chicago, and are in charge of Mr. Frank R. Schalk as managing director. Mr. Schalk was for many years associated with the subscription department of the *Electrical Review* and *Western Electrician*, Chicago. Following the line of work of its parent institution, the Chicago school will give practical instruction in electricity and magnetism for electricians and artisans.

## New Industrial Companies

The Electric Service Company, of Cincinnati, Ohio, has been incorporated with a capital stock of \$10,000 by John P. Shoemaker, Maurice E. Kieley and T. J. Kieley.

The Detroit Vibrator Company, of Detroit, Mich., has been incorporated with a capital stock of \$15,000 to manufacture and deal in electrical vibrators, flatirons and other electrical specialties.

The Electric Game Board Company, of Boston, Mass., has been incorporated with a capital stock of \$100,000. The officers are W. H. Gilman, of Newtonville, president, and W. Brown, of Cambridge, treasurer.

The Current Electric Company, of Chicago, Ill., has been incorporated by C. R. Barrett, B. Levering and C. L. Barrett, of Chicago, Ill. The company is capitalized at \$60,000 and purposes to manufacture electric heating appliances.

Hudson & Son, of New York, N. Y., has been chartered with a capital stock of \$10,000 to manufacture electrical machinery. The incorporators are M. L. Hudson, 1482 Broadway; J. H. Mason and W. Miller, all of New York.

The Dunkirk Corporation, of Dunkirk, N. Y., has been incorporated with a capital stock of \$30,000 by R. J. Gross, J. K. Buttolph and K. DeH. Caldwell, of Dunkirk. The company purposes to manufacture motors, engines, machinery, etc.

The Wicks Electric Company, of Cleveland, Ohio, has been incorporated with a capital stock of \$10,000 by J. C. Ceaman, A. G. Wicks, N. C. Ebert, John Ceaman and Herbert Vicks. The company proposes to deal in electrical devices and merchandise.

The American Motor Utilities Company has filed articles of incorporation under the laws of the State of Delaware with a capital stock of \$500,000. The company proposes to manufacture the Compton pneumatic starters and automatic control devices. The incorporators are J. McLaren, B. Knowlton and S. V. Dowling, of New York, N. Y.

The United Electric Car Owners' Garage, of Chicago, Ill., has been incorporated with a capital stock of \$50,000 by S. G. Abbott, D. S. Bobb and E. F. Rumrill, all of Chicago, Ill. The company proposes to manufacture automobiles and operate garages.

The Cooley Manufacturing Company, of New York, N. Y., has been incorporated with a capital stock of \$50,000 to manufacture and deal in engineers' supplies. The incorporators are R. L. and A. C. Henry and Arthur Phelps Marr, 108 Fulton Street, New York, N. Y.

The Lea Courtney Company, of Newark, N. J., has been incorporated with a capital stock of \$150,000 for the purpose of carrying on a general electrical engineering business. The incorporators are E. W. Heller and Spaulding Fraser, of Newark, and A. G. Lea, of Hackensack, N. J.

The Western Utilities Corporation, of New York, N. Y., has been incorporated by H. R. Frost, L. C. Haynes and Sydney Norman, 20 Broad Street, New York, N. Y. The company is capitalized at \$50,000 and proposes to construct water-supply systems, electrical generating devices, etc.

## Trade Publications

**Boulevard-Type Fixtures.**—King "white-way" fixtures are described in a pamphlet just issued by the King Foundry Company, St. Joseph, Mo.

**Flashing Devices.**—Thermo-Blink automatic flashers are described in a pamphlet issued by Kelley & Kelley, 105 Liberty Street, Brooklyn, N. Y.

**Rear Signal Lamp for Automobiles.**—The Standard Signal Lamp Company, Bridgeport, Conn., has sent out a folder describing a rear signal lamp for automobiles.

**Slate Slabs.**—Prices on slate slabs for electrical apparatus are listed in Price List No. 1 issued by the Davis Slate & Manufacturing Company, 608 East Fortieth Street, Chicago.

**Washing Machines.**—The Western Electric Company, 463 West Street, New York City, in a booklet entitled "Sunny Monday," describes the modern method of doing household washings.

**Rope Transmission.**—The American Manufacturing Company, Noble and West Streets, Brooklyn, N. Y., has prepared a sixty-four-page booklet entitled "The Blue Book of Rope Transmission."

**Motor-Driven Grocers' Appliances.**—The Hobart Manufacturing Company, Troy, Ohio, has issued a catalog describing motor-driven appliances which can be used in grocery stores.

**Construction Cleats.**—Construction cleats for fastening ceiling bracket switches and standard outlet boxes are referred to in a folder sent out by Alexander M. Knauber & Company, Oak Park, Ill.

**Stage-Lighting Apparatus.**—Arc lamps with which to light stages for the production of motion pictures are described in a catalog sent out by Kliegl Brothers, 240 West Fifth Street, New York City.

**Short-Distance Wireless-Telephone Set.**—Marconi's Wireless Telegraph Company, Ltd., Strand, London, has issued a pamphlet describing the construction and operation of its short-range wireless-telephone set.

**Combined Washer and Wringer Machine.**—A bench-type, belt-driven combined washer and wringer machine is described in a folder prepared by the H. F. Brammer Manufacturing Company, Davenport, Ia.

**Auto-Horn Push-Button.**—An automobile-horn push-button which can be attached to the steering wheel or to a flat surface is described in a folder prepared by the Typhoon Signal Company, Lincoln, Ill.

**Blueprint Machines.**—Machines for making, washing, drying and ironing blueprints are described in a booklet distributed by the Revolute Machine Company, 417 East Ninety-third Street, New York City.

**Steel-Taped Cable.**—Illustrated Bulletin No. 200 issued by the Safety Insulated Wire & Cable Company, 114 Liberty Street, New York City, gives comparative costs of conduit and "Safety" cable installations and descriptions of methods of installing, etc.



## Personal Mention

Mr. F. E. Wood has been appointed purchasing agent of the Zionsville (Ind.) Water & Electric Light Company.

Mr. D. R. Thomas has succeeded Mr. D. W. Low as manager of the Michigan Power Company, Lansing, Mich.

Mr. Tip. Taylor has resigned as superintendent of the Browne Mills Electric Company, North Manchester, Ind.

Mr. L. Keim has been appointed purchasing agent of the Augusta-Aiken Railway & Electric Corporation, Augusta, Ga.

Mr. L. W. McNamee has succeeded Mr. E. J. Buffington as president of the Gary (Ind.) Heat, Light & Water Company.

Mr. J. C. Sanford has succeeded Mr. A. D. Petit as chief engineer of the Osceola (Iowa) Light, Heat & Power Company.

Mr. E. L. Staley, of Staley & Fees, Wichita, Kan., has been elected president of the Kansas Electrical Contractors' Association.

Mr. A. C. Balch, vice-president of the San Joaquin Light & Power Corporation, Fresno, Cal., has recovered from his recent serious illness and returned to his office.

Mr. H. W. Stone, secretary and treasurer of the Harrisburg (Pa.) Light & Power Company, has been confined to his home for several months with a severe attack of rheumatism.

Mr. B. H. Gardner, formerly sales manager for the properties of the United Electric Light & Water Company, Waterbury, Conn., has succeeded Mr. F. K. Wade as superintendent of the South Norwalk district of that company.

Mr. Bion J. Arnold, of Chicago, has been appointed consulting engineer to the Jersey City Chamber of Commerce. Primarily, his work will consist in planning the development of port facilities. Mr. Arnold is now abroad as a member of the Chicago Railway Terminal Commission.

Mr. J. H. Lindsay, chief engineer for the Atchison (Kan.) Electric Light & Power Company, received a 2300-volt shock from the plant switchboard which rendered him unconscious for a time. Mr. Lindsay was rescued by a switchboard attendant. He is sixty-five years old.

Mr. C. C. Trees has resigned as auditor and assistant secretary of the Indiana Railways & Light Company, Kokomo, Ind., after a connection of eight years with that company. Mr. Trees has been appointed examiner of accounts in the valuation department of the Interstate Commerce Commission, with headquarters at Chicago.

Mr. Frank R. Schalek, of Chicago, for several years connected with the circulation department of the *Western Electrician* and later with the *Electrical Review* and *Western Electrician*, has been appointed managing director of the New York Electrical School of Chicago, a trade school to teach practical electrical construction and shop work.

Mr. Albert M. Dunham has resigned as assistant auditor of the Narragansett Electric Lighting Company, Providence, R. I., to become secretary to the president of the American Screw Company, Providence. On the occasion of his leaving the Narragansett company, July 31, a gold watch was presented to Mr. Dunham by his associates and the company.

Mr. John F. Hanley has succeeded Mr. E. W. Lothrop as general manager of the Federal Power & Light Company, which controls the Delphos (Ohio) Light & Power Company, the Public Service Company of Van Wert, Ohio, and the Urbana (Ohio) Electric Light Company. Mr. Hanley's headquarters will be at Van Wert. As noted in our Aug. 1 issue, Mr. Hanley supersedes Mr. F. L. Wise as manager of the Public Service Company.

Mr. Charles O. Tappan has resigned as chief engineer of the Northern Power Company and the Hannawa Falls Water Power Company, both of Potsdam, N. Y., and has opened an office at 2 Rector Street, New York City, where he will specialize in hydroelectric development, public utility engineering, and valuation and appraisal work. Before his connection with the companies at Potsdam Mr. Tappan was hydraulic power engineer with the Allis-Chalmers Manufacturing Company, Milwaukee, Wis.

Mr. H. C. Sterling has resigned as manager of the Constantine Hydraulic Company, Three Rivers, Mich., to be-

come assistant manager of the Atlantic City (N. J.) Electric Company. In 1888 he and his brother built and operated an electric-lighting plant at Helena, Mont. Later Mr. Sterling became superintendent of the Helena Rapid Transit Company, and when this company was merged with the Helena Power & Light Company he served as manager of the electric department of the consolidated company. Afterward he purchased and operated the Huron (S. D.) Electric Company, and was also engaged in constructing and operating electric plants in Minnesota, Wisconsin and South Dakota. Mr. Sterling had just completed a term as president of the Michigan Electric Association.

Mr. Harry G. D. Nutting, who has just opened an office in the First National Bank Building, Milwaukee, Wis., is a public utility expert and engineer, is a graduate of the University of Illinois. After leaving college he did extensive experimental work for Fairbanks, Morse & Company and later became a member of the engineering staff of the Railroad Commission of Wisconsin. Mr. Nutting was next appointed successively manager of the municipal electric plant at Fort Atkinson, Wis., district superintendent of the Central Illinois Public Service Company, Mattoon, Ill. and electrical engineer for the United States Arsenal, Rock Island, Ill. More recently he served as assistant to Mr. Clement C. Smith, of Milwaukee, and Mr. Smith retained him as consulting expert for the Wisconsin Public Service Company and the Wisconsin Railway, Light & Power Company. Mr. Nutting read a paper on "An Accounting System for a Small Public Utility" before the Wisconsin Electrical Association last January, and he was chairman of that association's committee on extensions and rules of service.

Col. Curtis V. Hard, the new president-elect of the Ohio Electric Light Association, is head of both the Wooster (Ohio) Electric Company and the Cleveland (Ohio) Light & Power Company. Colonel Hard was born at Wooster



C. V. HARD

1845, and was educated at Berea College, near Cleveland. A descendant of patriots who took part in both the American Revolution and the War of 1812, young Hard himself enlisted as a soldier in the Civil War, being a member of the 135th Regiment of Ohio Volunteer Infantry. When the Spanish American War broke out in 1898 he was appointed colonel of the Eighth Ohio, and served with distinction during that conflict. His regiment was with Shafter's corps during the whole of the Cuban campaign, and Colonel Hard was present in person at the surrender of Santiago. In 1886 Col. Hard, with several associates, first organized the Wooster Schuyler Electric Company, later renamed the Wooster Electric Company, and in 1909 he became its president. In the meantime he and his son had organized the Cleveland Light & Power Company, of which organizations they are still respectively president and treasurer.

## Obituary

James Wolff, for the last quarter century a well-known and respected figure in electrical jobbers' and manufacturers' associations in the Middle West, died at Milwaukee, Wis. July 30, aged fifty-two years. During his business career Mr. Wolff had been employed as Western representative of the New York Insulated Wire Company, the H. T. Pais Company and other concerns. In 1896 he acted as secretary at the meeting of electrical jobbers and manufacturers which organized the Electrical Credit Association of Chicago, and afterward served as a member of the executive committee of that body for many years. In 1898 he was one of the charter delegates responsible for the formation of the National Electrical Credit Association, and he served on its board of managers of that organization until April 1, 1900.

## Construction

## New England

**LISBON, N. H.**—The contract for construction of the addition (130 ft. by 40 ft.) of the power house at the Lisbon Falls, N. H., has been awarded to the J. P. Cummings Construction Co., of Ware, Mass.

**NEWPORT, VT.**—Within the next two months the Newport El. Co. expects to have a number of transmission lines to granite quarry. Charles A. Prouty is president and manager.

**SALMON, MASS.**—The installation of a new street-lighting system in West Salmon, Mass., under consideration by the Gardner El. Co. J. D. Whittemore is superintendent.

**WESTERLY, R. I.**—The Westerly Lt. & Wr. Co., it is reported, is contemplating placing 100 40-cp. street lamps with the nitrogen lamps of 60 cp.

**BRIDGEPORT, CONN.**—Work has begun rebuilding the power house of the Farist & Co. on East Main Street, which was destroyed by fire a short time ago. The building will be 55 ft. by 75 ft., one story.

**BRIDGEPORT, CONN.**—The building commissioners have granted the United El. Co., of Bridgeport, a permit to build an addition to its power plant on Congress Street, to cost about \$40,000. The new building will provide space for several new boilers, generators and other machinery.

## Middle Atlantic

**BROOKLYN, N. Y.**—Bids will be received by Robert Adamson, fire commissioner, for the addition of a fire department municipal building, New York, until Aug. 17, for furnishing material, establishing and replacing an extension to the fire-alarm system in the borough of Brooklyn. Blank forms and other information may be obtained at the above office.

**BROOKLYN, N. Y.**—Bids will be received by the State Hospital Commission, Albany, until Aug. 17, for construction of power, house, boilers, equipment to steam conduit; plumbing work; electric equipment and underground electric conduit at the Long Island State Hospital, Brooklyn. Drawings and specifications and blank form of proposal are on file at the Long Island State Hospital, Brooklyn, N. Y., at the office of the State Hospital Commission, Madison Avenue, New York, and at the Department of Architecture, Capitol, Albany. Copies of drawings and specifications may be obtained at the Department of Architecture upon deposit of \$10, which will be refunded upon return of same. Separate bids to be submitted on each part of the work.

**SUFFOLK, N. Y.**—Bids will be received by the Suffolk El. Co. for Ward, County, for construction of an eight-room addition to the present school building in District No. 54, on Main Street, between Levert and Oakwood avenues, in accordance with plans and specifications prepared by Green & Wicks, architects, as follows: (A) masonry, concrete work, cut stone, plaster, etc.; (B) structural iron and steel work; (C) fireproofing, concrete floors, base, partition, etc.; (D) carpentry, work, painting, glazing, hardware, etc.; (E) plumbing, sheet metal work, skylights, ventilators, etc.; (F) electrical work, telephone system, bell and battery work, etc.; (G) heating, ventilating, radiation, etc.; (H) painting, glazing, hardware, etc. Separate proposals must be submitted on each division. Plans and specifications may be seen at the office of the deputy building commissioner, Room 6, Municipal Building, where blank forms of proposals may be obtained.

**GENEVA, N. Y.**—The Central New York El. Co., of Geneva, has been authorized by the Public Service Commission to issue \$121,000 in bonds. The proceeds of \$33,562 to be used for improvements to the electric department.

**ITHACA, N. Y.**—The Ithaca Trac. Co., successor to the Ithaca Street Ry. Co., has been authorized to execute a mortgage on its new bonds, \$200,000 in bonds. The new bonds, \$211,000, together with the amount in capital stock, will be issued to acquire all the property of the Ithaca Street Ry. Co., which include the Remond power plant with equipment and materials. In addition \$277,000 of the new bonds are to be issued to provide for extensions and improvements, including double tracking, new bridges, new equipment, generators, boilers and other power-

house apparatus. All details have been approved by the Public Service Commission.

**NEW YORK, N. Y.**—Bids will be received by J. H. Woods, police commissioner, Police Department, bookkeeper for office, Headquarters of the Police Department, 241 Central Street, New York, until Aug. 18 for furnishing and installing the electric-light and gas fixtures in the new station house, prison and garage for the Thirty-seventh Precinct, Nos. 229, 231, 233 and 235 West 123d Street, borough of Manhattan. Bids to be submitted by 10 o'clock, and to be prepared by the Police Department, copies of which may be obtained at the office of Beverly S. King, architect, 103 Park Avenue, borough of Manhattan, where plans may be seen.

**RANDOLPH, N. Y.**—The Public Service Commission has authorized the transfer of the property and franchises of the Randolph Lt. & Pwr. Co., a co-partnership of J. W. Grace and A. V. Woolworth to the Randolph Lt. & Pwr. Co., Inc., the latter to issue \$16,000 in bonds and \$17,000 in capital stock, the proceeds of \$17,000 to be used for the improvement of property of the former; \$8,500 is to be expended on the erection of transmission, distribution and street-lighting systems in the company's territory, and the balance of \$8,500, and \$6,000 will be used to take up a mortgage held by J. W. Grace and A. V. Woolworth.

**SYRACUSE, N. Y.**—The contract for the construction of a power house for the new tuberculosis sanatorium has been awarded to Clynes & Leamy, at \$49,516.

**SYRACUSE, N. Y.**—The North Syracuse Lt. & Pwr. Co. has applied to the Public Service Commission for permission to erect transmission lines to connect the townships of Cicero and Hastings and the village of Central Square.

**WEEDSPORT, N. Y.**—According to the decision handed down by Supreme Court Justice Sutherland in Syracuse, the village of Weedsport has the right to build a municipal light and power plant. The Weedsport El. Lt. Co. owns a franchise and claimed that the village had not the right to build a power plant.

**PHILADELPHIA, PA.**—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Aug. 29 for two 500-kw rotary converter sets for the navy yard at Philadelphia. Specifications can be obtained on application to the bureau or to the commandant of the navy yard named. H. R. Stanford is chief of bureau.

**ALBANY, N. Y.**—Plans are being considered by Robert Swan, director of public service, for the installation of an ornamental street-lighting system on Oliver Street, between Smithfield Street and Hudson Avenue.

**WILKES-BARRE, PA.**—The Borough Council has approved an ordinance providing for a loan of \$390,000, in which is included an item of \$45,000 for underground conduits for power and fire-alarm wires and also a system of conduits for wires and cables.

**BAYONNE, N. J.**—The Public Service El. Co. has submitted a proposition to the City Council providing for installing wires in underground conduits. The company agrees to expend \$25,000 on the work the first year and \$10,000 each year thereafter until completed.

**VENTNOR CITY, N. J.**—The City Council has authorized the \$20,000 to install a police and fire-alarm system. Ventnor City has not a post office.

**WILMINGTON, DEL.**—Bids will be received by the New Castle County Building Commission and the Wilmington Building Commission at the office of the commission, corner of Market and Tenth Streets, Wilmington, until Aug. 21 for plumbing, heating and ventilating, electric wiring, timber framing, granite, marble work, etc., for the new county building for the county of New Castle and the municipal building for the city of Wilmington. Separate proposals are to be submitted for each department of the work. Plans and specifications and blank form for proposals may be obtained at the office of the commission, upon deposit of \$10, which will be returned upon return of same. Thomas F. Gormley is secretary of the commissions.

**CUMBERLAND, MD.**—The City Council is considering the purchase of a 300-kw generator for the municipal electric-light plant, at about \$12,000.

**RISING SUN, MD.**—At an election held Aug. 3 the proposal to issue bonds for a municipal electric-light plant and water-works system was carried.

**STAUNTON, VA.**—Within the next 30 days the Staunton Lig. Co. expects to purchase three 50-kva, 2300-440-volt transformers. The company is now erecting a cooling tower, material for which has been

purchased. W. F. Eicklen, Jr., is superintendent.

**WASHINGTON, D. C.**—Bids will be received by the Secretary of the Interior, Department of the Interior, Washington, D. C., until Aug. 18 for furnishing material and labor for the installation of cement pavements, conduits and manholes in Seventh Street and G Street basement corridors of the Patent Office Building; also until Aug. 25 for furnishing material and installation of cables in conduits, manholes, switches, circuit-breakers, etc., and connecting same ready for use in F Street Northwest and in the old Post Office and Pension Buildings, Washington, D. C., in accordance with plans and specifications on file at the office of the chief clerk of the department.

**WASHINGTON, D. C.**—Bids will be received at the office of the chief signal officer, War Department, Washington, D. C., until Aug. 18 for furnishing material, under Proposal 711 as follows: 550 lighting arresters with fuses; 100 complete carbor sets No. 84 Western Electric switchboard protectors; 400 chromac for Fuller cells; 250 heat coils, Western Electric code No. 67, for common-battery switchboard; 40,000 paper splicing sleeves, 3/16 in. by 1/2 in.; 500 pairs choke coils for Mason arresters equipped with carbon blocks and mica insulators; 10 telephone bell extensions, 1000 ohms, mounted in wooden box; 24 closed-circuit, legless telegraph key, 150 No. 17 electrose insulators; 25 10-amp, type 2 fuses; 25 6-amp, type 3 fuses.

**WASHINGTON, D. C.**—Bids will be received at the office of the chief signal officer, War Department, Washington, D. C., until Aug. 20, under Proposal 713, for furnishing the following supplies: For 50,000 ft. flexible-steel armor, galvanized, lead-sheathed, rubber-insulated, one-pair type 251 cable (to be delivered on reels of 1000 ft. each); 500 ft. 20-pair, switchboard, telephone cable (Western Electric Code 24); 6000 ft. 40-pair, Washington, D. C., wire (seven-strand, each strand 32 mils); 2000 ft. 162-mil, rubber-insulated and double-braided solid copper wire (National Electric code standard, 100 ft. of cross connecting wire (Western Electric 19 S. & S. gauge, insulated with flame-proof braid); 60,000 ft. 40-mil inside, twisted-pair wire; 10,000 ft. 3/4-in. Siemens-Martin messenger strand wire (ultimate breaking strength 6800 lb.); 359,000 ft. 45-mil copper-clad, twisted-pair, outside-distributing wire; 40,000 ft. 36-mil house wire; 10,000 ft. 36-mil pothead wire.

**WASHINGTON, D. C.**—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Aug. 25 for furnishing material for navy yards as follows: Brooklyn, N. Y., Schedule 7158—102,400 lb. A composition tubes (5/8 in. and 3/4 in. outer diameter, 10 ft. and 12 ft. in. long), 3500 lb.; 24,100 lb. brass tube sheets and 11,100 lb. supporting plates. Boston, Mass., Schedule 7156—5000 lb. 0.029-in. diameter bronze phosphor wire. Bids will be received until Sept. 1 as follows: Brooklyn, N. Y., Schedule 7166—500 watertight portables, type H, without globe, 1500 composition unions (unfinishing ground, one joint low pressure). Norfolk, Va., Schedule 7172—one automobile ambulance. Philadelphia, Pa., Schedule 7173—one 12-kw, 110-volt, Roentgen-ray machine, high-frequency apparatus and lead shield. Bids will be received until Sept. 8 as follows: Mare Island, Cal., Schedule 7171—50,000 lb. copper ground rod, 1 in. lb. ingots, 1500 lb. soft rolled copper, 525 lb. refined copper (prismatic type J, K and L), 100 boiler tubes (2 in. outside diameter, 6 ft. 3 in. long, 0.019 in. thick), 1750 seamless, cold-drawn, steel boiler tubes, 510 ft. welded lap steel tubing, 237 ground joint, rough brass, hexagon or octagon unions. Pearl Harbor, Hawaii, Schedule 7166—miscellaneous wire, 1000 ft. of lead cord, steel conduit, lock nuts, bushings, switches, etc.

## North Central

**HOLLAND, MICH.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Sept. 9 for construction complete, including mechanical equipment, interior lighting fixtures and other appurtenances of the United States post office at Holland, Mich. Drawings and specifications may be obtained at the above office or from the custodian of site at Holland. O. Wenderoth is supervising architect.

**MARQUETTE, MICH.**—Work will soon begin on improvements to the municipal electric-light plant, to cost about \$2,500. The work will include the removal and replacing bents under the penstock which carries the water from the upper dam to the power station.





started by the J. B. McCreary Co. of Atlanta, Ga. The J. B. McCreary Co. is now in possession of the franchise.

**WINNEBAGO, ILL.**—At an election held Aug. 10 the proposal to issue \$50,000 in bonds, the proceeds to be used for condensing water works and sewerage, was not carried. The J. B. McCreary Co. of Atlanta, Ga., is engineer in charge. The J. B. McCreary Co. is engineer in charge of the construction of electric light plant.

**AMERICUS, GA.**—The American Public Utility Co. and the American Pwr. Co., it is reported, have been consolidated under the name of the American Pwr. Co. The State Railroad Commission has authorized an issue of \$225,000 in new securities. It is understood that one plant will be dismantled and sold and the remaining plant will be operated by the new company. The new company is to be organized by J. B. McCreary, president, and J. B. McCreary, vice-president, and Frank Luther, secretary and treasurer.

**CLARKSVILLE, GA.**—Plans are being made for the installation of an electric light plant in Clarksville. A water power site has been located within 1 mile of the city where sufficient power can be developed. Tentative plans, it is reported, are being made for the erection of a steam plant at the site on the river where the dam is to be built, to be used while the dam is being constructed and to be kept for use in emergencies when the water power is available. W. C. Brown and W. R. Polk, of Atlanta, Ga., electrical engineers, have charge of engineering work.

**CLEARWATER, FLA.**—The City Council has granted C. H. Evans and others a franchise to construct an electric light plant in Clearwater. The franchise will be submitted to the voters for approval on Oct. 20.

**MARIANNA, FLA.**—At an election to be held Oct. 20 the proposal to issue \$50,000 in bonds for the purpose of making improvements and extensions to the municipal electric light plant will be submitted to the voters.

**OMVEDO, FLA.**—The installation of an electric light plant and ice factory in Omvedo is under consideration. M. M. Smith, of Ocala, is interested in the project.

**ZOLFO, FLA.**—The Zolfo El Co., recently organized, is planning to install an electric light plant. The equipment to consist of a 100-hp engine and a 50-hp boiler will be supplied by the Zolfo El Co. The Zolfo El Co. is planning to install a 100-hp engine and a 50-hp boiler will be supplied by the Zolfo El Co. The Zolfo El Co. is planning to install a 100-hp engine and a 50-hp boiler will be supplied by the Zolfo El Co.

**JACKSON, TENN.**—The Jackson Ry. & Co. contemplates the purchase of a new electric light plant for the city of Jackson. The plant will be used for the city of Jackson. The plant will be used for the city of Jackson. The plant will be used for the city of Jackson.

**RAY MINETTE, ALA.**—The citizens of Ray Minette have voted to issue \$5,000 in bonds for the installation of a municipal electric light plant. The plant will be used for the city of Ray Minette. The plant will be used for the city of Ray Minette. The plant will be used for the city of Ray Minette.

**DETNA, LA.**—The City Council is considering a number of public improvements, including a street-lighting and water supply system.

**MAGNUM, OKLA.**—The citizens of Magnum, Okla., voted to issue \$10,000 in bonds for the installation of a municipal electric light plant. The plant will be used for the city of Magnum. The plant will be used for the city of Magnum. The plant will be used for the city of Magnum.

**BOGATA, TEX.**—A stock company has been organized for the purpose of installing an electric light plant in Bogata. The plant will be used for the city of Bogata. The plant will be used for the city of Bogata. The plant will be used for the city of Bogata.

**EL RIO, TEX.**—Within the next eight months the City of El Rio, Tex., expects to have a new electric light plant for the city of El Rio. The plant will be used for the city of El Rio. The plant will be used for the city of El Rio. The plant will be used for the city of El Rio.

**PORT WORTH, TEX.**—An ornamental electric light system is being installed on the Main Street and West Seventh Street, consisting of 64 standards carrying ornamental lamps, maintained by underground conduit, at a cost of \$25,000. The lamps were and the material for the other has been purchased. The City Light Department is in charge of the work. C. F. Crabtree is superintendent and chief electrician.

**GEORGE WEST, TEX.**—Bids will be received until Aug. 24. It is reported by George W. West, of San Antonio, that the city of George West, Tex., has decided to install a waterworks system in George West, to cost \$125,000. Bartlett, Ranney, 105 East Crockett Street, San Antonio, are consulting engineers.

**FALLS CHURCH, TEX.**—Within the next four months Charles H. Trego, owner of the electric light plant, expects to purchase one 50-hp engine, possibly a three-phase dynamo (not connected); also apparatus necessary to use raw water.

**PALESTINE, TENN.**—The Palestine Electric Co. is now in possession of the franchise for the installation of an electric light plant in Palestine. The plant will be used for the city of Palestine. The plant will be used for the city of Palestine. The plant will be used for the city of Palestine.

**ROBY, TENN.**—The Roby Electric Co. is now in possession of the franchise for the installation of an electric light plant in Roby. The plant will be used for the city of Roby. The plant will be used for the city of Roby. The plant will be used for the city of Roby.

**SEVEN, TENN.**—Within the next three months the Seven Electric Co. is planning to install an electric light plant in Seven. The plant will be used for the city of Seven. The plant will be used for the city of Seven. The plant will be used for the city of Seven.

**THREE RIVERS, TENN.**—The Three Rivers Electric Co. has decided to install an electric light plant in Three Rivers. The plant will be used for the city of Three Rivers. The plant will be used for the city of Three Rivers. The plant will be used for the city of Three Rivers.

**CHEHALIS, WASH.**—The City Commission is contemplating the purchase of the local electric-lighting system owned by the Washington Oregon Power Co. The system has been appraised to look into the proposition.

**EDMONDS, WASH.**—The County Commissioners have granted the Edmonds Pwr. & Pwr. Co. a franchise to extend its transmission lines in Snohomish County.

**SEATTLE, WASH.**—The Board of Public Works has awarded the contract for furnishing the city lighting department with electric lamps to the Pacific Lamp & Supply Co. on its bid of \$80,000.

**STELLACOOM, WASH.**—Bids will soon be received, it is reported, by Joseph Brown, of Seattle, for furnishing materials, excepting poles, for the erection of a transmission line from the city limits of Steilacoom to and within the city limits of Shelton. Plans and specifications are on file in the office of the town clerk.

**TOLEDO, WASH.**—Subscribers have been completed by the Independent Electric Co., a subsidiary of the Washington Oregon Power Co., of Vancouver, Wash., for the extension of its transmission lines from Winlock to Toledo. Work will soon begin on the erection of same. When the line is complete a 24-hour service will be established in Toledo.

**HOOD RIVER, ORE.**—An application has been made to John H. Lewis, state engineer, by August Orger, of Hood River, for permission to appropriate sufficient water from the Hood River to develop 2000 hp. It is understood that Mr. Orger intends to build a hydroelectric plant and supply farmers in Hood River Valley with electric power for lamps and motors.

**REDFORD, ORE.**—The Oregon-California Pwr. Co. is contemplating the erection of a transmission line from its present plant at Redford, Cal., through Redford, to Canby, Ore., at a cost of from \$10,000 to \$20,000. The line, it is expected, will be extended into the Myrtle Creek district and eventually as far north as Roseburg. Messrs. Alenderfer & Kronmiller are representing the company.

**HEMET, CAL.**—The Southern Sierras Pwr. Co. and the city of Hemet, Cal., have submitted a proposal to the City Council for lighting the streets of the city.

**LOS ANGELES, CAL.**—Plans have been prepared for the installation of a new fire alarm and police-signal system in Los Angeles, to cost about \$200,000.

**PORTERVILLE, CAL.**—The city officials are considering the question of establishing a municipal electric and gas plant in Porterville.

**BOISE, IDAHO.**—The Idaho-Oregon Lt. & Pwr. Co., with headquarters in Boise, has resumed work on its Oxbow plant, the construction of which has been held in abeyance, owing to financial difficulties. W. J. Ferris, engineer, has recently completed arrangements for the installation of a 2000-kva Westinghouse generating unit.

**SALMON CITY, IDAHO.**—The Salmon River Lt. & Pwr. Co. recently incorporated with a capital stock of \$100,000, proposes to build a power plant on the Salmon River and erect transmission lines throughout the county.

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company. The others are: C. L. MacFarland, president; H. H. Brown, vice-president; J. B. Brown, secretary; R. H. Brown, treasurer; and J. B. Brown, engineer.

**EL PASO, TEX.**—At an election held Aug. 10 the proposal to install a municipal electric light plant was carried. The plant will be used for the city of El Paso. The plant will be used for the city of El Paso. The plant will be used for the city of El Paso.

**PHOENIX, ARIZ.**—The franchise and engineering contract for the Salt River Valley El. Co. has been awarded to R. W. Martin, of New York City. The company, who are to construct an interurban electric railway between Phoenix and Mesa, via Tucson, a distance of 18 miles. A power plant and will be built in connection with the project.

**ANACONDA, MONT.**—The City Council has passed an ordinance providing for the installation of electric lamps on Commercial Avenue, for which bids will soon be asked.

**BOULDER, COLO.**—The stockholders of the Northern Colorado Pwr. Co., of Boulder, have voted to change the name of the company to the Western Lt. & Pwr. Co. and to increase the capital stock from \$1,000,000 to \$1,500,000.

## Canada

**CALGARY, ALTA.**—A by-law authorizing an expenditure of \$300,000 for extensions to the municipal electric-light plant has been approved by the ratepayers.

**VANCOUVER, B. C.**—Preliminary investigations and estimates are being made by the Canadian Northern Ry. Co. for developing the water-powers of the Sumas and Nicolaean Rivers.

**STONY MOUNTAIN, MAN.**—The Winnipeg, Selkirk and Interlake Ry. Co. is contemplating the construction of a new substation at Stony Mountain.

**BOLTON, ONT.**—The ratepayers on Aug. 3 voted in favor of the proposal to contract with the Hydro-Electric Power Commission to furnish electricity in Bolton. About \$6,000 will be required to remodel the power plant. The transmission line will be extended from Weston and Woodbridge to Bolton.

**ORILLIA, ONT.**—Tenders will be received by the Town Council until Aug. 24 for furnishing equipment under water works specifications as follows: (A) Contract (B) furnishing and erecting motor-driven turbine pumps and equipment for furnishing and erecting a Diesel oil engine and appurtenances; (C) furnishing and erecting of a mechanical pressure-type filtration plant. W. K. Greenwood, is engineer.

**PORT ARTHUR, ONT.**—The City Council has awarded the contract for the erection of a pumping station to the Thunder Bay Contracting Co. at \$15,000. The equipment will consist of three motor-driven pumps and three pumps having a capacity of 200 gal. per minute under 30-ft. head.

**TORONTO, ONT.**—Tenders will be received by W. C. Wilkinson, secretary and treasurer of board of education of Toronto, until Aug. 28 for construction of High School of Commerce (new building). Specifications may be seen and all information may be obtained at the municipal superintendent of buildings, City Hall.

**ALMA, QUE.**—Plans are being considered, it is reported, by a New York syndicate, in which H. E. Scott, 3 Ste. Genevieve Avenue, Quebec, is interested, for the construction of a power plant for the erection of pulp and paper mills at Jonquière, 20 miles distant, to cost approximately \$4,000,000. Alma has not a post office.

**MENA, ARK.**—The Bear State Pwr. & Development Co. has been incorporated with a capital stock of \$25,000 by J. D. Thayer, J. W. Bradley and Minor Pipkin.

**ZOLFO, FLA.**—The Zolfo El Co. has been organized with a capital stock of \$100,000 to install an electric-light plant. The officers are: H. G. Murphy, president; Fitz Williams, vice-president; J. I. Roberts, secretary; and A. C. Skipper, treasurer.

**WATERLOO, IA.**—The Cedar Valley Pwr. Co. has been organized with a capital stock of \$1,000,000. The officers are: H. G. Murphy, president; Fitz Williams, vice-president; J. I. Roberts, secretary; and A. C. Skipper, treasurer.

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# Weekly Record of Electrical Patents

## UNITED STATES PATENTS ISSUED

AUG. 4, 1914.

[Prepared by Robert Starr Allen, 16 Exchange Place, New York, N. Y.]

- 1,105,629. **FOUR-PARTY KEY:** A. F. Dixon, Newark, N. J. App. filed July 15, 1911. Simplification in the mounting and construction of the keys.
- 1,105,636. **ELECTRIC FURNACE PROCESS AND ELECTRIC FURNACE:** C. Hering, Philadelphia, Pa. App. filed July 15, 1911. Molten mass in tubes is connected with the electrodes and constitutes the resistor. (Fifty-three claims.)
- 1,105,659. **SPARKING DEVICE FOR INTERNAL-COMBUSTION ENGINES:** G. Honold, Stuttgart, Germany. App. filed July 29, 1910. Electromagnetic spark plug.
- 1,105,662. **INSULATED TROLLEY CROSSING:** F. C. Hornstein, Indianapolis, Ind. App. filed March 6, 1911. Parts made readily separable.
- 1,105,664. **INSULATED CLEAT:** B. G. Jones, Malden, Mass. App. filed July 29, 1912. Wooden button concaved on under side to grip wires.
- 1,105,636. **SPEED GOVERNOR FOR PRIME MOVERS:** G. Rennerfelt, Turbino, N. Y. App. filed Oct. 16, 1908. Turbine control; avoids "hunting."
- 1,105,716. **SYSTEM OF DISTRIBUTION:** E. Thomson, Swampscott, Mass. App. filed Aug. 4, 1911. Reduces voltage in alternating-current circuits when current therein exceeds the amount contracted for.
- 1,105,717. **OZONE PRODUCER:** H. A. Thomson, Glasgow, Scotland. App. filed Aug. 5, 1912. Embodies glass cylinders having internal and external electrodes of wire cloth.
- 1,105,738. **BOILER-FEED SYSTEM:** J. Wilkinson, Boston, Mass. App. filed May 31, 1912. Lamps indicate when the boilers of a "battery" are delivering their proportionate load.
- 1,105,741. **CURRENT CONDUCTING AND DISTRIBUTING DEVICE FOR INTERNAL-COMBUSTION ENGINES:** F. A. Zika, Chicago, Ill. App. filed June 9, 1913. Connections from the spark plugs mounted in a holder, the ends of the connections being exposed and directly engaged by a distributor arm and the holder being oscillatable for advancing or retarding ignition.
- 1,105,754. **ELECTRIC-TRAIN DISTRIBUTION:** E. R. Carichoff, Schenectady, N. Y. App. filed March 24, 1913. When the trolley of any car is removed the transforming device of that car is prevented from supplying energy to any other circuit in the car.
- 1,105,761. **RELAY SHORTRCUT ATTACHMENT:** S. L. Dickson, Short Creek, W. Va. App. filed Sept. 2, 1913. Adjustable diaphragms engaged by the armature lever.
- 1,105,764. **APPARATUS FOR MAKING WELDED TUBING:** W. C. Frick, Deal Beach, N. J. App. filed July 19, 1909. Electrically heats first end edge and then the opposite edge of the skelp.
- 1,105,765. **APPARATUS FOR WELDING TUBING:** W. C. Frick, Deal Beach, N. J. App. filed July 19, 1909. Has grooved feeding rolls which are electrically connected.
- 1,105,766. **INDIVIDUAL CALLING KEY:** M. F. Geer and R. C. Leake, Rochester, N. Y. App. filed May 10, 1911. Governs the starting and stopping of generator to furnish current for the impulses.
- 1,105,770. **MINIATURE ELECTRIC LAMP:** H. E. Gustafson, Pueblo, Col. App. filed Feb. 25, 1914. Attachment for the under side of the cover of a "talking machine."
- 1,105,771. **SEARCHLIGHT MECHANISM:** J. L. Hall, Schenectady, N. Y. App. filed April 21, 1910. Special mounting and adjustment for the electrodes.
- 1,105,753. **COOLING ELECTRICAL APPARATUS:** H. M. Hobart, Schenectady, N. Y. App. filed Nov. 11, 1913. Prevents condensation of moisture from the air within a transformer tank by cooling the entering air.
- 1,105,787. **APPARATUS FOR IGNITION OF REVERSIBLE INTERNAL-COMBUSTION MOTORS:** G. Honold, Stuttgart, Germany. App. filed March 19, 1910. Special polar construction of magneto-electric generator.
- 1,105,793. **AUTOMATIC SIGNALING DEVICE:** P. C. Johnson, Halifax, Canada. App. filed April 10, 1913. Contacts for rear

auto signal operated by turning of steering wheel.

- 1,105,795. **FLEXIBLE TUBING:** W. A. Johnston, Prince's Bay, N. W. App. filed May 23, 1913. Has an embedded electrical conductor for heating an anesthetic passing therethrough.
- 1,105,806. **COMPUTING SCALE ILLUMINATING DEVICE:** C. B. Longstreth, Dayton, Ohio. App. filed Jan. 4, 1909. Has an auxiliary scale-controlled circuit which controls the lighting circuit.
- 1,105,811. **SEQUENCE SWITCH:** F. R. McBerly, New Rochelle, N. Y. App. filed Sept. 5, 1908. Embodies a rotary shaft and a series of cams and switch springs.
- 1,105,823. **AUTOMATIC SWITCH ARRANGEMENT:** L. C. Nicholson, Buffalo, N. Y. App. filed Jan. 26, 1912. Automatically inserts a new fuse when a fuse blows.
- 1,105,829. **ELECTRIC SIGNALING MECHANISM:** O. D. Plummer, C. H. Hauser and E. A. Warner, Altoona, Pa. App. filed April 24, 1913. Automatically replaces a burnt-out lamp in a signal.
- 1,105,837. **SIGNAL-RECEIVING DEVICE:** C. S. Rhoads, Jr., Sandwich, Ill. App. filed Aug. 8, 1911. Substation receiving device for use in signaling systems.
- 1,105,842. **SUBSTATION SIGNALING APPARATUS:** H. O. Rugh, Sandwich, Pa. App. filed Dec. 14, 1911. Sluggishly acting magnet for controlling the operation.
- 1,105,843. **CONTROL SYSTEM:** H. O. Rugh, Sandwich, Pa. App. filed Aug. 26, 1912. For selectively calling any of a plurality of stations along a railway signaling circuit.
- 1,105,859. **ELECTRIC FURNACE:** E. Stassano, Turin, Italy. App. filed Oct. 15, 1913. Electric furnace which can be adjusted by hand to regulate the height of its casting outlet.
- 1,105,860. **SIGNALING SYSTEM:** C. Stephens, Barton Heights, Va. App. filed Aug. 31, 1909. Automatic operation of semaphores on single track.
- 1,105,883. **FAULT LOCALIZER:** E. E. Freighton, Schenectady, N. Y. App. filed May 14, 1913. For cable transmission systems; metallic sheath of cable is divided into insulated sections.
- 1,105,887. **ARC-LOUP ELECTRODE:** C. W. Day, Chicago, Ill. App. filed April 12, 1912. Has tungsten or like metallic sheath of high fusing point which resists disintegration.
- 1,105,888. **CONNECTOR:** G. St. J. Day, Oldsmar, Md. App. filed May 26, 1913. Terminal grips wire end without use of fixing screws.
- 1,105,907. **CONTACT SWITCH-BOX:** S. R. Hippie, Williamsport, Pa., and W. L. Connelley, Mechanicsville, Md. App. filed July 17, 1912. For supplying propelling current to motors of car passing over track.
- 1,105,908. **INCANDESCENT ELECTRIC LAMP:** J. E. Deches, Pittsburgh, Pa. App. filed Dec. 15, 1912. Spiral wound filament braced at the center and wound closer at the apex where braced.
- 1,105,920. **TELEGRAPHY:** L. M. Potts, Baltimore, Md. App. filed June 17, 1909. Automatic transmitter and other features. (Forty-nine claims.)
- 1,105,921. **PUNCHING MACHINE:** L. M. Potts, Baltimore, Md. App. filed June 17, 1909. For punching the sheets used on automatic telegraph transmitters. (Fifty-one claims.)
- 1,105,922. **TELEGRAPHY:** L. M. Potts, Baltimore, Md. App. filed June 17, 1909. Combined receiver and manual transmitter.
- 1,105,923. **RAILWAY SIGNALING OR TRAIN CONTROL:** F. W. Prentice, Toronto, Ontario, Canada. App. filed March 27, 1911. Generator of Hertzian waves controlled by conditions of safety to propagate such waves.
- 1,105,924. **TELEPHONE:** E. S. Pridham and P. L. Jensen, Napa, Cal. App. filed Aug. 20, 1913. Special receiving apparatus.
- 1,105,938. **LOCK FOR PORTABLE ARTICLES:** J. Tertilt, Glendale, Cal. App. filed April 21, 1913. Locking pin which engages lamp base has a frusto-conical key-receiving head.
- 1,105,962. **ELECTRICALLY HEATED DEVICE:** J. E. Carlson, New Britain, Conn. App. filed Dec. 4, 1913. Curling iron.
- 1,105,984. **APPARATUS FOR THE PRODUCTION**

OF CONTINUOUS ELECTRICAL OSCILLATIONS: H. Manders, London, Eng. App. filed Oct. 30, 1909. Condenser electrode of block form having flattened discharge area.

- 1,105,995. **FACTORY TAG OR TICKET-MAKING APPARATUS:** C. H. Nichols, Haverhill, Mass. App. filed June 7, 1909. Cost system for factory; employs special card-punching mechanism. (Seventy-two claims.)
- 1,106,001. **TELEGRAPH REPEATER:** G. L. Rawdon, Cleveland, Ohio. App. filed April 24, 1913. Embodies a triple-wound magnet.
- 1,106,029. **TREATMENT OF SEED GRAIN:** H. E. Fry, Godmanstone, Dorchester, England. App. filed Oct. 10, 1913. Places in a solution of manure through which an electric current is passed.
- 1,106,053. **CONNECTOR:** L. C. Nichols, Milwaukee, Wis. App. filed Dec. 29, 1909. Clamp in form of a single sleeve-like member having two separated tubular wire-receiving portions.
- 1,106,072. **FRANGIBLE COVERED GUARD:** C. E. Beach, Birmingham, N. Y. App. filed Feb. 5, 1914. For fire-alarm box key.
- 1,106,092. **TRAIN CONTROLLING AND STOPPING SYSTEM:** G. R. Guild, Fort Bayard, N. M. App. filed June 2, 1913. Electrics and mechanical devices on track bed to operate with train.
- 1,106,095. **ELECTRICAL BATTERY:** A. S. Hubbard, Belleville, N. J. App. filed Apr. 22, 1911. Insulating supports for the cells of storage battery and lead lining protected from corrosion.
- 1,106,116. **REMOTE-CONTROL SYSTEM:** W. M. Scott, Philadelphia, Pa. App. filed Feb. 23, 1907. Motor operating always in one direction serves for operation switch in both directions.
- 1,106,118. **SWITCHBOARD PLUG:** L. I. Snyder, White Lake, S. D. App. filed May 17, 1909. Has a contact tip and handle portion formed at an angle thereto.
- 1,106,125. **BATTERY:** W. E. Winship, New York, N. Y. App. filed Jan. 24, 1913. Secondary; has a tank of porous structure.
- 1,106,126. **OPERATING DEVICE FOR ELECTRIC SWITCHES:** A. T. Ytterberg, Wisk, Sweden. App. filed March 30, 1910. Special arrangement of electromagnet. (Forty claims.)
- 1,106,134. **SIGNAL FOR MOTOR VEHICLE:** J. B. Cole, St. Louis, Mo. App. filed March 31, 1913. Semaphore arm carried in lamp housing which is normally received in lamp housing.
- 1,106,151. **FIRE-ALARM SYSTEM:** G. Matthews, Uniontown, Pa. App. filed May 13, 1913. Fuse sets off alarm at visual signals.
- 1,106,166. **ELECTRIC FURNACE:** N. Testro, London, England, and T. Rigby, Dundee, Scotland. App. filed Dec. 6, 1913. Smelting furnace, peat used as fuel.
- 1,106,168. **CABLE HOOR:** A. E. Berg, Holden, W. Va. App. filed July 18, 1913. For "gathering locomotives"; has a fit which blows out on overload.
- 1,106,187. **ELECTROMAGNET AND SIMILAR APPARATUS:** F. Bossu, Paris, France. App. filed Dec. 14, 1912. Automatic compensates for reluctance.
- 1,106,230. **CONTACT INTERRUPTER:** A. Maitre and V. H. Martin, Rouen, France. App. filed Aug. 11, 1909. For vibrati bells.
- 1,106,251. **TIME SWITCH:** M. Chivell, New York, N. Y. App. filed April 1913. For illuminated signs.
- 1,106,284. **ACCOUNTING SYSTEM:** W. Crumpton, Evanston, Ill. App. filed Jan. 28, 1909. For accounting time in wages of workmen.
- 1,106,295. **ELEVATOR DOOR SAFETY DEVICE:** E. M. Fraiser, San Francisco, Cal. App. filed Oct. 21, 1911. Prevents start when any door is open.
- 1,106,334. **CAR HEATER:** W. S. Menck, Brooklyn, N. Y. App. filed March 1913. Utilizes the heat produced by a motor.
- 1,106,347. **ELECTRODE FOR WELDING:** A. Herrick, New York, N. Y. App. filed Nov. 29, 1912. Of laminated structure with the laminas disposed transversely to the line of current flow.

# Electrical World

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## The Price of Neutrality

In none of his utterances has President Wilson given better evidence of his statesmanship and appreciation of his mission as a real leader than in the appeal for reason in war discussions here. More than any other country in the world, this nation has drawn people from all lands. These people have strong affections and ties which still bind them in sympathy with the nations at war. Only the short time that has passed, scarcely measured by weeks, is necessary to show that efforts will be made from both without and within to drag this country into the conflict. In his solemn word of warning against "that deepest, most subtle, most essential breach of neutrality" which may spring out of "passionately taking sides" Mr. Wilson voices from his high position the sober wish of thinking people that this country may keep out of the war. There is a cost or compensation about all things. Like other things, neutrality has its price. If that price is the closely guarded expression which the President believes is necessary, let us willingly pay the price. Without wavering Mr. Wilson bent all his efforts and influence toward honorable peace in Mexico. We do not need to read his latest words to know that if peace is possible he is for peace. Our opportunity does not lie in war but in a control which will fit us, alone of all the nations of the world, to act for peace when the hour is ripe. Twice have the President's recent statements shown that he is not unmindful of that opportunity by which this country can serve the world and promote its lasting peace.

## Money Available for Public Utilities

Bankers generally are of the opinion that the new federal reserve act will have a decidedly favorable influence on the financing of public utilities. Formerly, owing to its antiquated banking laws, this country was in the position of the merchant who carried continually in his cash drawer a great deal more money than he ever used. We have been keeping a much larger reserve of gold than any other civilized nation in proportion to the amount of business being transacted. Credit has been unevenly distributed and could not always be used when and where it was needed. The new banking act will set much of the idle money to work. By making a great reduction in reserve requirements it will release a large volume of funds after the new needs of the federal reserve banks are complied with. The possible danger of inflation at the beginning of this period has been foreseen and will be guarded against. Adjustment to changed conditions will be quick, and then the far-reaching effects of the increase

in this country's working capital will be felt. Even if there are no changes in business methods, credit will be cheaper and more evenly diffused. It will be more steady, and those who are entitled to it will find it promptly available. This will come at an especially opportune time for public utilities in all stages of establishment. Its effect should be particularly apparent in the opening up of fields that have remained undeveloped under old conditions. Financing extensions of developed enterprises should proceed on a steadily increasing scale, and after readjustment to changes brought about by the European industrial stagnation, the electrical industry in this country should enter on a new era of progress and prosperity.

## Central Stations and the War

So far as war costs are visited on central stations in this country they will come from the condition of general business. Assuming continued neutrality by this nation, it is plain beyond argument that business interests will keep trade active. In this effort they will have the support and co-operation of bankers. As a people we are wasteful and extravagant in buying and consuming and, even with hostilities among European countries, there will still be a wide market here for our own goods. This means activity, although the exact measure of that activity can be gaged more accurately a little later when the situation is steadier than it is under the first shock of war. The consumption of electrical energy will go on. The load for residence lighting represents one of the first household necessities. The load for motor service is affected by the vicissitudes of business. If manufacturing is curtailed, this load, so far as it represents connected service, will be reduced. But there is a fine element of strength in the electrical industry which differentiates it from many other forms of business. Its markets have not yet reached the saturation point. Some years later, when they do, the increases in gross revenue will not be so astonishing. But until they do there are always encouraging openings for new contracts that help to overcome the reduction in demand from existing installations. From the standpoint of gross business central stations can make a showing that will again prove the virility of the electrical industry. Until banking conditions are restored to their normal state operators of central stations will pay heed to the temporary cost of capital. Generally, financing will be postponed until the banking situation is cleared. The banks have complete control and will not relax precautions until they are confident that such action is entirely safe. Local banks in communities of



independent wealth are desirable financing agencies for central stations under the conditions prevailing now, when necessary financing is likely to be temporary. Central stations have ordinarily a rate of growth that can be forecast accurately, and it is therefore usually the case that they are well prepared in advance against disturbance in the money market.

### The Fort Worth Generating Station

Despite the leveling effect of standardization in equipment, the large Texan plant described elsewhere in our columns is somewhat notable in a number of features. The steam plant in particular is worthy of comment as it is specialized to meet the conditions of local fuel supply. It is designed to utilize efficiently the rather low-grade Texas and Oklahoma coals and incidentally to work with natural-gas firing. Coal is conveyed by a crane from cars or from storage bins and dumped into the large suspension bunkers, whence it may be shot down to the mechanical stokers. A crusher traveling the whole length of the bunkers on rails can receive coal from the crane bucket and discharge it into the bunkers if the shipments require this treatment. The plant is worked at high steam pressure and superheat as befits the economical use of turbines. One boiler has been fitted with burners for natural gas in addition to its regular setting, and steam can thus be raised in seven minutes if necessity requires.

The water supply involves some unusual features. The feed water comes from wells 1200 ft. in depth, being pumped by the air-lift method. Water for condensation is obtained from the river, when water is available, through the use of a cooling pond. The intake pipe opens into the deepest part of the pond near the dam, while the condenser discharge goes into the stream 200 yd. above, only the cooled portion getting back into the intake, as the upper layers of warm water pass off over the spillway. The river supply is also utilized for an under-water coal-storage pit built of reinforced concrete to hold 6000 tons. When the river runs almost dry reliance is placed on four large cooling towers for the service of which turbine-driven boosting pumps are thrown in to assist the ordinary motor-driven circulating pumps.

Another unusual feature of the plant is the distributing voltage of 4000 for the local service. The neutrals of the star-wound generators are solidly grounded; the transformers are arranged to be put in "star" at 4000 volts or in "mesh" at 2300 volts as occasion requires. Several transformers are arranged to transform from three-phase to two-phase for supplying energy to a large number of two-phase motors which were in use before the older plant was replaced by the present station. Much energy is also delivered at 60,000 volts to the lines of the Texas Power & Light Company. The details of the system seem to have been very thoroughly worked out, and the plant represents a capital example of meeting effectively the requirements of a somewhat unusual situation.

### Prosperous Farmers and Electric Service

With assurance of exceptionally heavy crops throughout America and an unprecedented foreign demand for American agricultural products, the farmer's of this country are justified in expecting unusual prosperity to be upon them before the year's end. The maximum amount to sell at the maximum price per unit sold is what the immediate future seems to have in store for them. On the basis of prices during peace, it has been estimated that the total value of this year's crop in the United States will be at least \$11,000,000,000. Just how high the prices will rise as a result of the European consumption it is difficult to predict, but it is safe to state that the farmers will have considerably more money to spend than usual this fall and winter. Manufacturers of electrical apparatus are aware of this prospect, and some of them are planning to take advantage, if they can, of the opportunity thus presented. This is particularly true of the makers of farm-lighting sets. These outfits usually consist of a gasoline engine, a generator, a storage battery, an automatic voltage regulator, a small switchboard and two or three measuring instruments. A large number of these sets have been sold for the lighting of country homes, and it is believed that with the growing prosperity of the farmer a special effort will be made to interest him in electrical conveniences. It has been said that these isolated plants should not be regarded as competing with the central station where the latter is making an effort to extend its lines into the country to serve farmers. The manufacturers, or at least some of them, contend that they are educating the farmer and the farmer's wife in the use of electrical conveniences, and when the rural user has become accustomed to electricity he will demand such service as can best be supplied by the central station. Whether this theory is correct or fallacious, it is an undoubted fact that there are many places where the farmer would be deprived of the benefits of electricity unless supplied by an isolated plant. In these situations it would seem that no one interested in the electrical industry could oppose the installation of isolated service. Where there is a chance for competition, each case must be decided on its merits.

### Formation of Export Associations

The suggestion for the formation of export associations among manufacturers of allied lines, advanced by Mr. M. A. Oudin in the interview published in this issue, is constructive and helpful. Manufacturers who have not enough plant equipment or business to send their own representatives to foreign countries can unite in such associations and meet some of the needs of foreign consumers. If these manufacturers confine their united activities wholly to allied but non-competitive lines, scarcely any question of possible conflict with the law or public policy of this country can be raised. The only ground for interference would arise in case a manufacturer to whom admission was denied should assert that the combination was unlawful; but this is a claim

that seems so remote a possibility that the chance should not deter manufacturers from union in such associations. Though associations conducted carefully on these narrow grounds would not be so effective as the long-standing German associations in which competitors have combined to wrest foreign business from other countries, they would still be efficient and profitable means of opening some export trade to small manufacturers who otherwise would have no chance to reach the overseas markets. Mr. Oudin did not touch in his interview on the larger question of export associations among competitive manufacturers. In the absence of construction by a final court of the attitude of the Sherman law on this point, and in the doubt as to the attitude of the public in regard to associations of competitors designed to deal wholly with even export business, associations of this kind have not given the aid to our manufacturers that they have given to foreign competitive manufacturers. It is reasonable for American manufacturers to ask Congress now to make it legal to form associations of competitors dealing with export business. Congress can do this without relaxing in any measure its inhibition against combinations affecting domestic business. The argument for associations to foster export trade by the use of even the expedient of combination is that thereby the production of American factories is increased, the capital investment receiving greater stability of principal and return and labor more regular employment. Mr. Oudin's suggestion is excellent, but it cannot do so much good to American industry as combinations similar to the unions of foreign manufacturers which our industries have had to face when they have gone into the world markets in past years.

### The Battle of Giants

This is neither the time nor the place to analyze the proximate causes of the present European war. Future historians may secure from the confessions of the dying or the secret memoranda of the dead the interest story of its inception, but in the last resort it is a demonic struggle for the abrogation of the Eighth Commandment. Could some benign Omnipotence rule that no boundaries should be changed and no war inemities be collected, every cannon would soon be silent and every sword sheathed. It is not a war of race hatred or revenge or mad ambition, but of envy and covetousness and plunder. Worst of all, it is the Titanic embattlement of bloodthirsty and cynical militarism against all the righteous impulses of a Christian civilization. With whomsoever one's sympathies may be, he must recognize that at the end irreparable evil will have been wrought unless the world shall have been taught thereby to lay down its arms and dwell in peace.

We are far from being advocates of peace at any price, of supinely yielding to oppression and surrendering the rights of future generations unresisting. Wars always have been, and perhaps always will be, until human nature is void of evil, but such a horrible mêlée of nations as is this ought to be without the range of

possibility. Thus to remake the map of Europe is not worth the price from any point of view. Provinces may be made fertile with blood but the tillers will be few; the grass may grow rank in city streets and there will be none to mow. The slaughter has just begun and thousands of brave and useful men have already laid down their lives, to be followed by tens of thousands more, while hundreds of thousands, perhaps, will return maimed and broken to drag out the remnant of their shattered existence.

Scarcely less dreadful to contemplate is the utter wreckage of civilization and the arts of peace. To remove from useful efforts a large share of the world's workers for months or years paralyzes every industry and blocks the wheels of progress. Were the war to stop to-morrow it would be many months before the orderly procedure of affairs could be resumed. Let it go on, as now seems likely, for a prolonged horror of desperate fighting, and it will be more than a generation ere men's lives are settled anew and war's work fairly put aside. Every participating nation will stagger under the weight of public and private debt, and every industry will have to struggle upward from devastation. This much one can predict with certainty. Of the destruction which will intervene one cannot even guess. It may be that the issue may fairly be decided at the point of the bayonet, or, just as "General Winter" checked the imperial career of the great Napoleon a century since, so now the gaunt legions of Field Marshal Famine may turn the tide of battle and scatter the warring millions.

From its situation and its traditions long honored, our own country is clear of the fray in any probable course of its development, but our duties are none the less imperative—to preserve even-handed neutrality toward the combatants, with all of whom we are on friendly terms; to lend a hand to every effort to promote an honorable peace, and to give such aid as we may to the suffering. In no way perhaps can we do more for ultimate peace than by refusing financial support in continuing the war, as has already been done in at least one instance. What resources we have will be needed to the last dollar in the slow and weary work of rehabilitation after peace comes. And meanwhile we can help the neutral nations to lessen the incidental burdens that war brings upon them. We ourselves must suffer from the struggle in many ways and bear the harm as best we may. Many a factory will be shut down and many a prosperous business wrecked. Yet, on the whole, with the world's trade open to us, the outlook is not so bad as it seemed for the moment. Confidence is being restored and business is beginning to readjust itself to the new and strange conditions. We cannot keep away from our hearts the horror of the thing, but we can at least bear home to all who struggle, Briton and Gaul, Teuton and Slav, the evidence of honorable friendship and the earnest desire to bring about enduring peace—a peace perchance where The Hague will be the court of last resort and its decrees will be enforceable.



# Effect of War on the Industry

## Consumers in South America Need American Goods—Export Markets for Electrical Manufacturers

### Secretary Lane on the Value of Our Resources

Mr. Franklin K. Lane, Secretary of the Interior, stated in an interview that a direct benefit to the United States from the European war will be its effect in making the people of this country realize to a greater extent the value of its mineral resources. He declared that the interference with manufacturing caused by interruption of the flow of importations of many necessary raw materials may be overcome almost wholly by development of neglected resources in our country. The main difficulties to be overcome in order that the United States may make itself independent of the rest of the world in its manufactures are in the rearrangement of the distribution system necessary to the establishment of this independence.

It has been easier and perhaps cheaper, Mr. Lane added, to import mineral products and materials from other countries than to go to the trouble and expense of developing our own resources of the same nature. Mr. Lane added that the suspension of ocean transportation will not mean disaster to our industries but inevitable interruption to some extent. It means that some of the materials upon which great industries depend must be obtained from other sources. Importers, consumers and manufacturers are making anxious inquiries as to where they may find in the United States supplies of crude materials to replace the foreign supplies now shut off. This is the opportunity of the United States to free itself from dependence of its industries upon other countries. Business men are awakening to this fact.

### Argentina Welcomes American Manufacturers

In an interview Señor Romulo S. Naon, Argentine Ambassador to the United States and one of the A-B-C mediators in the Mexican trouble, expressed the hope that American manufacturers would respond promptly to the commercial needs of his country. As evidence of her desire to trade with us he cited the emergency foreign exchange system which his government had established. He warned American manufacturers, however, that South American trade customs must be studied if headway is to be made.

It is necessary, he said, for the American manufacturer to change his business methods from what are customary here when trading with a South American country. Payments at 90 or 120 days are considered as cash payments. It is almost useless to expect any inquiries from pamphlets delivered by mail. Traveling salesmen, equipped with letters of introduction and other credentials and familiar with the South American ways and manners, are necessary if goods are to be sold.

Engineers and engineering contractors should also realize that bids are generally delivered in person by a representative, and not by mail as is customary in the United States. In advertising for bids on construction work the interval of time given before opening proposals is often as long as six months, so as to

enable representatives of foreign firms to forward specifications and other data to the home office an allow adequate time for the preparation of careful estimates.

Extensive commercial relations depend on good banking facilities, a fact that has been readily appreciated by the Argentine Senate and Chamber of Deputies. On Aug. 11 a law was passed empowering the executive to receive and deposit in the Argentine legations seal gold from commercial and banking houses. The Treasury Department upon receipt of telegraphic advice from the legation will then issue a bond in favor of the Caja de Conversion for the amount of gold deposited. Against the delivery of this bond through the Banco de la Nacion Argentina, the Caja de Conversion will deliver to the same bank the equivalent in paper pesos, to be credited to the proper person.

The Argentine government, Señor Naon said, has thus made foreign exchange easy. It is for Americans to supply the ships. They can enter the South American trade in force assured that they will be received most cordially by the nation to the south.

### Trade Information for Manufacturers

The foreign trade department of the National Association of Manufacturers has issued from its office in New York City under the date of Aug. 19, 1914, No. 1 of a series of special foreign trade bulletins. The special bulletins are intended to keep members advised promptly of all developments affecting the export and import trade arising out of the war. Further issues will be made as occasion warrants. The bulletin discusses the effect of the war on American trade, the conditions governing banking, credit and exchange and present shipping conditions. The data in regard to shipping conditions were compiled by the managers of the international freight bureau of the National Association of Manufacturers and are illuminating as to the interruption of service and heavy increases in rates. Marine insurance rates are also quoted in the bulletin. These, of course, are still large, although the bulletin states that the outlook is for a decrease rather than an increase. The subjects of other articles in the bulletin are as follows: "Contraband and Neutral Trade," "Loss of Goods in Transit," "Moratorium Defined," "Foreign Collections" and "Proposed New Shipping Laws."

### Partly Filled Foreign Order Opened to American

The interruption of manufacturing in Germany and of shipments from that country has led the Chile Copper Company to come to this country for some of its electrical equipment. This company is controlled by the Guggenheim interests, and it is building a power plant with a transmission line 85 miles in length in connection with the development of copper deposits in northern Chile. American electrical manufacturers were asked to bid on the complete construction and equipment of the plant originally. The station contract

however, was let to the Siemens & Schuckertwerke Company, which undertook to erect the plant complete or operation. The plant is partly finished but lacks some equipment. It is designed to hold four 10,000-volt units, and two of these are delivered. As one of the four units is designed for reserve purposes, the installations of three would provide for the full capacity of the plant. It is expected that the plant will be started on March 1 with the one-half of the units already in place.

When it was seen that on account of the war further manufacture and shipments would be discontinued in Germany the company began to ask for bids through its New York office from domestic manufacturers for that part of the material which had not been delivered. It is estimated that the total value of this part of the material is in the neighborhood of \$100,000. Most of the orders for the electrical material needed have been placed, and the company expects to be able to start the plant on schedule time.

#### Mr. Oudin on the Export Needs Created by the War

Mr. M. A. Oudin, manager of the foreign department of the General Electric Company and a member of the National Foreign Trade Conference, in an interview with a representative of the *Electrical World*, declared that the opportunity before American manufacturers as a result of the curtailment of European production is one that concerns all industries. He was glad to give his views because he regards it as a patriotic duty to do all that can be done to remove the obstacles which have hampered the growth of export business. The problem is larger than the interest of a single company or a single industry.

In emphasizing the fact that the probable effect of the European war upon American exports is a subject of the most permanent importance, Mr. Oudin said that it is engaging the attention of the general public, as well as of those immediately concerned with export trade. There has been a complete paralysis of the machinery for manufacturing, purchasing and selling abroad the output of factories, mines and fields of most of the continental countries of Europe, and at the same time a partial stoppage of the export trade to Great Britain. Conditions that are not at war which have been supplied heretofore by the European countries immediately affected by the present hostilities must fill their requirements in some other manner. In these circumstances the great neutral manufacturing and producing country best able to meet the demand is the United States.

The electrical business should share in the stimulation which our exports are bound to experience in the immediate future. The question which most concerns electrical manufacturers is how this trade may be acquired on a profitable and permanent basis.

#### Adverse Factors

Mr. Oudin pointed out that while the stoppage of European supplies of all kinds is a factor favorable to a great extension of American trade, there are two adverse factors which have a very important bearing upon the magnitude of the trade that may be obtained. The first adverse factor is the financial disturbance which exists throughout the world for over a year; this economic depression, particularly in South America, has been made much worse by the war in Europe. The second adverse factor, which is of a temporary character, is the dislocation of transportation facilities which now exists.

The two most important markets for our goods in South America—namely, Brazil and the Argentine—

have been passing through a financial crisis of the first order. The inability on the part of the former country to obtain the loan which was needed so greatly has accentuated an already difficult situation. This loan was almost closed when the war broke out. The withholding of European funds for the further development of public and private enterprises in both countries will cause a cessation of engineering and other work there.

It should also be remembered, Mr. Oudin added, that the purchasing power of South American countries particularly has been greatly lessened by the partial closing of the European markets to their products. This undoubted lessening of exports from South America, with the result mentioned, will be offset more or less by an increase in prices.

For the reasons given above, at least reasonable caution should be exercised in the extension of credits. However, this is a time when liberality, both at home and abroad, should be shown by bankers, manufacturers, merchants and others, and, so far as possible, a give-and-take policy should be followed in order that a possibly unhappy economic condition may be averted.

Interruption of the shipping facilities in this country would have a most serious effect upon home affairs if prolonged, and a continuation of this situation would go a long way toward nullifying the favorable opportunities for furthering our export trade. But already the situation is much improved. Mr. Oudin expressed pleasure that so far as it has the power Congress has relieved this situation by passing a law admitting under certain conditions foreign vessels to American registry and removing the regulations heretofore applying to our merchant marine which made the employment of ships in our foreign trade an unprofitable adventure.

#### War Risks for Shipping

It should be noted, however, that so long as the war lasts the change of vessels from foreign to American registration is not necessarily going to improve the position materially, for, notwithstanding the fact that an increasing number of vessels become available as time passes, the expense of transportation at the present time has blockaded our ports with goods. Freight rates have been increased from 25 per cent to 100 per cent and war risks on neutral and American bottoms are not low. The British and French governments, in order to encourage the movement of grain and other products, are prepared to guarantee war risks on vessels flying their flags, and also have announced their intention of insuring cargoes against the vicissitudes of war at a reasonable rate. That announced by the British government is approximately 4 per cent. It is not likely, Mr. Oudin thinks, that insurance brokers will give lower war risk rates on American ships. Strange as it may seem, since neutral and American boats run the risk of being blown up by mines or of being seized as prizes because of contraband of war which they may be carrying, they must be insured. Congress has been urged by the National Foreign Trade Council to undertake to guarantee war risks on both vessels and cargoes. If this is not done in manner similar to the new departure of the British and French exporters, American exporters may find practically no advantage in shipping by American vessels.

The question which naturally arises, said Mr. Oudin, is: How can the manufacturers in this country take advantage of the present situation abroad? It is a well-known fact that a very large percentage of our exports of machinery and of manufactures of a complicated character, involving a high percentage of labor, are done by companies of large resources and capital. This is the strength and the weakness of our export situation. It is the strength because it means the prosecution of a



foreign trade movement on a large scale, with a disregard of early discouragements and a bending of every effort toward the development of a business for later years, even at some initial cost; it is the weakness because up to this time the population of the country as a whole has not been sufficiently interested in the wonderful possibilities of this trade to try to promote it. The large manufacturers have been the pioneers and they have already blazed the way along which the small manufacturer can follow. The small manufacturer, however, does not seem to have taken full advantage of the opportunities—not that he has been discouraged by the difficulties of obtaining a foothold in the foreign market, but perhaps because he has not realized the necessity of foreign markets for his output. With the prestige already made in many countries for American goods and with the reputation for honest dealing established in these countries by large American concerns, the path has been made easy for the introduction of the goods of the small manufacturer.

#### Representation, Price and Quality

The essential elements in the exploitation of manufactures abroad, Mr. Oudin declared, are representation, price and quality. If the small manufacturer cannot afford to have his own office abroad he must have recourse either to agents as a medium through which his goods may be sold or to commission houses or brokers in his own country. Another method by which the small manufacturer can acquire a market is through association with other manufacturers of allied lines. The idea of export associations is a new one in this country and has not yet been adopted to any material degree. There is no secret as to the ways and means of securing foreign business. The methods of our great competitors, the Germans and English, are apparent to any one who is familiar with foreign trade conditions. What America is especially weak in abroad is personal representation. The splendid machinery used by England in her foreign trade has been built up during a century. The number of English firms established throughout the world dealing exclusively in English goods is almost legion. In the last thirty years Germany has copied English methods and German firms are being established in constantly increasing numbers in every country on the globe. What we need most abroad is American business houses. Until our small manufacturer can sell his goods through such concerns established abroad his business is bound to be more or less intermittent, for it is obvious that he cannot depend upon the permanency of an agency arrangement with a European firm, nor can he secure the highest effectiveness from an arrangement with a native concern. As to prices, the prices of American manufacturers are higher ordinarily than those of European competitors. This is due to the higher cost of labor which prevails in this country. The influence of the war will operate in the direction of overcoming that handicap because it will have a tendency to increase labor costs in Europe. As to quality, American goods in general are superior to those of European countries, especially of Germany, but they are not always sufficiently superior to overcome the differences in cost. In many lines American engineering is recognized as superior to European engineering, but this advantage is not regarded as sufficiently great in some countries to overcome differences in cost. Particularly is this true in countries whose financial resources are limited and where the people are more concerned to get low first cost than about the future maintenance and operating expenses.

In the beginning American manufacturers should make up their minds to spend a large amount in investigation of foreign conditions, particularly in South

America. They should expect no return for the first year or two. The difficulties of the language, the different customs and different business practices, and the entire difference in racial characteristics, are not perhaps fully appreciated by those who do a little export business with Latin America, and not at all by those who have no acquaintance with the Latin-American people. It is worse than useless to send the American type of drummer to South America.

Already two factors have been mentioned prominently as bound to influence our foreign trade favorably. One is the increase in our merchant marine and the other the establishment of American banks abroad. Mr. Oudin believes that it is easy to overestimate the influence of these activities in creating new business. In normal times foreign ships carry American goods as cheaply and as expeditiously as American vessels possibly can. He does not wish to be understood as in any way deprecating the necessity of having a merchant marine. The shipping business is one which can be conducted with profit, and had we our own ships the vast sums now paid to foreign shippers would be kept in the United States; but the *per se* increase in our merchant marine will not greatly influence our foreign business.

#### Influence of Banks on Commerce

The establishment of foreign banks abroad will have certain advantages which must affect our foreign trade favorably, but is not likely to have as great an influence upon it as the other factors which have been mentioned. Americans established in business abroad utilize foreign banks at the present time for the following purposes, viz., for purchasing exchange, for ordinary banking purposes—i.e., as depositories—and for obtaining information with reference to credit of prospective purchasers. It is not conceivable that American banks will quote lower rates of exchange than existing foreign banks. It is possible that American banks may offer improved banking facilities and establish reciprocal credit between two trading countries. It is generally necessary for American business houses established abroad to do business with a bank which has branches throughout that country. If American banks established abroad could have branches in different parts of the country, there is no doubt that such banks would assist to a very large extent in securing more reliable information as to the financial standing of prospective purchasers.

The great potential influence cited by Mr. Oudin in connection with our foreign business in the establishment of banks in foreign countries is that thereby American capital will be encouraged to seek investment abroad. This possibility opens up a field of conjecture which is highly interesting. The absorption of capital by Europe for its own needs has left most of the other countries of the globe without the funds necessary to carry out great improvements already under way and in contemplation. Perhaps as much as one-half of the exports of Germany and England are the result of the participation of German and English capital in foreign enterprises and are a direct result of the sympathetic interest of European bankers in the financial debts of other countries. If American banks abroad could arouse American investors to the opportunities for investment in these foreign countries, both in issues of government bonds and the loans of private enterprises, their usefulness would be established beyond any question.

Mr. Oudin's familiarity with conditions convinces him that the present concentrated attention upon our foreign business is a potential factor making for a very large foreign trade, and that it must give rise to the permanency which has been conspicuously absent in the past

## Acting Secretary of the Department of Commerce on Export Opportunities

The following statement has been made to the *Electrical World* by the Acting Secretary of the Department of Commerce:

South America is a growing market for electrical machinery and supplies, and one in which the United States should have a greater share of business. That this country will be called upon to furnish the South American countries with more electrical materials will be the natural result of the war now in progress in Europe; but the permanence of this business depends upon a change in certain factors that have worked much to the disadvantage of American manufacturers and exporters. Heretofore the countries of South America have looked to Europe for capital to develop their natural resources and to utilize their water-power in the development of electrical energy. This source of capital is now largely or completely cut off, and the result will be a curtailment of expenditures and the postponement of new enterprises until more auspicious times. The United States will profit, no doubt, through the necessity of getting supplies, but it should be borne in mind that purchases by South American countries will be limited to urgent needs.

### Nationality of Engineers

The chief factor against the sale of American equipment and supplies is the fact that the source of capital for South American enterprises and the nationality of the engineers have largely determined where they shall be purchased. A project with German financial backing, carried out under the supervision of German engineers, is practically certain to use German materials, so far as they are available at competitive prices. In fact, in recent years it has become a practice for banks furnishing the money for such enterprises to stipulate the use of materials from the country in which the banks are situated.

Investment of United States capital in South America is small as compared with the amounts invested there by England, Germany and France. Hence supplies of electrical machinery and supplies in this country have been at a great disadvantage. Conditions in the electrical field are similar to those obtaining in the railway field. A consular report from Brazil makes this significant statement:

### Investments of Europeans

"Unfortunately, there is very little American capital invested in railways or other public utilities in Brazil, and while steam and electric roads are managed by Americans who favor American equipment, these managers cannot, in justice to their stockholders, place orders elsewhere than in Europe, everything else being equal."

From Chile comes the statement that "practically all the electric-light companies of this district are German, and they favor German supplies whenever possible."

The one country that seems to have been most successful in combining the efforts of bankers and manufacturers toward the increase of business and export trade is Germany. Back of the greatest electrical concern in Germany is a group of banks that furthers the interests of the combine in foreign countries by furnishing money for the development of various enterprises. The net result is that the money furnished by these banks is spent largely in the purchase of goods from the manufacturing companies with which they are allied.

Trade follows investment, and when the United States enters the foreign field of investment it will reap

the benefits not only in interest upon the actual money furnished but also in increased sales of American goods.

It must be borne in mind that the financial resources of the great European nations are being rapidly exhausted by war. It is fair to assume that it will be many years before they recover from its effects. In the meantime they will have great industrial problems to solve at home and investments in far-off South America will be much less attractive to their citizens than they have been in the past.

### Opportunities Before American Manufacturers

The time seems ripe, therefore, first, for a more liberal investment of the United States in South American development; second, for a very considerable business in ordinary electrical supplies and in the equipment necessary for the completion of projects already begun; third, for demonstrating to the people of South America the satisfactory character of American electrical apparatus. In common with other American-made goods, apparatus of this kind has been misrepresented by foreign competitors, and we ought to make the most of our opportunity to demonstrate its excellence. To take the fullest advantage of the present situation prompt and vigorous action on the part of our manufacturers is needed.

## Mr. Hurley on Electrical Exports to South America

Mr. E. N. Hurley, president of the Hurley Machine Company, of Chicago, and also interested in a number of other business enterprises, is an enthusiastic student of the foreign-trade possibilities of the United States in South American countries. He has been engaged in the export trade since 1899 and is chairman of the foreign trade committee of the Illinois Manufacturers' Association. He was chairman of a large delegation of business men sent by that association to South America in February of this year. This party was gone three months. Mr. Hurley was also requested by Secretary Redfield of the Department of Commerce to investigate banking and credits in South America. He has just made his report on the subject to the department.

Mr. Hurley is very strongly of the opinion that there are great possibilities in South America for electrical manufacturers of the United States. To a representative of the *Electrical World* Mr. Hurley spoke of the extensive use of electrically developed water-powers in Brazil. The particular development referred to has been brought about by the investment of Canadian and American capital, and American electrical equipment is used. The principal electrical needs of Rio de Janeiro are supplied by one central-station company in charge of an American.

If four competitors were struggling to get a certain class of business and three of them were compelled to cease their efforts, would not the situation redound, Mr. Hurley asks, to the advantage of the fourth man still doing business? The situation is not quite so simple as that, for means must be provided for transporting goods, and it is also to be remembered that the South Americans must be able to sell their products in order to buy our manufactured goods. However, steps are being taken to provide facilities in both of these directions, and if American manufacturers are alert and enterprising at this juncture, they will be enabled to take advantage of a great opportunity for extending their business.

### War Risk Insurance and Foreign Exchange

Mr. Hurley was present at a conference called by the Secretary of the Treasury and held in Washington on



Aug. 14. Representative bankers, business men, shippers and insurance people discussed the South American trade situation. After the passage of the Alexander ship-registry bill, the matter of war-risk insurance will be taken up. It is said that there are over 100 ships owned, or principally owned, in this country but flying the British flag. They will raise the American flag if the ship-registry bill becomes a law, but then some means must be provided for the war risk. Possibly the government may appropriate the sum of \$50,000,000 to be an insurance fund back of the war-risk protection guaranteed by the United States, the shippers or owners paying 5 per cent premiums for the protection. This would be in addition to the ordinary marine insurance. Of course, it is not expected that ships flying the American flag will be attacked by belligerents; nevertheless, the dangers of navigation are very greatly increased by wartime conditions, owing to the possibility of mistaken identity, the placing of mines, darkened lighthouses and other military expedients.

Means are being provided now to establish foreign exchange between South American countries—particularly Argentina, Brazil and Chile—and the United States. It is probable that New York bankers will establish a fund which will be sufficient to provide exchange not otherwise available owing to the unsettled condition of financial affairs in London. It is to be remarked that the action of the United States government in inviting the mediation of Argentina, Brazil and Chile in the Mexican situation has had a good effect in South America. It has helped to dissipate the idea of many persons there that the attitude of Americans toward the inhabitants of the Latin-American republics is one of patronizing superiority.

As a student of foreign trade Mr. Hurley was asked for some advice to American electrical manufacturers. He gave these hints:

#### Advice to Those Seeking Foreign Trade

First—All kinds of electrical products are and will be in demand in South America. The American manufacturer does not have to change his product to meet any unusual conditions in the Latin-American countries. It has been said that Americans do not adapt themselves to the demands of the South American trade. If this is so, it has nothing to do with electrical products. It is not necessary to change patterns to produce appliances that will be useful in South America.

Second—Electrical manufacturers should get the addresses of people engaged in the electrical business in South American centers.

Third—Letters should be written to these persons in the language of their country—Portuguese for Brazil, Spanish for all the other South American countries. The attitude of American business men should be that of extending a helping hand to their fellow business men in these foreign countries. Printed matter in the language of the country should follow the letters. It is a mistake to try to sell all kinds of goods at once. It is well to push specialties and novelties at first. The Illinois Manufacturers' Association will probably advertise in four of the principal South American newspapers, offering the assistance and co-operation of the association in any way to local merchants. This example might be followed by electrical manufacturers. It is well to avoid being in too much of a hurry at the start. It must be remembered that exchanging goods with South America must be regarded as a give-and-take proposition between equals.

Fourth—Do business in South America something after the manner in which a Boston house would go after business in Oklahoma. That is, in a friendly,

sensible way, adapting yourself to the character of your customers.

Fifth—The direct salesman must speak the language of the country. He may well follow the printed matter after a little business has been worked up. However, it is to be remembered that the larger aspects of the South American trade campaign should be handled by executives who may go to the countries in question and direct the efforts of salesmen. It is not so essential that these broad-minded executives should speak the language of the country. As foreign trade develops it must be studied in a broad-minded way. The American who can study foreign markets on the ground, who can plan campaigns, who can feel at ease with the highest authorities, and who can direct the efforts of perhaps twenty or thirty salesmen, is of very great value in the foreign commercial work in which the United States must now engage. It is men of this class to whom Mr. Hurley refers as "executives."

In conclusion, the Chicago expert said that he would like to emphasize the point that the foreign consuls of the United States are all right. They are almost always men of education and experience and they are eager to extend a helping hand to the interests of business men at home. With their card-index systems and their modern methods of keeping track of the business of their offices the consuls are a very great help. Further, American machinery has a good reputation for reliability and finish, and the citizens of the United States need not be ashamed of it.

#### Mr. Tripp Home from Europe

Mr. Guy E. Tripp, chairman of the board of directors of the Westinghouse Electric & Manufacturing Company, returned from Europe on the steamship *Celtic* on Aug. 15. As Mr. Tripp could not get accommodation in the first cabin for all the members of his party they returned by second cabin. Except for the inconveniences due to the fact that the crowding of the second cabin accommodations made it necessary to divide the passengers into three shifts for meals, Mr. Tripp did not mind his experience. Few lights were used at night during the voyage and the portholes were covered with blankets. Mr. Tripp expressed his great pleasure at being on American soil again.

When war was declared by Germany on France Mr. Tripp was in Paris. When he went to the office of his hotel on the morning of Aug. 2 he found that foreigners had been given twelve hours to leave Paris. The force of employees had already disappeared and he could not get even a cup of coffee. After a great effort and necessarily abandoning all baggage he, with Mrs. Tripp and their three daughters, managed to get aboard the train for Calais. Upon reaching London Mr. Tripp met a cordial reception. He said that no American who had seen the sights that confronted the people everywhere in Europe could fail to come back to this country a better citizen than before, and with a keener realization of the high rank to which this nation is entitled because it is controlled by intelligence and reason.

Although Mr. Tripp's voyage was taken for business and pleasure combined, it was interrupted in France and for that reason he did not have much opportunity of observing commercial conditions abroad. He thinks that it is impossible to form any conclusive opinion at this time as to the effect of the war on ultimate commercial conditions in Europe. Both the French and the Austrian subsidiary Westinghouse factories have been closed. It was necessary to do this because the operatives left to go to war. The plant in Italy is still in operation. The plant at Manchester, England, is

operating on full time. Up to the time that Mr. Tripp left England comparatively few men at the Manchester plant had left to go to war.

The export business of the Westinghouse company to South America, Japan and China is handled from this country, and Mr. Tripp mentioned the opportunity presented to American manufacturers to meet the needs of consumers in those countries. In order that trading relations may be developed the principal necessity is to establish banking facilities and, following the practice of German manufacturers, to give buyers longer time for payment. The German manufacturers have been borrowers at low rates and were satisfied with small margins of profit. There is no reason, Mr. Tripp believes, why this country should not follow the practices to which South American buyers have been accustomed.

Mr. Tripp believes that as a result of the present situation this country should become a creditor nation instead of remaining a debtor nation. By the development of a larger export business it can get a steadier load for factories and reduce the overhead cost. The great bugbear which confronts manufacturers in this country is the fluctuation in the volume of business. When the business is stretched over a larger area the fluctuation in volume is likely to be less.

### Advice Regarding South American Markets

Dr. E. L. Corthell, consulting engineer, New York, has expressed his views in regard to the openings in South American markets. Dr. Corthell was engineering adviser to the Argentine government for two years, passing upon all large public improvements. The extensive port works of both Buenos Aires and Rosario were designed and executed under his direction. After the completion of his engagement in 1903 he became interested in several large South American engineering projects. The most recent and one of the largest of these was the financing, design and construction of the port works of Para, Brazil. His past and present connection with officials in South America and financiers interested in South American works qualifies him to speak authoritatively.

Dr. Corthell is urging upon all with whom he comes in contact the importance of seizing without the delay of a day these suddenly arisen opportunities.

The real straits in which Latin America finds itself at the present time are not well known, or at least not appreciated. It is suddenly and almost wholly deprived of the products of vital necessity to its existence, but it has no ships to go for them even if they could reach their most important supply depots, especially in Germany. The United States has no ships which to send the goods required.

Argentina and Brazil have no vessels suitable for the long course to our ports. Like ourselves, they have a coastwise fleet. In the meantime there is an insistent inquiry from one at least of these governments for ships to be bought instantly. In fact, a cablegram from Rio de Janeiro states that the Brazilian financial minister has arranged to despatch four or five steamers of the Lloyd Brasileiro government line to New York with coffee from Santos and Rio and rubber from Para, thereafter to return with articles of prime necessity. Cable messages are now being received from various South American and West Indian countries demanding importunately that we send them what they need.

Our trade with these countries, outside of importations of kerosene and gasoline, harvesting machinery and a few other specialties, is a very small proportion of their commerce with countries now at war, says

Dr. Corthell. Note the following important features of the trade of Buenos Aires alone for 1913: Imports from Germany, \$69,000,000; Belgium, \$21,000,000; France, \$37,000,000; Great Britain, \$126,000,000; Austria, \$6,000,000; United States, \$60,000,000. Exports to Germany, \$56,000,000; Belgium, \$32,000,000; France, \$36,000,000; Great Britain, \$116,000,000; Austria, \$3,000,000; United States, \$22,000,000. The total imports were \$406,000,000, total exports, \$466,000,000, of which trade the United States had not over 10 per cent.

It would seem to be easy to secure now and hold at least 50 per cent of the trade, and the same may be said regarding the whole of Latin America, but it will be no easy task. The Germans, French, English, Italians, Spaniards and Belgians have built up their enormous trade by continued and intelligent effort. They have able agents, their own men, conform to natural and local requirements of the trade, give credit where our manufacturers demand spot cash, have banks to handle the financial business, where we have none, and provide their own splendid steamers with excellent service while even our 10 per cent share of the business is carried in foreign bottoms.

There is only one organization, in New York at least, that realizes the situation, or at least is materially helping Latin America, and that is the Pan-American Chamber of Commerce of New York, of which Dr. Corthell is a founder and an adviser. It has existed only four years, but its altruistic work for the good of all Latin America is telling for the benefit not only of that region but for that of our own country by opening markets and engineering and contracting opportunities for our people.

### United States Versus Great Britain in Electrical Export Trade

As was shown in our issue of last week, the electrical export trade of the United States from July 1, 1912, to June 30, 1913, was a little over \$26,000,000. For the same period Great Britain exported electrical goods to the value of over \$34,000,000, or 30 per cent more than the United States. These figures include all electrical machinery, appliances and apparatus.

The American electrical exports to England have been more than the English exports to the United States to the extent of about \$300,000 a year. This means that England took roughly 30 per cent more electrical goods from the United States than we did from Great Britain. This difference is practically accounted for in the export trade of motors and generators.

Great Britain's motor and generator exports into Germany were alone greater than the total American electrical export trade to Germany. Germany annually took from Great Britain electrical goods valued at over \$570,000 while she took from the United States electrical goods to the value of only \$215,000, or less than half what she bought from Great Britain.

The trade of both nations in Austria-Hungary has been small, and while America led by about 35 per cent, the actual difference has been in the neighborhood of \$6,000. England has had none of the electrical machinery trade with Austria-Hungary, and America has had only slightly over \$5,000. France bought over 150 per cent more electrical products from Great Britain than from America. The actual difference has been roughly \$630,000. The great difference has been in the machinery trade, in which England led by over \$600,000, or the difference in the total trade of the two countries. The telegraph and telephone apparatus and



miscellaneous trade was approximately the same, with England slightly in the lead. Russia has been taking approximately half a million dollars' worth of electrical goods annually from Great Britain and only about one-ninth as much from the United States. In the matter of machinery alone Russia took over twenty-five times as much from Great Britain as from

TABLE I—VALUE OF BRITISH ELECTRICAL EXPORTS DURING 1912 TO COUNTRIES NOT NOW AT WAR

Country	Motors and Generators	Lamps	Miscellaneous
Denmark	\$64,827		\$250,000
France	232,002		140,180
Netherlands	38,378		151,387
Norway	18,041		
Portugal	37,047		
Sweden	291,101		214,000
Switzerland	8,018		
Turkey			218,873
U.S.A.	48,412		
United States	183,206	83,562	985,021
Argentina	1,028,766	95,001	1,746,200
Brazil	189,885	23,378	1,223,420
Chile	264,425	13,032	253,012
Colombia	158,000		348,101
Other Latin America			72,100
Japan	906,678	2,420	570,000
Spain			18,569
Portuguese Africa	256,132		45,356
Egypt	73,496		302,754
Other neutral countries	451,426	121,287	1,608,147

NOTE.—Other neutral countries include Greece, Switzerland, Costa Rica, Guatemala, Honduras, Nicaragua, Panama, Salvador, Cuba, Dutch West Indies, Haiti, Santo Domingo, Bolivia, Colombia, Ecuador, Dutch Guiana, Paraguay, Peru, Uruguay, Venezuela, Korea, Philippines and Liberia. Danish West Indies included under head of Denmark. Japanese China included under head of Japan.

America. America's electrical lamp trade with Russia was woefully weak, being less than \$500, whereas Great Britain sent to Russia lamps to the value of almost \$100,000.

The United States and Great Britain did practically the same volume of business with Belgium in all electrical goods with the exception of machinery. In this one item America was credited with about \$3,500 and England with over \$185,000. The percentage difference, as can be seen, is enormous.

In making up our totals for the exports of the United States and of Great Britain to those countries at war it was found that, excluding England's import trade, America annually sent over goods to the value of \$830,000, and Great Britain sent to the Continent \$2,400,000. Thus the actual difference is \$1,570,000.

England annually sent out to her colonies close on to \$20,000,000 in electrical goods. America sent to the English colonies somewhat more than \$11,000,000.

TABLE II—VALUE OF BRITISH ELECTRICAL EXPORTS DURING 1912 TO COLONIES OF COUNTRIES NOW AT WAR

Country	Motors and Generators	Lamps	Miscellaneous
Canada	\$243,747	\$39,188	\$919,874
Australia and Tonga	93,847	292,001	2,826,311
Other British colonies			
India	2,900,000	397,921	10,887,000

America's large trade, of course, is with Canada, with which we have been doing a yearly business of approximately \$9,000,000. England, on the other hand, has been sending only approximately \$1,700,000 in electrical exports to Canada. Even in Australia and Tasmania our exports amounted to over \$1,000,000, whereas England's amounted to less than \$5,000,000.

Referring now to Central and South America, the only countries for which the figures are available for both the American and the English electrical export trade are Mexico, Argentina, Brazil and Chile. Britain's trade with Mexico in comparison with our trade was negligible. England's total exports in electrical goods to Mexico were covered by the item machinery and amounted to less than \$50,000. The United States, on the other hand, sent electrical goods to Mexico to the value of \$2,000,000.

Argentina, however, has been importing about five times as much from England as from America. The totals from England are roughly \$3,000,000 and from America roughly \$600,000. In the machinery trade America has been doing only one-tenth as much as Great Britain, and in the telegraph and telephone apparatus and miscellaneous trade only one-fifth.

With Brazil America has had the lead again. England sent to Brazil electrical exports to the value of \$1,750,000, and America sent \$3,000,000. England led in the machinery trade by over \$100,000, but in the telegraph and telephone apparatus and miscellaneous trade America did approximately twice as much as Great Britain.

The two countries have been doing practically the same volume of business in Chile. The difference might easily be bridged by a couple of large orders

TABLE III—VALUE OF BRITISH ELECTRICAL EXPORTS DURING 1912 WITH COUNTRIES NOW AT WAR

Country	Motors and Generators	Lamps, Including Incandescent and Arc and Accessories	Miscellaneous
Germany	\$238,473	\$35,675	\$286,201
Austria-Hungary			17,495
Serbia			
France	706,218	11,249	209,546
Russia	293,244	95,243	77,894
Belgium	185,746	10,287	149,562

NOTE.—Fans included under Miscellaneous.

England's export trade to Chile was \$530,000, and America's export trade to Chile \$420,000. Here, as in the other two South American republics above cited, the principal difference is in the machine trade. England has led in selling motors and generators to South America.

### California Contractors' Convention

The California Association of Electrical Contractors and Dealers held its fifth annual convention at Sacramento, Cal., Aug. 4 to 8, the attendance being about 200. Eight papers dealing with various phases of co-operation in allied electrical industries were read, and an illustrated lecture on the hydroelectric plants of the Pacific Coast was given by Mr. George Oberton. The meetings were arranged in conjunction with those of the California branch of the National Association of Electrical Inspectors. An extensive entertainment program was provided, and on the evening of the last day of the convention a non-official rejuvenation of the Jovian Order was held.

The newly elected officers of the California Association of Electrical Contractors and Dealers are: President, Mr. C. V. Schneider; secretary, Mr. W. S. Harbridge; vice-presidents and executive committeemen, Messrs. L. R. Boynton, J. C. Render, Lee Gilpin, Claude Loviday and Frank Somers.

### A. I. E. E. Affairs

At the first meeting for the administrative year of the board of directors of the American Institute of Electrical Engineers, held on Aug. 11, President Paul M. Lincoln announced his appointments on the various Institute committees. The chairmen of the committees appointed are: Finance, Mr. J. Franklin Stevens, Philadelphia, Pa.; meetings and papers, Mr. L. T. Robinson, Schenectady, N. Y.; editing, Prof. H. H. Norris, New York; board of examiners, Mr. Maurice Coster, New York; sections, Mr. H. A. Hornor, Philadelphia, Pa.; standards, Dr. A. E. Kennelly, Cambridge, Mass.; United States national committee, International Electrotechnical Commission, Dr. C. O. Mailloux, New York; public policy, Mr. Calvert Townley, New York; library, Dr. Samuel Sheldon, Brooklyn, N. Y.; code, Mr. Farley Osgood, Newark, N. J.; relations of consulting engineers, Dr. L. B. Stillwell, New York; historical museum, Mr. T. C. Martin, New York; membership, Mr. H. D. James, Pittsburgh, Pa.; patent, Mr. Ralph D. Mershon, New York; transmission, Mr. P. H. Thomas, New York; railway, Prof. D. C. Jackson, Boston, Mass.; electric lighting, Dr. Clayton H. Sharp, New York; industrial power, Mr. D. B. Rushmore, Schenectady, N. Y.; telegraphy and telephony, Mr. C. E. Scribner, New York; use of electricity in mines, Mr. Wilfred Sykes, Pittsburgh, Pa.; use of electricity in marine work, Lieut. C. S. McDowell, Brooklyn, N. Y.; electrochemical, Prof. A. F. Ganz, Hoboken, N. J.; electrophysics, Dr. J. B. Whitehead, Baltimore, Md.; educational, Prof. V. Karapetoff, Ithaca, N. Y.

The board elected from its own membership the following members to serve upon the Edison medal committee for two years to fill the places of members whose terms had expired: Messrs. C. O. Mailloux, L. T. Robinson and Charles E. Scribner. Dr. A. S. McAllister was elected for the term of one year to fill a vacancy.

The board also confirmed the appointment by President Lincoln of the following members of the Edison medal committee for five years: Messrs. Charles F. Brush, William Stanley and N. W. Storer.

The following local honorary secretaries were reappointed for a term of two years: Prof. Robert Julian Scott, Christchurch, New Zealand; Mr. Henry Graftio, St. Petersburg, Russia, and Mr. A. S. Garfield, Paris, France.

### Cleveland I. E. S. Convention Papers

Although all of the minor details of the program for the Illuminating Engineering Society convention in Cleveland from Sept. 21 to 26, 1914, have not been decided upon, yet an excellent idea of the general character of the convention from the business point of view can be obtained from the list of papers given below:

"Color Variation in Illuminants," "Reflection Standards" and "A Transmission and Absorbing Photometer for Small Areas," by Messrs. Nutting and Jones; "Planning for Daylight and Sunlight in Buildings," by Messrs. Marks and Woodwell; "Present Practice in Machine-Shop Lighting," by Messrs. Powell and Harrington; "The Lighting of a Carpet Mill," by Messrs. Rose and Oakley; "Effect of Room Dimensions on Efficiency of Lighting Systems," by Mr. Ward Harrison; "Illumination of Light Shafts," by Dr. C. H. Sharp; "Artificial Daylight—Its Production and Use," by Messrs. Luckiesh and Cady; "The Development of Daylight Glass," by Mr. E. J. Brady; "Light Filters for Use in Photometry," by Mr. C. E. K. Moes; "Experiments with Colored Absorbing Solutions for Use in Heterochromatic Photometry," by Mr. E. F. Kinsbury; "Notes on the Ulbricht Integrating Sphere and Arc-Lamp Photometry," by Mr. H. K. Chaney; "A New

Standard Light Source," by Mr. L. A. Jones; "Some Experiments with the Ferree Test for Eye Fatigue," by Mr. J. R. Cravath; "Relation of Light to the Critical Inspection of Documents," by Mr. A. S. Osborne; "Some Recent Experiments on Vision of Animals," by Mr. H. M. Johnson; "The Locomotive Headlamp," by Mr. J. L. Minick; "Physiological Effects of Light on the Body," by Mr. E. C. Titus; "Characteristics of Gas-Filled Lamps," by Mr. G. M. J. Mackay.

### Pacific Coast Electrical Conventions at Spokane

The program for the seventh annual convention of the Northwest Electric Light & Power Association, to be held at Spokane, Wash., Sept. 9, 10 and 11, in conjunction with the meeting of the Pacific Coast Section of the American Institute of Electrical Engineers, has now been determined upon. A preliminary list of papers to be presented at this joint convention appeared in our issue of July 18. Here is the final arrangement:

Sept. 9—Welcome by Mayor Hindley of Spokane; response by Mr. D. L. Huntington, Spokane, Wash.; address by President H. L. Bleeker, Spokane, Wash.; report by Secretary N. W. Brockett, Seattle, Wash. Afternoon—"Rates and Physical Valuation of Public Utilities," by Mr. W. W. Cotton, Portland, Ore.; "Outdoor Substations," by Mr. J. C. Martin; "Electric Power Development on the Pacific Coast," by Mr. W. E. Herring, Seattle, Wash.

Sept. 10—"Organization and Operation of Branch Offices and Plants," by Mr. L. A. McArthur, Portland, Ore.; "Extension of Electric Service Into Small Communities and Rural Districts," by Mr. M. C. Osborn, Spokane, Wash.; "Electric Pumping Plants in Rural Districts," by Mr. J. E. Davidson, Spokane, Wash. Afternoon—"Electrical Appliances," by Mr. H. B. Pierce, Spokane, Wash.; "Rates," by Mr. Stacy Hamilton, Portland, Ore.

Sept. 11—"Public Policy Review," by Mr. F. T. Post, Spokane, Wash.; "Balance-of-Stores System for Lighting Utilities," by Mr. E. A. West, Portland, Ore. Afternoon—"Wrinkles," by Mr. P. A. Bertrand, Aberdeen, Wash. Executive session.

Messrs. L. A. McArthur, P. A. Bertrand, M. C. Osborn, George Quinan and E. A. West form the Northwest association's committee on program.

Following is a revised list of the papers to be presented before the Pacific Coast Section, A. I. E. E.:

"A Distribution System for Power Purposes," by Mr. F. D. Nims, Vancouver, B. C.; "Electrical Application in the Lumber Industries," by Mr. E. F. Whitney, Portland, Ore.; "Operation of the Butte, Anaconda & Pacific 2400-Volt Direct-Current Railway System," by Messrs. J. B. Cox and C. A. Lemmon, Schenectady, N. Y.; "Considerations in the Application and Control of Electric Motors for Gold Dredges," by Mr. G. B. Rosenblatt, Salt Lake City, Utah; "The Effect of Delta and Star Connections Upon Transformer Wave-Forms," by Prof. Leslie F. Curtis, Seattle, Wash.; "Economy in the Operation of 55,000-Volt Insulators," by Mr. M. T. Crawford, Seattle, Wash.; "Work of the Joint Committee on Inductive Interference with Telephone Lines," by Mr. A. H. Griswold, San Francisco, Cal.

The entertainment program for the joint convention includes an opening reception, a Dutch lunch, theater parties and automobile rides for the ladies, an illustrated address on the San Francisco Exposition and the International Electrical Congress, by Mr. A. H. Halloran, San Francisco; a joint banquet, a trip to plants of the Washington Water Power Company at Little Falls and Long Lake, a trip over the Inland Empire Railway Company's system to Cœur d'Alene Lake, etc.



## PUBLIC SERVICE COMMISSION NEWS

## New York Commissions

Under authority of the New York Public Service Commission, Second District, the Nassau Light & Power Company will reduce its maximum rate for energy for lighting from 15 cents to 12 cents per kw-hr. The Glen Cove Light & Power Company offered to supply Sea Cliff in competition with the Nassau company at 9 cents per kw-hr. After investigation the commission decided that there was no certainty that the Glen Cove company could continue to supply energy in the Sea Cliff territory with profit to itself as it secures its energy from the surplus of a generating plant in an industrial factory controlled by the H. R. Ladew estate, which also controls the Glen Cove company. There is no contract between the two and the industrial plant could increase its charge for energy at any time. The Nassau company agreed to make a maximum rate of 12 cents in all territory served by it.

## Indiana Commission

The commission has announced its completed appraisals of the property of the three Indianapolis heating and lighting companies, which are the Indianapolis Light & Heat Company, the Merchants' Heat & Light Company and the People's Light & Heat Company, the last two companies being merged. The valuations were made by the engineering staff of the commission, and are marked "first tentative." The Indianapolis Light & Heat Company, the largest of the three, was given a total cost of reproduction allowance of \$4,893,881 and a present value of \$3,917,889. In these figures, as in all the valuations, 12 per cent was allowed to cover cost of engineering, superintendence, interest during construction, contingencies, etc. The cost of reproduction of the Merchants' company was given as \$2,391,190 and the present value of the company was given as \$2,076,638. The People's company was given a cost of reproduction value of \$442,898 and a present value of \$273,134. The appraisals have been filed with each of the companies and a date for the beginning of the hearings on the petitions for rate revision was fixed for Aug. 20.

## Rhode Island Commission

The annual report of the Public Utilities Commission of Rhode Island, covering the calendar year 1913, repeats the belief expressed in its first report that the best results will obtain for both the public and the utilities if a determination of value is made in the first instance, with revaluation from time to time as the same may appear necessary. The commission again recommends the adoption of legislation substantially similar to that of Wisconsin, prescribing the principal portion of the requirements relative to annual reports and physical valuation of the property of utilities.

The commission has not yet prescribed a form of return for utilities other than railways of all kinds, although the matter of such returns by gas and electric-lighting companies has had consideration during the year. Numerous conferences have been held with officials of such utilities, and the commission has ascertained that the methods of accounting in use by these utilities vary to a considerable extent.

The form of standard classification of accounts of the New England Section of the N. E. L. A., that used by the Stone & Webster Management Association and those prescribed by various public service commissions have been under consideration, and undoubtedly during the coming year a form, containing what the commission deems the best features of the various classifications, will be adopted.

## Current News Notes

CANADIAN NIAGARA PLANTS UNDER GUARD.—The Canadian Militia Department has sent a detachment of the Forty-fourth Regiment to protect the equipment of the Toronto Power Company, the Ontario Power Company and the Canadian Niagara Power Company.

\* \* \*

SHERMAN WAS RIGHT.—Energy for electric lighting is furnished now in Argentina only until 3 a. m. Train service has also been reduced. This action has been taken in order to conserve the coal supply on hand. Argentina has relied for her coal supply on foreign nations. With shipping tied up on account of the European war the above precaution became necessary.

\* \* \*

FOR AN "ALL-ELECTRICAL DAY."—Mr. Robert Montgomery, of the Louisville Gas & Electric Company, whose suggestion for the nation-wide observance of an "electric-vehicle day" was recently noted in this column, explains that his original idea was even more comprehensive, and has now proposed the possibility of an "All-Electrical Day" which the entire electrical industry might take part in celebrating. As the birthday anniversaries of both Franklin and Edison come during the winter months, Mr. Montgomery suggests the date of the first commercial use of the incandescent lamp. It is his idea that electrical firms might grant their employees a half-holiday on that occasion, and that the day be fittingly celebrated with parades, meetings, outings, etc.

\* \* \*

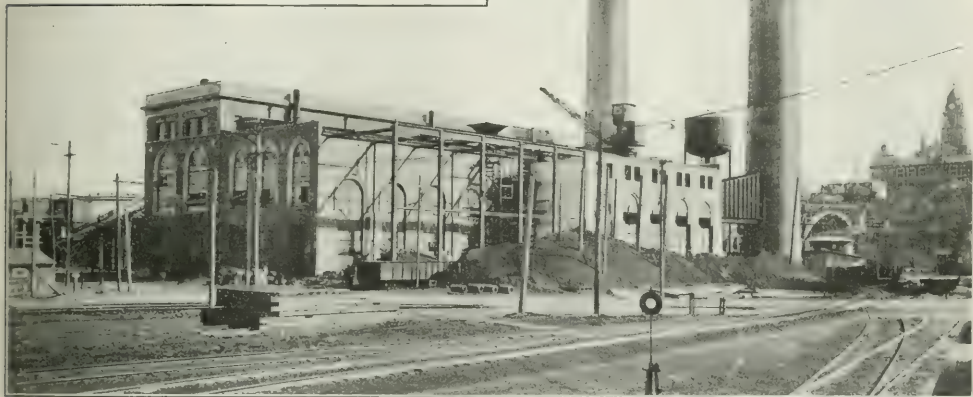
MOTION PICTURES ON ELECTRICAL TOPICS.—In his recent report to the members of the Society for Electrical Development Mr. J. M. Wakeman, general manager, announced that three special reels of electrical motion pictures will be released Aug. 24, two more on Sept. 1, and another the latter part of September. At once upon release these reels start from fifty different centers in the United States and Canada and will be shown in all the large cities. The attention of the society has also been called to an objectionable film now being run, which shows one of the characters accidentally killed by placing his hand on an electric water kettle. Another scene depicts the power house and the alleged accident which the scenario writer imagined could cause such a result. The society, through its Mr. L. G. H. Smith, has pointed out the impossibility of the situation and the injustice to the electrical industry resulting from this film, and has urged the manufacturers to withdraw the film and to prevent others of a similar character from being exhibited.

\* \* \*

COMMERCIAL TRAVELERS IN SOUTH AMERICA.—Taxes imposed by South American countries on commercial travelers are far from being prohibitive to the average exporter. While various license fees are prescribed by law in those countries, their purpose, as explained in a report issued by the Bureau of Foreign and Domestic Commerce of the Department of Commerce, is chiefly to prevent unfair competition with local concerns, which are themselves subject to similar taxes. By associating himself with some local house the traveler may obtain exemption from all but a few of the more moderate taxes. The rates of license fees and the conditions under which samples may be temporarily admitted free of duty in practically all the countries of South America are shown in the report entitled "Commercial Travelers and Samples in South America" (Tariff Series No. 19A), copies of which may be purchased for 5 cents each from the superintendent of documents, Government Printing Office.

## Texas' Largest Central Station

Steam-turbine plant of the Fort Worth Power & Light Company—Provisions for cooling circulating water in pond and towers—Distribution circuits with emergency feeders and block transformer structures



THE largest central-station power plant in Texas is the steam-turbine station of the Fort Worth Power & Light Company, which not only supplies the electric-service needs of its own community but also sells large amounts of energy to the Texas Power & Light Company, operating an extensive high-tension transmission system in the north central section of the State. The present station first went into operation about eighteen months ago with a peak load of 3000 kw. Since that time its load has increased to 13,000 kw, and the construction forces have been busy keeping pace with the rapid growth of the demand for power.

The plant is situated on the west bank of the Trinity River, from which during the major portion of the year its supply of condensing water is drawn, although during the dry season cooling towers must be depended upon as auxiliaries to the operation of the large surface-type condensers for the turbines.

### Fuel Supply and Boiler Room

Texas and Oklahoma coals are used as fuel in the Fort Worth plant. From the cars or piles in the fuel storage yard a 68-hp Brownhoist crane with a 36-cu. ft. bucket elevates the fuel to the roof of the bunkers over the boiler room. Here the coal can be either deposited directly into the bunkers or passed first through a traveling crusher which is arranged to move on rails the entire length of the bunker roof. The bunkers are of the Browning suspension type and hold 1200 tons of fuel.

There are fourteen Edge Moor boilers—eight 500-hp units and six 600-hp units. Ordinarily, with the Texas coal provided, these boilers are operated at about 150 per cent of this normal rating. The furnaces are equipped with Green chain-grate stokers with one excep-

tion, this one having been fitted up with a Taylor under-feed stoker for purposes of test.

Experiments are also being made with natural-gas firing. One of the chain-grate furnaces has been equipped with forty Kirkwood gas burners which were installed without disturbing the coal-firing apparatus. Each burner is rated to develop 25 boiler-hp. Large receiver chambers are features of the gas supply piping. The gas-fired boiler is being tested for economy of operation compared with coal, and also with respect to the time interval in which it can be put into service in case of emergency. The load on the Fort Worth plant is extremely uniform and regular, but in the event that it is needed steam can be raised in this gas-fired boiler in about seven minutes.

An operating steam pressure of 220 lb. per sq. in. is employed and Foster superheaters furnish 150 deg. superheat. Hoppe feed-water heaters heat the boiler supply, utilizing the waste thermal units in the exhaust from the auxiliaries. The boiler-feed pumps are turbine-driven. All feed-water entering the boilers is measured.

### Stacks and Ash-Handling Equipment

Each row of boilers is connected through a metal breeching to one of the 256-ft. reinforced-concrete stacks which carry aloft the products of combustion. These stacks are lined with firebrick all the way from a point 4 ft. below the breechings, and at the top they measure in inside diameter 13 ft. and 15 ft. respectively.

From a gallery beneath the firing aisle the ashes are raked from the furnace ash-pits into hoppers leading to the vacuum-conveyor system which transports the ashes to a two-car ash tank. A five-car ash tank is now also under construction.





FIG. 1—COAL-STORAGE PILES AND TRAVELING HOIST

To supplement the present ground storage piles, an under-water fuel storage pit is being built on the plant property. This pit will be of reinforced concrete and will hold 6000 tons. It will measure 215 ft. long, 32 ft. wide and 30 ft. deep, and will be spanned by a Whiting crane equipped with a 54-cu. ft. bucket.

Special attention has been given to flue-gas analysis and to the improvement of operating efficiency in the boiler room of the Fort Worth plant. Provision is made for tapping the flue gases from each furnace and for making a continuous test of the average carbon-dioxide content of the units in service. Draft gages are provided for noting the conditions of combustion and each boiler and principal steam line is tapped for steam-flow

meter connections. A completely equipped laboratory is installed on the ground floor of the station and here experienced chemists and engineers are in charge. Operating reports and analyses of plant losses are compiled daily, and each element of loss is studied in detail and every effort directed at reducing the magnitude of the separate items.

Three 1200-ft. wells furnish the water supply of the station. These wells are located near the plant and are pumped by the air-lift method. Compressed air at 150 lb. pressure is furnished by a pair of Ingersoll-Rand two-stage compressors, one steam-driven and the other operated by a 235-hp Westinghouse synchronous motor.

#### Generating Units in Turbine Room

One 5000-kw and two 4000-kw General Electric horizontal turbo-alternators comprise the prime power units. These machines deliver 4000/2300-volt, sixty-cycle, three-phase energy and have their neutrals solidly grounded. There are three 100-kw exciter sets, two being turbo-driven, while the third is directly connected to a 4000-volt induction motor. The last-mentioned set ordinarily supplies excitation energy, while the first two are retained for starting service.

The large turbines exhaust into Alberger surface-type condensers, the main exhaust lines being controlled by 72-in. motor-operated valves. During the season of flow in the Trinity River circulating water for the condensers is obtained from this stream. By impounding the river at a point near the plant a cooling pond is formed.



FIG. 2—BOILERS EQUIPPED FOR GAS AND COAL FIRING



FIG. 3—TURBINE ROOM OF THE FORT WORTH STATION

Water coming from the condensers is discharged into the river at a point about 600 ft. above the dam where the intake is situated. This intake pipe opens into the lowest part of the pond, thus obtaining the coolest water, while the hot water, which remains near the surface, passes off over the spillway. The circulating pumps are installed in a pump house in the plant yard, and are all electrically driven by vertical-shaft motors. There are an 11,000-gal. pump operated by a 100-hp motor and a pair of 6000-gal. pumps driven by 75-hp motors.

At certain seasons of the year, as already noted, the flow in the Trinity River at Fort Worth practically ceases altogether, and resort must then be had to the cooling towers, of which there are four installed. These are of the Alberger type and are to be supplemented by another Alberger tower and a Worthington tower. When the cooling towers are in operation turbine-driven booster pumps are required to assist the motor-driven circulating pumps. These booster pumps are of the same ratings as the circulating pumps, namely, 11,000 gal. and 6000 gal. per minute.

#### Duplicate 4000-Volt Bus

For flexibility in operation the 4000-volt station bus is arranged in duplicate. By means of the motor-operated General Electric H-3 2000-amp, 15,000-volt "machine switches," any generator can be thrown onto either bus. A similar "synchronizing switch" serves to tie the two buses together when that is desired. The outgoing feeders are arranged in groups, each controlled by a group switch by means of which connection can be made to either bus. The group switches are of the motor-operated type similar to the machine switches but are mounted on the overhead switchboard gallery. The

individual feeder switches are of the General Electric K-12 solenoid-operated type and are installed with the machine switches and bus structure just beneath the switchboard gallery. The 6000-kw and two 1500-kw transformer banks serving the 60,000-volt transmission line also have their individual switches leading from the station buses, and connections are furthermore made for station lighting and power and for the motor-driven exciter set. The exciter bus, it is of interest to add, is also installed in duplicate, so that separate excitation systems can be operated if advisable.

One of a pair of 5-kw motor-generator sets ordinarily energizes the operating bus, but in case of interruption to this supply an automatic switch connects in circuit an 80-amp storage battery, thus insuring that energy will always be available for operating relays and switches. This battery is made up of 104 vehicle-type Edison cells.



FIG. 4—HATCHES OVER COAL BUNKERS



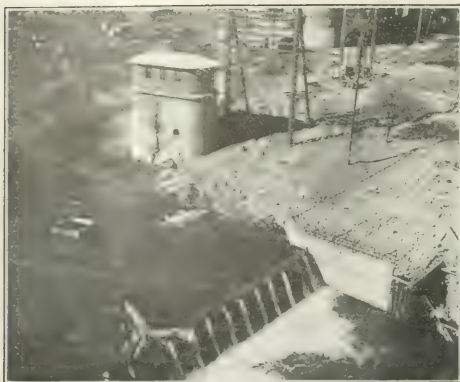


FIG. 5—DAM, COOLING POND AND FOREBAY

Among the curve-drawing instruments on the switchboard not ordinarily found in similar plants are recording frequency meters, recording voltmeters, recording wattmeters and recording power-factor meters. The machine panels are also equipped with wattless-component meters in addition to the usual ammeters and kilowatt-hour meters. The method of totalizing the output of the several machines is also rather novel, the secondaries of the individual instrument transformers being paralleled to give the total reading required, although the machine circuits themselves are carried separately to the bus switches.

The turbine room is spanned by a 50-ton Cleveland crane with a 5-ton auxiliary. Twenty two-lamp groups of 250-watt tungsten units furnish the lighting.

In over-all dimensions the Fort Worth power plant building measures 136 ft. wide by 291 ft. long.

#### Underground Distribution in Business District

Much attention and interest have been attracted by the novel scheme of distribution employed in the underground district of Fort Worth. Four feeders of No. 1 to No. 4/0 cross-section supply the region within the fire limits. These feeders, along with other circuits, are all taken overhead on steel-tower structures across the river bottoms to the terminal house on the edge of the river bluff where the underground construction begins. From the terminal house the four 4000-volt feeders, together with a "spare" No. 4/0 three-con-



FIG. 6—BUS STRUCTURE AND OIL-SWITCH COMPARTMENTS

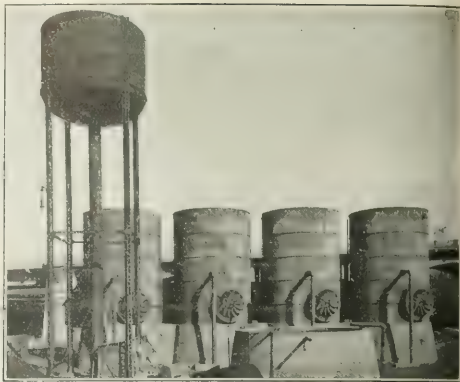


FIG. 7—COOLING TOWERS AND WATER-SUPPLY TANK

ductor cable, are taken in fiber conduit up Throckmorton Street, which parallels the main street of the city at a distance of two blocks.

At every second street one of the feeders ends at a double-throw hand-operated oil switch which connects it to the "lateral" feeding "crosstown" in both directions. The other throw of the same oil switch connects the lateral to the spare feeder cable which is tapped in this way to one side of each of the Throckmorton Street switches. In event of accident to the feeder for a given district a troubleman can be dispatched to the switch at the Throckmorton Street intersection with the lateral, and by transferring the circuit over to the spare feeder service can be quickly restored.

#### Laterals and Transformer Structures

Coming now to the laterals under the crosstown streets, these circuits are tapped at each alley intersection by two "branch-offs," one leading to each of the transformer structures serving the block on its side. As shown in Fig. 9, these transformer structures comprise a pair of tubular steel poles supporting a steel platform on which the transformers are set. The structure is installed in the alley opening just outside the building line. From the transformers the secondary lines are carried down the alley on poles, brackets, etc. Each transformer structure in this way serves one city block and each branch-off serves two transformer structures. A given lateral thus supplies a sec-

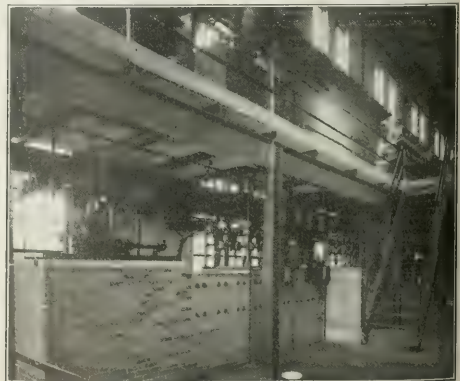


FIG. 8—GENERATOR, GROUP AND FEEDER OIL SWITCHES



FIG. 9—TRANSFORMER STRUCTURE AT ALLEYWAY

tion two blocks wide across the fire district. The hand-operated double-throw oil switches at the Throckmorton Street intersections are inclosed in heavy pedestal castings and despite their necessary size are quite inconspicuous. They are locked against tampering, but keys are carried by each member of the company's operating staff.

Transformers are connected both delta and star on the three-phase feeders, while a number are also arranged in the Scott relation to supply two-phase energy for the large number of alternating-current motors of this type remaining on the company's circuits. This two-phase equipment remains from the former two-phase motor service which was furnished exclusively by the predecessor of the present plant.

There is in addition a 500-volt direct-current "power" circuit which is supplied from a pair of 500-kw six-phase rotary converters in the power house. This circuit is operated ungrounded. The duplicate 400,000-irc. mil feeders which supply this 500-volt energy are arranged in duplicate, taps to both feeders being brought up to a double-throw switch on each transformer structure. In this way the 500-volt motors in



FIG. 10—MOTOR-DRIVEN CIRCULATING PUMPS

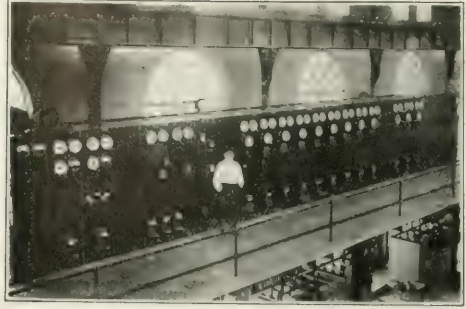


FIG. 11—SWITCHBOARD GALLERY

the local block may be fed from either line in case of accident to the other. In addition, the transformer structures also carry the usual lightning-arrester equipment, and in some instances watt-hour meters recording the consumption of the nearby "white-way" lighting on Main Street.

Energy is delivered to the 60,000-volt transmission system of the Texas Power & Light Company over three banks of transformers—one 6000-kw group and two 1500-kw groups. The oil switches are of the General Electric solenoid-operated type and are rated at 150 amp and 70,000 volts.

The plant and city distribution system described were designed and built by the Cleveland Construction Company, Cleveland, Ohio, Mr. Hugh Cook being resident engineer at Fort Worth.

Mr. A. J. Duncan, Jr., is president and general manager of the Fort Worth Power & Light Company. Mr. W. G. Riddle is chief engineer in charge of the plant.



FIG. 12—CURBSIDE FEEDER SWITCH



## Hydroelectric Station on the Cuyahoga River

**A three-unit, 1800-kw hydraulic station at  
Great Falls operating in conjunction with  
an 18,900-kw steam plant near Akron, Ohio**

**T**HE hydroelectric station of the Northern Ohio Traction & Light Company at the Great Falls of the Cuyahoga River operates in conjunction with a steam station on the same river. The Cuyahoga from the town of Benton to Hiram Springs, a distance of 8 miles, flows in a deep channel through a beautiful valley varying from 0.5 mile to 2.5 miles in width. Legend has it that small tribes of Indians habitually spent the severe months of the winter in a sort of cave formed by an overhanging ledge less than 100 yd. below the Great Falls. Later, on account of the peculiar formation of rock strata in the cave it became known as the "Old Maid's Kitchen," and it is almost before the door of this historic cavern that a hollow-concrete-steel dam, 52 ft. in exposed height and 100 ft. across its top, has been erected. The pond created by this hydro-gravity dam, when the water stands at the crest, is 35 acres in area and represents an available storage reservoir containing 35,000,000 acre-ft. of water. Records show that the actual discharge of the river has fluctuated from 0.8 cu. ft. to 9.2 cu. ft. a second. The drainage area tributary to the hydroelectric development amounts to approximately 400 sq. miles, and from this district the mean annual run-off ratio has been found to be 1 cu. second-ft. per square mile of tributary drainage area. Referred to sea level the dam crest is at an elevation of 910 ft., and as the river elevation at the upstream boundary of the company's property is at 911, a slope of 1 ft. is allowed in the pond above the dam. In the tail channel the river elevation at the power house is 805, and the effective fall for the development equals (911—805) — (friction head + velocity head, 5 ft.) — 1 ft. lost at turbine entrance and draft-tube efflux, equaling an effective head of 100 ft.

### 2760-Ft. Steel Penstock from Dam to Power House

The diversion conduit is a 90-in. riveted steel-plate pipe with its intake, situated on the upstream side and at the south end of the dam, properly guarded by trash racks. A motor-driven gate valve operated from the power house controls the inflow into the pipe. Concrete benches spaced 10 ft. apart support the pipe throughout its entire length of 2760 ft. One manhole, an air valve, a mud sluice and an expansion joint are provided for each 1000 ft. of its length. This circular steel penstock terminates in a riveted-steel-plate receiver at the power house, where a relief valve is provided. The thickness of the steel plate is 0.3125 in., and the weight of pipe with rivets is 440 lb. per linear foot. The expansion joints offer ample safety against temperature influence, while two surge tanks and the relief valve represent duplicate insurance against damage from water hammer. One coat of hot asphalt and two of graphite paint have been applied, which, it is estimated, will serve five years without renewal. The useful life of the pipe, if recoated every fifth year, is estimated at from thirty to forty years. The per cent of silt carried by the Cuyahoga River water is not sufficient to affect the capacity of the pipe or its durability.

### Generating Station and Electrical Equipment

The power house is erected on rock foundation at the downstream boundary of the company's property, the substructure consisting of the head wall, which supports the pipe receiver, two side walls, pits and a concrete-slab floor extended downstream about 50 ft. to form an apron for the outflowing water. All substructure walls are of monolithic concrete construction bedded on rock. Brick walls and a steel-framed roof with corrugated-iron covering complete this fireproof structure. As it stands the power house measures 31 ft. by 47 ft. inside, but the building can be increased in length to house additional units.

Three hydraulic turbines of the Francis type compose the prime-mover equipment furnished by the Trump Manufacturing Company, of Springfield, Ohio.



FIG. 1—DAM ON THE CUYAHOGA RIVER

The rating of each turbine is based upon a guarantee efficiency of 80 per cent from three-fourths to full-gate openings, developing from 5000 minute-ft. (83.33 cu. ft. a second) of water and a shaft speed of 500 r.p.m. 750 hp. These turbines are of the so-called high-head reaction type, a comparatively recent development secured by the adaptation of the Francis turbine characteristics to the American reaction turbine design. The steel frame anchored to the concrete-steel floor supports the turbines, generators and a 2500-lb. flywheel. The hydraulic governors are of the Woodward oil-pressure relay type. Water is supplied to the turbines through feeder pipes from the receiver. Each of the 54-in. riveted-steel feeder pipes is equipped with a motor-driven valve gate. After passing through the 28-in. runners the water leaves the turbines through steel plate draft tubes emptying into the pits in the tailrace. The draft tubes are 6 ft. in diameter, curving downstream and flaring at their efflux ends.

The 720-kva, 2800-volt, three-phase, sixty-cycle generating equipment consists of three Westinghouse

ternators directly connected to the horizontal water-wheel shafts. Excitation for the main generators is supplied by two 40-kw, 125-volt exciter sets placed near the east wall of the station. One of these machines is connected to an outboard pulley on the generator end of main unit No. 3, while the other is directly connected to a 60-hp, 2200-volt induction motor operating at 1800 r.p.m.

The six-panel black-slate switchboard, the high-tension bus and switching equipment, and three 600-kva, 2200/22,000-volt, three-phase transformers for increasing the potential of outgoing energy are installed along the north station wall. All switching apparatus on the board controlling circuits operating at a potential of 2300 volts or more is of the manually operated, remotely controlled type. A three-phase oil switch connecting the high-tension side of the step-up transformers to the outgoing transmission line is not controlled from the switchboard, but from a lever mounted on the switch rack. The entire equipment of the station being on one floor in a single room makes it possible for the station traveling crane to serve all apparatus.

#### The Line and Transmission Lines

About 0.75 mile upstream is the main steam generating station of the Northern Ohio Traction & Light Company, which is known as the Gorge steam station described in the *Electrical World* Aug. 30, 1913). The present installation in the steam station consists



FIG. 2—ELECTRICAL EQUIPMENT IN HYDROELECTRIC STATION ON THE CUYAHOGA RIVER

of three Westinghouse 6300-kw, 2300-volt, sixty-cycle turbo-generators, and this equipment is operated in parallel with that of the water-power station, connections being made on the 22,000-volt bus. Leaving the hydroelectric station, a No. 00 copper line ascends the steep bluff to a roadway cut on the side of the hill. From here a line of 35-ft. wooden poles carries the leads to a point about 0.25 mile distant, from which place the circuits continue to the steam station on steel towers. In connection with the wooden-pole line it is interesting to note the peculiar type of construction employed. To safeguard the high-tension circuit and the smaller wires leading to the intake house at the dam, four 0.5-in. steel messenger wires have been strung at 18-in. intervals on an angle-iron cross-arm at the top of the pole. This precaution has been found valuable for fending off flying branches blown from trees higher up the neighboring hillside.

A railroad was built to provide a means of hauling material and machinery to the site of the hydroelectric station and is now used for hauling supplies. In speaking of the difficulties encountered in building the plant,

Mr. W. H. Roberts, superintendent of motive power, said that the construction of the electric railroad had indeed been wise, as the saving in haulage expense and in time had amounted to more than the cost of the road.

Mr. Charles Currie is vice-president and general manager of the Northern Ohio Traction & Light Company, and in his work he is assisted by Mr. W. H. Douglas, general superintendent, and Mr. W. H. Roberts, superintendent of motive power. Mr. E. C. Stakes is chief operating engineer at the Gorge station and the hydroelectric plant.

#### Switchboard Connections for Making Commercial Transformer Tests

The Commonwealth Edison Company of Chicago makes a practice of testing a certain percentage of all shipments of new transformers for such characteristics as excitation, core loss, no-load ratio of transformation, polarity, temperature rise under load, and impedance. As the number of transformers to be tested each month is considerable, a special equipment has been rigged up for this purpose alone and a switchboard has been designed to simplify the making and changing of connections. The latter is so arranged that practically all of the above tests can be made by simply throwing switches. The arrangement works out so well that it is described here in some detail for the benefit of other companies that may desire to test their transformers in a similar fashion. Such tests may be made either when the transformers are new or when they have been in service for some time.

A photograph of the switchboard is shown in Fig. 2 and the corresponding wiring diagram in Fig. 1. The board provides for the simultaneous testing of two similar transformers and provides both alternating-current and direct-current energy. Before taking up the details and connections of the several tests it will be necessary to examine the general lay-out of the switchboard.

#### General Layout of the Board

The power supply section of the board is shown at the left in Figs. 1 and 2. The upper corner contains the alternating-current terminals and fuses, and the lower corner the direct-current terminals and fuses. This section is supplied with direct current from a storage battery and with alternating current from a variable-frequency motor-generator set. A double-throw switch *M* when closed in position 1 puts alternating-current voltage on the busbars through the ammeter *I<sub>a</sub>*; while in position 2 it puts direct-current voltage on the bars through ammeter *I<sub>d</sub>*. These ammeters may be cut out by means of short-circuiting switches.

In the main section of the board there are three double-pole switches *A<sub>1-2</sub>*, *B<sub>1-2</sub>*, and *C<sub>1-2</sub>*, which make connection with the secondary windings of the No. 1 transformer, and three similar switches *A<sub>2-3</sub>*, *B<sub>2-3</sub>*, and *C<sub>2-3</sub>*, for transformer No. 2. *A<sub>1-2</sub>* and *A<sub>2-3</sub>*, when closed to the left apply voltage to the primary windings of transformers 1 and 2 respectively. At the same time auxiliary contacts installed behind the switchboard connect pairs of high-tension terminals of the two transformers respectively to *P<sub>1</sub>* and *P<sub>2</sub>*, which are two of a row of potential terminals in the middle of the board to which a voltmeter can be conveniently connected. Of these voltmeter lugs, *P<sub>1</sub>* gives busbar voltage; *P<sub>2</sub>* and *P<sub>3</sub>* give primary voltages through protecting switches forming integral parts of *A<sub>1-2</sub>* and *A<sub>2-3</sub>*; *P<sub>4</sub>* and *P<sub>5</sub>* give secondary voltages on the respective secondary coils of the No. 1 transformer, and *P<sub>6</sub>* gives the total secondary voltage; *P<sub>7</sub>*, *P<sub>8</sub>*, and *P<sub>9</sub>* give the same voltages

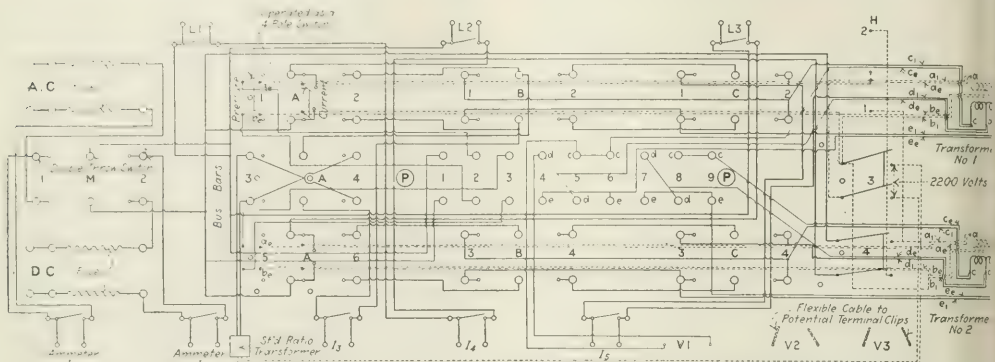


for transformer No. 2 as do  $P_1$ ,  $P_2$ , and  $P_3$  respectively.

In the right-hand position, switches  $A_{1-}$ , and  $A_{2-}$ , supply energy to the centers of the  $B$  or transfer switches by means of which the two secondary coils of each transformer can be connected in series, or the connections can be transferred to the  $C$  switches. The  $C$  switches allow energy to be supplied separately to the two secondary windings of each transformer. In the left-hand position  $A_{1-}$ , and  $A_{2-}$ , make two connections on the rear of the board by means of auxiliary four-pole switches operated by studs projecting through

voltage on the primary of the standard-ratio transformer.  $H_1$  and  $H_2$  are for the load-back test and are so arranged as to connect the primaries of transformers Nos. 1 and 2 in parallel, and in one lead the low-tension bus, an ammeter and a lamp-bank are in series.  $H_1$  and  $H_2$  provide for connection of the primary coil of the two transformers and the standard-ratio transformer in parallel for measurement of cross-current.

Along the top of the board are studs with short-circuiting switches for the insertion of lamp-bank resistors, and along the bottom are terminals for fo



### Operation of the Board

The simplicity of operation of the board can be illustrated by means of a brief description of the more important tests. For exciting current and core-loss measurement switches  $M$ ,  $A$ ,  $B$ , and  $C$ , are closed, exciting the upper coil of transformer No. 1. Ammeter gives the exciting current, and a wattmeter connected across  $I$ , and  $V$ , the core loss. The voltage is measured at  $V_1$  with a flexible connection to  $P_1$ . Throwing switch from right to left gives the connections for an excitation test on the lower coil, the voltage clips merely being transferred to  $P_2$ . With switch  $C$  open and  $B$  closed to the left excitation can be obtained with the oils in series.

For a load-back or opposition test of the two transformers, the switches closed are  $M$ ,  $A$ ,  $A_1$ ,  $B$ ,  $B_1$ ,  $H$ , and  $H_1$ . The low-tension coils are then in parallel on the alternating-current supply and the high-tension coils are in opposition. Losses are supplied to the high-tension winding at low voltage and are measured by means of a wattmeter connected at  $I_1$  and  $P_1$ .

Resistance tests are made with direct current. For example, to obtain the resistance of the upper coil of transformer No. 1, switches  $M$ ,  $A$ ,  $B$ , and  $C$ , are closed. Current is measured at  $I_2$  and is controlled by lamp-bank  $L$ . Voltage is measured at  $V_1$  through studs  $P_1$ . Power can also be measured as a check at  $I_1$  and  $V_1$ .

Tests for ratio of transformation are made by banking the transformers under test with the standard-ratio transformer and measuring the cross-current. This test also checks polarity. For these purposes switches  $A$ ,  $A_1$ ,  $B$ ,  $C$ , or  $C_1$ ,  $A_2$  or  $A_1$ ,  $A_3$ ,  $B_1$ ,  $C_1$  and  $H_1$  and  $H_2$  are closed, the transformer in the lower bank being used to excite the primary coils of transformer No. 1 and the standard-ratio transformer. Increase of current at  $I_1$  when switch  $H_1$  is closed indicates the presence of cross-current and its magnitude.

The only tests which require disconnection of transformer cables are those for load loss of a single transformer and for impedance. These require the short-circuiting of the secondary leads. The load-loss test can be made in a working day by starting it at 8 a.m. Regulation is calculated from the measured impedance

by the method described by Lloyd and Agnew in the *Bulletin* of the National Bureau of Standards.

A practical insulation test is made by doubling the voltage through doubling the frequency by which expedient the core flux is not increased. The company considers this test more reliable than one in which the voltage is supplied from an outside source, because the test more nearly duplicates practical over-voltage conditions. The usual insulation tests are also made.

The accompanying chart summarizes the connections and positions of the switches for the important tests.

In the foregoing account no attempt has been made to exhaust the possibilities of the testing equipment. Enough has been said, however, to indicate how, by careful study of operating conditions, the routine of testing may be simplified. In fact, only by the use of some such plan is the actual testing of a large transformer equipment practicable. Transformers up to 25 kva capacity are tested. Not only are samples of all new transformers put through these tests, but the studies made are of great value in connection with transformers injured in service. For example, during 1912 274 preliminary and 396 final tests were made.

The transformer test is a part of the general testing laboratory described in the *Electrical World* of Jan. 3. This laboratory is in charge of Mr. E. O. Schweitzer, chief testing engineer.

### Nitrogen-Filled Street Lamps for Chicago

Mention was made in the issue of July 11 of the fact that the Westinghouse Lamp Company was awarded the contract by the Sanitary District of Chicago for nitrogen-filled series tungsten street lamps with auto-transformers and fixtures, to be used for street lighting in Chicago. The total number of lamps to be furnished under this contract will be not less than 2000, but the Sanitary District has the right to purchase during 1914 at prices specified in the contract 8000 additional lamps in lots of 1000, as ordered by the District's electrical engineer.

Division A provides for compensators, with globes and fixtures complete, and Division B for nitrogen-filled series tungsten lamps complete. The prices for furnishing and delivering the compensators, with glassware and fixtures complete, range from \$13.60 to \$13.45 each, according to quantity. The prices for furnishing the lamps range from \$4.50 to \$3.655 each, depending on the quantity taken. Thus the units will cost \$18.10 each for the first 2000, the price being reduced for a greater quantity, so that if 10,000 units are used it will be \$17.105. Sixty-cycle energy will be supplied to the lamp circuits, which will be of both the 6.6-amp and 10-amp types. The manufacturer guarantees the average total life of the lamps to be 1000 hours.

Mr. E. B. Ellicott, the electrical engineer of the Sanitary District, thinks that there is no question of the usefulness of the new lamps for residence-street lighting. He believes, however, that the flame-arc lamp still has a field in lighting business streets.

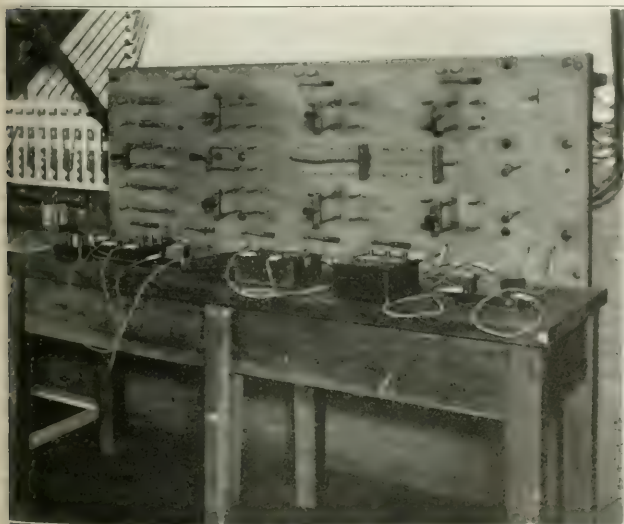


FIG. 2—SWITCHBOARD FOR ROUTINE TRANSFORMER TESTS



# Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods and Current Practice Among Successful Utilities

## Threshing with Electricity in Iowa

By F. S. DEWEY

It has not been a very long time since the farmer was accustomed to do his threshing with the old-fashioned flails, when the grain was beaten out on the threshing floor. Then came threshing machines operated by horse-power through sweeps. The next development in power for the threshing machine was the steam engine. And at the present time, while the steam engine and the gasoline engine are contesting for supremacy, the electric motor is making its appearance in the agricultural field. The reason for the farmer adopting this method of doing his threshing is its lower first cost, as well as the reduction in operating expenses secured. The fire hazard is also eliminated, there being no danger from cinders thrown from the engine smokestack or ashes with live coals being left on the ground under the engine.

The Muscatine Lighting Company, of Muscatine, Ia., is now furnishing the towns of Blue Grass, Walcott, Stockton and Durant, Ia., with electric energy for both motors and lighting. Along the 33,000-volt transmission line which feeds these towns there is installed a 2200-volt primary line on the same poles and beneath the 33,000-volt feeders. From this 2200-volt line the enterprising farmers along the route have availed themselves of the opportunity to secure electric energy for power and light. Between Walcott and Stockton there is an association of farmers who own their own threshing machine. As the steam engine that they had used in the past was getting old and some other apparatus for furnishing power would soon be necessary, they decided to give the electric motor an opportunity to prove its merits.

The electrical equipment consists of a 30-hp, 220-volt, sixty-cycle, single-phase Wagner motor complete with rails and pulley. The motor operates at 1165 r.p.m., but there are provided

three different sizes of pulleys in order to obtain three different speeds, as the proper speed of the cylinder is determined by the kind and condition of the grain being threshed. The transformer is a 25-kva General Electric unit stepping down to 220/110 volts secondary; the primary being equipped with two 5 per cent taps.

The transformer is mounted in ahead of the motor.

### RESULTS OBTAINED FROM ELECTRIC THRESHING

	Bushels	Kw.-hr.	Kw.-hr. per Bushel
Barley	1150	140	0.1217
Oats	1125	73	0.0649
Barley	1800	278	0.154
Barley	1045	160	0.153
Barley	1375	170	0.124
Barley	1015	160	0.153
Oats	720	67	0.093

on the truck of what was once a road grader, as shown in the illustrations. Energy is fed to the transformer over a temporarily installed line which is connected to the 2200-volt feeders. Mounted on the rear of the truck is a temporary ladder pole with cross-arm carrying the 2200-volt wires to the transformer. Also mounted on the pole are two Garton-Daniels lightning arresters, for the protection of the transformer. Mounted on the side of the truck on a wooden frame

a two-pole double-throw switch along with the motor starter. The double pole, double throw switch is used in order that large capacity fuse for the starting of the motor may be employed, and as soon as the motor has reached full speed the switch quickly thrown to the smaller capacity or running fuse. This affords better protection to the motor from overloads.



FIG. 1—ELECTRIC THRESHING NEAR MUSCATINE, IA.

To render the field apparatus safe to touch a 1-in. galvanized iron rod, 5 ft. long is driven into the earth at each setting. To this rod, by means of clamps, are grounded the transformer secondary neutral, the frame of the transformer, the motor and the truck. In this manner ample protection is secured.

The threshing machine used is one built by the Avery Manufacturing Company. The cylinder measures 32 in. with a 54-in. separator. In threshing barley a cylinder speed of about 1100 r.p.m. has been found to be most satisfactory. One of the advantages discovered for the electric motor is that the constant speed obtainable does not carry the grain over into the straw pile, whereas with the steam engine, when grain is damp, the speed has to be increased in order to run the grain through, and in doing this some of the grain is carried over.

In the table herewith is a list of the different threshing jobs handled, and the results obtained.

The cost of a complete equipment such as described above was \$800, while a steam or gasoline engine outfit of the same capacity would cost from \$1,800 to \$2,500.

It is figured that with electric energy at 5 cents per kw-hr. the operating expense will be 25 per cent less



FIG. 2—PORTABLE TRANSFORMER AND MOTOR ON GRADER BODY

than the operating expense of the steam engine, and that when interest, depreciation, insurance and taxes are taken into consideration steam-power cannot compete with electric service. The farmers who purchased this electric outfit declare themselves entirely satisfied with its operation.

### Reducing Maximum Demand Created by Motor-Driven Fire Pump

Wiring rules in some cities require that service for fire-pump motors shall be entirely separate from the general-motor service, and where the "demand and energy" system of rates is in effect two maximum-demand indicators must necessarily be installed. Ordinarily the demand created by testing the fire pump at stated intervals is added to that of the general motor-service installation, increasing the monthly bill considerably. Inasmuch as this testing may be accomplished at times when motors on the general service are at rest or only partly in operation, this procedure has been considered hardly fair to the consumer, and the accompanying circuits have been worked out by Mr. Nels Joleen for customers of the Commonwealth Edison Company, Chicago.

Normally the four-pole, double-throw switch is thrown to the right, separating the two services electrically even though they are both passing through the same switch. When testing or filling is to be done, however, throwing the four-pole, double-throw switch to the left allows the fire-pump motor to operate from

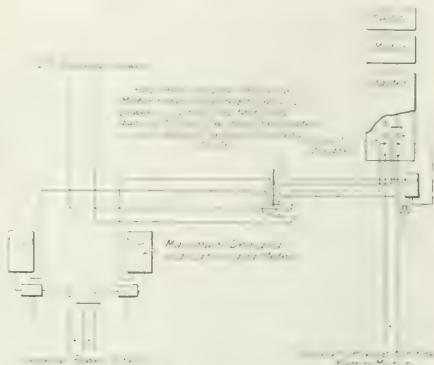


FIG. 1—DIAGRAM OF CIRCUITS FOR DIRECT-CURRENT INSTALLATION

the general motor-service circuit through the maximum-demand indicator on that circuit. It should be noted that the wiring is arranged so that if the switch is accidentally left in the open position the condition will be detected immediately by the absence of energy on the general-motor circuit.

By the use of this scheme motor-service customers are enabled to comply with the laws regarding fire pumps without incurring the excessive maximum-demand charges otherwise established. Likewise the electric-service company receives a fair rate for energy used, and should the customer operate his fire-pump

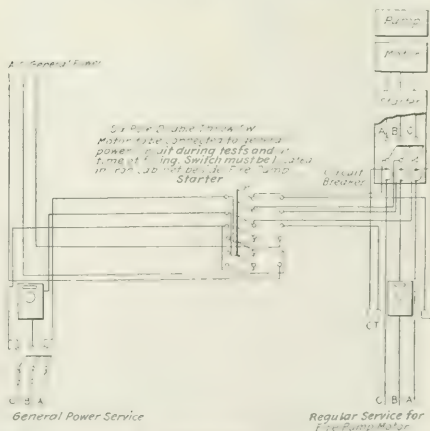


FIG. 2—DIAGRAM OF CIRCUITS FOR ALTERNATING-CURRENT INSTALLATION

motor when his general motor-service load is high the fact will be recorded by the demand indicators.

Where alternating-current, three-phase motors are installed a six-pole double-throw switch is required. Connections for a similar scheme using alternating current are given in Fig. 2.



## Apparent Power Paradox in Making Ice-Cream by Electricity

An interesting case recently arose on the lines of the Central Illinois Public Service Company in which it was shown that as an ice-cream factory approached its rated output the specific cost of production actually in-

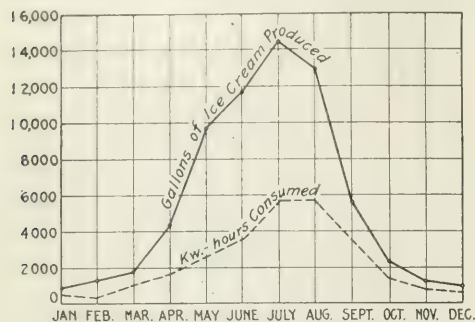


FIG. 1—CURVES OF ENERGY INPUT AND FACTORY PRODUCTION FOR TWELVE MONTHS

creased instead of decreased. In the plant under consideration the equipment consisted of a 20-hp, three-phase motor operating at 900 r.p.m. and driving a 10-

DATA ON ICE-CREAM FACTORY OPERATION

1913	Kw.-hr.	Gallons of Ice Cream	Kw.-hr. Divided by Gallons
January	598	960	0.62
February	479	1,120	0.43
March	717	1,865	0.38
April	1,575	4,287	0.37
May	2,527	9,668	0.26
June	3,560	11,812	0.30
July	5,443	14,495	0.35
August	5,452	12,954	0.42
September	3,399	5,517	0.61
October	1,343	2,117	0.63
November	756	1,212	0.62
December	645	558	0.68

ton refrigerating machine; a 5-hp, three-phase, 1800-r.p.m. motor driving a line shaft to which three brine-cooled ice-cream freezers were connected, a 3-hp,

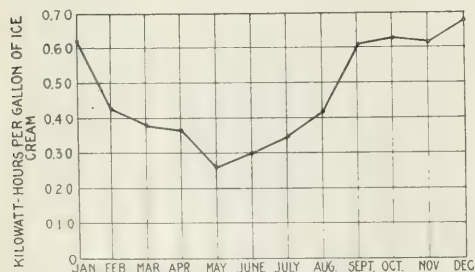


FIG. 2—CURVE SHOWING SPECIFIC ENERGY PRODUCTION FOR TWELVE MONTHS

three-phase, 1800-r.p.m. motor driving an ice crusher; a 3-hp, single-phase, 1800-r.p.m. motor driving a brine pump, and a 2-hp, single-phase, 1800-r.p.m. motor driving a fan. Taking the ice-cream company's monthly energy consumption in kilowatt-hours and its monthly output in gallons of ice-cream,

Mr. H. H. Wood, district salesman for the electric-service company, plotted the curves shown in Figs. 1 and 2. Here it was revealed that the kilowatt-hours per gallon of ice-cream were less in May than in June, July or August, even though the production was much greater in each of the latter three months. The explanation of this apparent paradox, however, was found to lie in the fact that during the month of May it was unnecessary to drive the large refrigerating machine at its full rating, while in the hotter months all of the available refrigeration was needed and the 20-hp motor worked at full load.

The data in the accompanying table are also interesting as indicating what specific energy consumption may be expected in a plant of this kind operating all twelve months of the year. The column headed "Kw.-hr. Divided by Gallons" shows an average of 0.39 kw-hr. per gallon of ice cream throughout the year.

## An Electric Sign on the Factory Lot

On a lot adjoining the factory site of the Hartford (Conn.) Rubber Works Company an electric sign, 60 ft. long, with letters 3 ft. high, has been erected, facing an important street in the outer industrial district.



LARGE ELECTRIC SIGN ON FACTORY LOT

The sign, which is illustrated in the accompanying photograph, is carried on an angle-iron frame, with letters 10 ft. above the ground, and its illumination is provided by 213 5-watt, 12-volt lamps. Electric energy for the illumination of the sign is supplied by the Hartford Electric Light Company.

## Pumping Illinois Oil Wells Electrically

After prospectors had become discouraged by unsuccessful efforts to find oil in Crawford County, Illinois, in the vicinity of the city of Robinson, one with greater persistence than the rest drilled a well on a vacant back-yard in town. The result was a producing well. More wells were then drilled in back-yards, and now eleven of these successful projects are being made to deliver up their crude black product through the agency of motor-driven pumps.

Motors rated at 3 hp, operating on three-phase, sixty-cycle, 220-volt circuits, are installed at each of these wells, for although the average pull on the pump for a 1000-ft. well is less than 3 hp, there are times when the well, becoming choked with sand, requires a motor of this size. The pumps operate from eight hours to ten hours a day and constitute a load which is very desirable from the central-station point of view both from its aggregate size and because it is in the main of an "off-peak" character.

# Illumination and Wiring

## Construction of 13,000-Volt Line Near Baltimore

By J. T. KELLY, JR.

Early last year the Consolidated Gas, Electric Light Power Company, of Baltimore, contracted to furnish service to the Maryland Steel Company at Sparrows Point near Baltimore, the original contract being for 300 kw, with a possible ultimate growth to 9000 kw or 10,000 kw. The Maryland Steel Company, it will be remembered, built for the United States government the floating drydock *Dewey*, which was taken to Manila, P. I. In addition to its large marine department, this company also produces annually many tons of steel girders.

The relative locations of Baltimore and Sparrows Point are shown in Fig. 1, together with the route of transmission line as finally chosen. Several routes were considered but discarded in favor of the one shown, which is approximately 43,000 ft. in length.

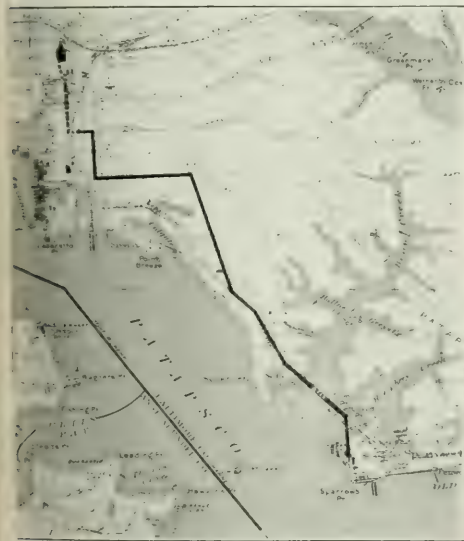


Fig. 1—LINE BETWEEN BALTIMORE AND SPARROWS POINT

The voltage used is 13,200 at twenty-five cycles. From the Highlandtown substation at the Baltimore end the first 6700 ft. of the line is underground, the rest being strung on wood poles designed to carry four circuits, to be originally installed.

The crossing of Bear Creek, some 3600 ft. wide and an un-navigable stream, presented the greatest problem. To clear all shipping the wires had to be 85 ft. above high water, and there was no foundation for towers. It was therefore decided to erect poles in the water from either shore to the edges of the channel and cross the channel by means of submarine cables, each 490 ft. in length.

The company has a gas main crossing Bear Creek at this point, supported by a bridge structure. The poles were set opposite and close to bents of this structure, being erected by a pile-driver and bottomed in the mud by a few light blows on the top. They were then secured by iron bands to the bridge structure itself. The submarine cables, each weighing with its reel

over 7000 lb., were loaded on a scow at Baltimore, towed to Bear Creek, the reels set up on the scow, and the cables pulled into place by a tugboat.

Fig. 2 shows the construction described above, also the connections of the submarine cables to the line, and the lightning arresters, which are mounted in pairs

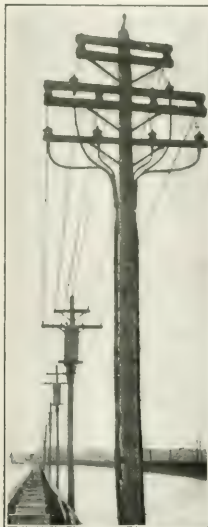


Fig. 2—LINE CROSSING BEAR CREEK



Fig. 3—DERRICK FOR ERECTING POLES

on poles adjacent to the terminus of the line. The method of dead-ending on spool-type insulators is also plainly shown. At corners in the line a method of rolling without cutting the wires was used, the pole framing being the same as shown for dead-ending, except that extra long arms were used to allow proper clearance between wires and the arms were canted to



Fig. 4—STANDARD POLE FRAMING

divide the angle in the line. Fig. 4 shows the standard pole framing.

The line is made up chiefly of 50-ft. poles and consists entirely of chestnut timber except for some thirty poles set in the bed of Bear Creek, which are of Southern



express, as high as 75 ft. on account of the depth of water and mud. At the crossing over the Baltimore & Sparrows Point Railway in Sparrows Point two steel towers were used, in order to meet the railroad specifications. These are 44 ft. high and 6 ft. square at the base. They were built and erected by the Maryland Steel Company.

The underground and submarine cables are No. 40 and are equipped with Davis open-air terminals. These are shown in Fig. 2. The cables are protected by three sets per circuit, of graded shunt lightning arresters, there being one set of three arresters at the underground pole and one set at each end of the submarine cable.

The line wires are No. 0. The ground wire is standard 5/16-in. galvanized guy strand and is grounded every fifth pole to a 12-ft. pipe driven in the ground. The line insulators were supplied by the Ohio Brass Company and the spool-type insulators also. The galvanized angle-iron cross-arm braces, shown in Figs. 2 and 4, are standard with the Consolidated company for high-tension or heavy work. The guying is done with 7/16-in. galvanized strand.

The standard pole spacing is 105 ft., and most of the poles were handled with the pole-erector wagon. Fig. 3 shows a 55-ft. pole just going into position. It will be noted that it was necessary to splice the boom on account of the unusual height of some of the poles to be handled. The Maryland Steel Company provided a brick substation of ample size and substantial design, equipped with concrete shelf bus structures in duplicate.

The load at the present time is about 2000 kw, partly alternating current handled through transformers, and partly direct current, 120-240 volts, supplied by two 400-kw rotaries. Owing to the synchronous operation of these rotaries, the power-factor of the load remains very close to unity.

### Church Lighting with High-Efficiency Incandescent Lamps

BY A. L. POWELL

From an illumination standpoint the church has too often been sadly neglected. Great stress has been laid on the architectural harmony of the lighting equipment, and in some cases this has proved fatal to proper lighting. The fixtures in many instances are things of beauty by day, but, being studded by bare lamps and hung low, many light sources are in the field of view during the evening services. It is appreciated, of course, that in no instance should the architecture of the building be spoiled by the improper placing of lamps, but the designer can usually find a way to meet this requirement without the lighting scheme becoming a cause of annoyance.

Inasmuch as there are a great many kinds of church interiors, no one scheme of lighting will be universally applicable. It is well that this is so, or a monotony and commercial appearance might result. Hence it is necessary to describe an individual installation rather than to give a general discussion of the subject.

The writer has previously outlined in the technical press\* the principles of good church lighting. Recently an installation was brought to his attention which is quite novel and which, by reason of its peculiar features, warrants description.

St. Mary's German Catholic Church, McKeesport, Pa., is Byzantine in treatment, consisting of a central portion with narrow side aisles. The walls are of masonry, and these, as well as the arches and clerestory, are

elaborately decorated with brightly colored convention and ecclesiastical pictures. The beamed wooden roof light in color. The general illumination formerly in use was supplemented by the numerous combination side wall brackets now shown unlighted. These were placed low, and hence when turned on tended to distract a



FIG. 1—VIEW TOWARD ALTAR ST. MARY'S GERMAN CATHOLIC CHURCH, MCKEESPORT, PA.

tention. Recently, however, there have been installed eight 1000-watt multiple tungsten lamps. These are spherical in shape and have their lower halves frosted. At the time of installation no suitable reflectors were available for use with this size of lamp, so the units were simply hung from the roof trusses by single chain fixtures.

The use of bare lamps is generally to be discouraged but in this case the hanging height is so great (40 ft. above the floor) that the glare is not noticeable. The lamps are hung about 15 ft. below the roof and spaced



FIG. 2—LOOKING TOWARD REAR OF CHURCH LIGHTED BY EIGHT 1000-WATT TUNGSTEN LAMPS

on approximately 25-ft. centers. A relatively high wattage is used considering the area to be lighted, but the church is brightly illuminated, as can be judged from the night photographs reproduced herewith.

It is true that the efficiency of downward utilization is comparatively low, but it was quite essential to use a unit giving a wide spreading of the light upward and

\*General Electric Review, February, 1914.

the sides, to illuminate the elaborate decorations. A reflector which had a tendency to concentrate the light would have been absolutely inapplicable. The balance is well preserved, and the lamps are so placed that the eye is not seriously fatigued.

Thus the present installation shows that sometimes a lighting unit which on first thought is quite inappropriate may be satisfactorily applied and may actually meet conditions.

### A Revolving Four-Sided Electric Sign

Tremont Temple, Boston, makes use of the electric signs shown in the accompanying halftone in advertising lectures and moving-picture entertainments in its auditorium and smaller halls. The most interesting of these signs is a vertical four-sided steel-frame structure about 25 ft. high, which is arranged to revolve about twice a minute, the drive being by a  $\frac{1}{4}$ -hp, 110-volt motor located in a box opposite the lower bearing. The letters measure approximately 10 in. square and contain about ten 10-watt tungsten lamps each. By using all four sides of the sign for display lettering the passer-by



A REVOLVING FOUR-SIDED ELECTRIC SIGN

can easily be informed of coming attractions for several days ahead, the rotating feature being decidedly effective in this class of service.

### RECENT TELEPHONE PATENTS

#### New Apparatus

Telephone wall instruments are usually fastened in position by means of screws. Mr. J. A. Douglas, of Waterloo, Ia., has devised a method of hanging the wall set on hooks so that it may be removed easily. A flexible electrical connector between the line wires and the telephone instrument is provided. The telephone instrument is equipped with an upward-projecting block which carries a conductor on each face. The line wires terminate upon two conducting arms which are so mounted that their free ends are forced together by springs. These ends are cut with a V-shaped opening into which the telephone-connected block slips, thus driving the arms apart and riding them upon the conducting plates.

#### Selective Systems

A circuit system has been patented by Mr. O. A. Daniels, of New York City, the patent having been assigned to the Western Electric Company. Two keys, each with two positions, may be made to control six or more different current sources. This is effected by the use of polarized relays in turn controlling other relays. Two oppositely poled polarized relays are associated with each side of the line. The keys cause these relays to operate in combinations so that their contacts control six sets of local circuits, one at a time.

A patent granted jointly to Messrs. P. Lavery and W. E. Brandlow covers a lockout system designed to prevent a third party on a line from interrupting or listening to a conversation. A control magnet of the interfering instrument receives sufficient current, if two instruments are already connected, to block the switch springs.

## Letters to the Editors

### Reversed-Polarity Correction

*To the Editors of the Electrical World:*

SIRS:—In reply to a question asking how to correct the polarity reversal of a generator, in your issue of Aug. 1, page 237, it is suggested that in the case of a shunt machine wires be extended to it from some other generator. This is seldom necessary, as accidental reversals are usually caused by some other generator or battery with which the machine in question has been running. With the bus alive and the generator armature at rest, one may raise the positive or the negative brushes all around the commutator or insulate them from it with pasteboard or paper, and then close the main switch for a moment. With the armature circuit open in this way the shunt-field circuit receives current from the bus in the proper direction to build up the machine with the correct polarity. This applies of course to shunt and compound machines alike and is used on compound generators having three-pole switches. It eliminates all wiring changes and one does not need to know the polarity of the field circuit.

Golden, Col.

WILLIAM J. HAZARD.

### Rubber-Insulation Specifications

*To the Editors of the Electrical World:*

SIRS:—It has come to my attention that certain manufacturers are attempting to discredit the specification and analytical procedure for rubber compound issued in the preliminary report of the joint rubber insulation committee, which was outlined on page 133 of your issue dated Jan. 17, 1914.

The method adopted is to send to those using the specification a reprint of the report of the analytical committee of the American Chemical Society on the procedure of the joint rubber-insulation committee. This reprint is not accompanied by the reply of the joint rubber-insulation committee, which appeared in the same issue of the *Journal of Industrial and Engineering Chemistry* (Vol. VI, No. 6, p. 155, June, 1914).

This reply shows that the report which was made by the analytical committee of the American Chemical Society is defective in that the procedure criticised was not properly followed by the members of that committee in the tests upon which their report is based. Engineers who receive copies of the Chemical Society report are therefore requested to read likewise the above-mentioned reply.

W. M. A. DELMAR,

Secretary Joint Rubber Insulation Committee  
New York, N. Y.



# Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

## Efficient Method of Providing Back-Pressure Valves with Drips

Fig. 1 shows the piping at a feed-water heater which was so arranged that the back-pressure valve would not relieve the pressure. To relieve air binding in the heater, a 2-in. vent was connected into the 6-in. exhaust

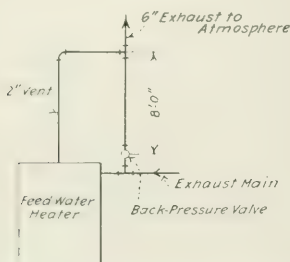


FIG. 1—PIPING TO FEED-WATER HEATER

to atmosphere above the back-pressure valve. This valve was, however, not dripped. Consequently a static head of about 3.5 lb. formed above the seat of this valve and prevented it from opening, as the pressure in the heater was never above 2.5 lb.

Trouble was experienced with two other back-pressure valves at other points in this same plant, owing to the lack of drips at these valves. The steam leaking past these valves, when closed, condensed and formed a static head. When this reached a height equivalent in pounds to the pressure carried it could rise no higher as it was then balanced by this pressure. The objection to this condition, however, was that the water standing above the valve corroded the valve parts, thus causing them to stick. One remedy for this condition is to drill a couple of holes through the valve seat, thus allowing the water to drain back. The steam escaping through these holes (say 2.25 in. in diameter) would

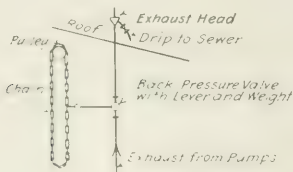


FIG. 2—CHAIN-OPERATED BACK-PRESSURE VALVE

be slight. Another remedy would have been the provision of drips on the valves.

Both of the above methods would have been more expensive to carry out than the arrangement shown in Fig. 2. By operating the chain a few times each day the valve is opened and the condensation drained back, thus keeping the valve parts in better condition.

## Some Safety Rules in St. Louis

Mr. H. Spoehrer, secretary of the central safety committee of the Union Electric Light & Power Company, of St. Louis, has promulgated additional safety rules as follows:

Railings are to be erected where, on the company's properties, preventive measures are necessary to keep pedestrians from stepping on railroad tracks.

Picket doors are being installed at stations so that solid wood doors may be left open in warm weather without possible danger to public.

Switchboard guards are to be erected wherever such construction is of advantage from the standpoint of safety.

Walkways on cranes and other apparatus are to be equipped with railings wherever needed.

Trucks are to be provided with boxes to contain about ten rubber blankets, which are to be thus carried in order to prevent wear due to their rubbing against ladders, etc.

Pole ladders are to be equipped with chain at the top so that ladder rests firmly against pole to lessen danger from the ladder turning when it is subjected to weight.

All trucks are to be subjected to a rigid inspection nightly, which is to cover all vulnerable parts such as brakes, locknuts on wheels, drive chains, etc. Brake locks, in particular, are to be kept under strict inspection and shall not be used when condition is questionable.

Where dummy elevators are in use a safety latch shall be installed to be operated in conjunction with bell signal to preclude possibility of accidents to the arms or heads of persons working around them.

## Electric Heater for Maintaining Heat Balance During Refrigeration Tests

An electric heater is employed in connection with the experimental refrigerating plant at the University of Michigan, Ann Arbor, Mich., for maintaining a heat balance while refrigerating tests are being conducted on the apparatus. By compelling the brine to circulate through a heat-insulated closed circuit consisting of the brine cooler, electric heater and brine pump it is possible, without the introduction of much error, to assume that the electrical energy heat input to the heater is equal to the heat energy absorbed by the brine. When the refrigerating apparatus is operating at full rating, which is 13 tons of refrigeration per twenty-four hours, more than 155,000 lb.-Fahr. heat units must be supplied by the heater per hour. To provide for overload tests the heater is designed to dissipate as much as 204,720 lb.-Fahr. units per hour. Six heating elements are employed each requiring 10 kw at 220 volts. Each unit consists of 50 ft. of No. 32 B. & S. gage nichrome resistance ribbon, 0.75 in. wide, wound around a strip of transite (asbestos wood) and inclosed in a galvanized sheet-iron brine-excluding case. Heavy copper terminals are attached to the ends of each resistance unit for connection to the energizing circuit.

### A Thermocouple Electrical Generator

A method of generating electricity on a commercial scale by thermo-electric couples has been devised by Mr. Johannes Marschall, of Dresden, Germany. The apparatus appears relatively simple and inexpensive to install, and will, it is declared, produce energy at considerably less expense than any other system now used.

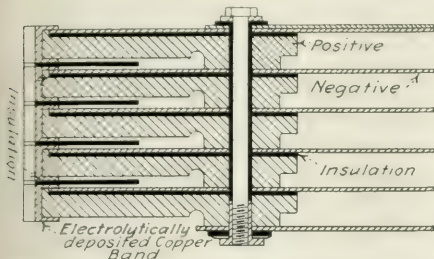


FIG. 1—SECTION THROUGH THERMO-ELECTRIC UNIT

In general, the apparatus consists of connected thermo-electric couples arranged around and touching the periphery of flues carrying heated gases. The unheated ends of the couples are cooled by circulating cold air around them. The furnace employed in heating the couples may be designed to burn coal, lignite or oil, and may be equipped with automatic firing devices controlled by the current flowing through the couples. The system has been developed, it is said, especially for installations in private houses, office buildings, isolated plants, etc., but may be extended to meet the requirements of central-station use.

Tests on the apparatus conducted by Dr. Kollert, professor in the technical schools at Chemnitz, Germany, are said to show that, with a temperature of 369 deg. C. at the hot junction of the couples and 56 deg. C. at the cold ends (making a difference of 313 deg.), the open-circuit emf produced in a single couple was 0.077 volt. With 28.2 amp flowing the working pressure was reduced to 0.0412 volt.

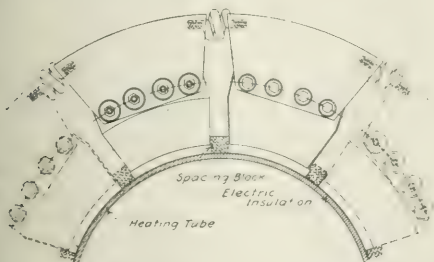


FIG. 2—THERMO-ELECTRIC UNITS ASSEMBLED ON TUBE

The couples consist of two elements, one a casting made of special alloy the composition of which is kept secret, the other a plate of copper-nickel alloy. The two elements are separated by a sheet of mica or asbestos and at the place where the heat is applied are joined by an electrolytically deposited band of copper. Five of these couples are connected rigidly together in series, forming a unit. Ten of these wedge-shaped units are made into rings and clamped around the heating tubes as shown. In the apparatus developed by Mr. Marschall sixteen rings were employed, making a total of 800 couples. The rings may be connected in parallel, series or parallel-series to obtain the desired voltage.

A sheet of insulation is interposed between the heating tube and the hot contacts of the couples to prevent the elements being short-circuited. The air emerging from the cooling case may be utilized for heating the building in which the apparatus is installed.

According to experiments which have been conducted with this apparatus, about 5.5 lb. of lignite must be consumed per kilowatt-hour of energy produced. Assuming that lignite costs about \$2.40 a ton, the fuel cost of producing the energy was about 0.66 cent per kw-hr.

The cost of installing a thermo-electric generating equipment as compared with steam, gas and petroleum-engine-driven plants of the same rating is declared to be in the ratio 13:26:30:38 respectively. The cost of producing energy in the same plants is stated to be in the ratio of 5.6:24.0:16.5:19.3 respectively. The latter figures, it is explained, do not take into account the depreciation or attendance expense in the steam, gas and petroleum-engine-driven plants.

### Pulling Underground Cables in St. Louis

Supplying St. Louis with energy from the hydro-electric generating station at Keokuk necessitated tying the existing feeders of the Union Electric Light & Power Company to the 60,000-kw substation which



FIG. 1—DRAWING-IN WIRE READY FOR WORK

distributes the energy at St. Louis. The point at which the two systems are tied together is on the opposite side of the city from the main distributing substations, and the most modern methods were used to pull the underground cable through the conduits between these points.

The Union Electric Light & Power Company arranged the motors on its electric trucks so that they could be utilized in pulling the cables through the conduits. The adaptation of truck motors to this work, while not entirely new, is interesting in this case because of the ease with which the drive can be transposed from the truck wheels to the cable-pulling drum. The drum is supported above the motor on two rocker





# Digest of Current Electrical Literature

## Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

### Generators, Motors and Transformers

**Calculation of Tooth Induction in Dynamo Armatures.**—F. BLANC.—The author has formerly described graphical method for determining the true tooth induction in slotted armatures and has applied his method to two special cases, the first being that of slots with parallel sides and the second that of slots with radial sides. He now applies it to a third example, namely the case in which the sides of the tooth are parallel.—*Elek. Zeit.*, July 23, 1914.

### Lamps and Lighting

**Arc-Lamp Electrodes.**—A note on a recent British patent of the British Thomson-Houston Company and the General Electric Company of this country (No. 3,355, 1913.) The invention consists in employing a lithium compound such as borate, fluoride, or oxide as a steadying material in white arc-lamp electrodes. In the case of titaniferous electrodes it is found that the addition of the lithium compound increases the intensity of the light produced, so that the invention also includes the addition of a lithium salt to such electrodes as an intensifying agent even if other steadying materials are also present. A satisfactory electrode has been made by mixing 96 per cent of finely powdered titanium carbide with 3 per cent of black copper oxide and 1 per cent of lithium fluoride in a thin iron tube.—*London Elec. Eng'g*, July 30, 1914.

**Electric Stairway Lighting.**—ARTHUR VON ALKIER.—An illustrated article on automatic clocks which switch the lamps of stairway-lighting systems in and out at regular hours.—*Elek. Anz.*, May 21, 28 and June 7, 1914. A lighting calendar showing the proper hours of switching in and out the lamps in different German cities at different periods of the year is given in *Elek. Anz.*, June 14, 1914.

**Electric Train Lighting.**—MAURICE D'ASTE.—The first part of an article in which the author deals with the electric-lighting equipment of railway trains and shows how to determine the maximum capacity of generator and storage batteries required for service. The article is to be continued.—*La Lumière Elec.*, June 7, 1914.

### Traction

**Brazil.**—H. M. SAYERS.—A paper read before the Newcastle Congress of the (British) Tramways and Light Railways Association. The author details the conditions and difficulties under which street-railway construction is carried out in Brazil, special reference being made to experience gained in the neighborhood of Santos. He deals with the problems of labor, legislation, track construction, overhead work, car erection, car haulage and passenger traffic. A special method of packing new cars for shipment by steamer is described.—*London Electrician*, July 24, 1914.

**Newcastle.**—RICHARD MAYNE.—A paper read before the (British) Tramways and Light Railways Association describing some features of the municipal electric-railway system of Newcastle, especially the spreading out of the lines, carrying of great numbers of workmen at low fares and receipts gained by the haulage of acceptable parcels. About three years ago it was

realized that on the outward journey on most of the routes the cars began to unload in the last three-quarters mile, and after a census was taken as to the number of 2-cent fares paid in that part of the journey a system of 1-cent fares for the last half mile was instituted. This proved very successful.—*London Electrician*, July 24, 1914.

**Town Planning in Relation to Street Railways.** J. A. BRODIE.—A paper read before the (British) Tramways and Light Railways Association. In the first part of his paper the author discusses how railways affect and are likely to be affected by the various schemes of improved town planning which may be carried out in the near future. He gives some account of what is being done in Liverpool in this direction, together with details of the arrangement of the railway lines on new roads. Finally he details certain improvements which he considers necessary if the prosperous future of electric railways is to be assured.—*London Electrician*, July 24, 1914.

**Rail Joints.**—R. HUMPHRIES.—An abstract of a paper read before the (British) Tramways and Light Railways Association. The author is in favor of welded joints with fishplates. The use of electric arc welding for welding on the fishplates is described. An account of the discussion is also given.—*London Electrician*, July 24, 1914.

**Rail Sections.**—FRED BLAND.—An illustrated paper presented before the Newcastle Congress of the (British) Tramways and Light Railways Association on standard tramway rails. The author compares English rail sections with sections used in other countries.—*London Electrician*, July 24, 1914.

### Installations, Systems and Appliances

**Rates for Electricity in Different Countries.**—G. SIEGEL.—The conclusion of his long statistical article in which the author reviews the rates in use in different countries for charging for electrical energy. In Holland the simple meter rate is prevalent. The usual charges per kw-hr. are 8.5 and 10.5 cents for lighting and 4 and 6 cents for motor service. Discounts are often allowed. In the summer resort Zandvoort temporary residents have to pay 25 cents per kw-hr. for lighting and the inhabitants 10.5 cents. In England the flat rate is rarely used, but meter rates are employed with greatly varying modifications. Both the Wright tariff and the telephone system are based on the principle that the fixed charges should be primarily considered in the development of the rate schedule. In Sweden, though water-powers are used to a large extent, flat rates are rarely offered. The usual system is a simple meter scale without much complication. The article closes with a brief review of the different tariffs in use in the United States.—*Elek. Zeit.*, July 23, 1914.

**London's Electricity Supply.**—The supply committee of the London County Council has made what is called an unexpected proposal for the future of London's electricity supply. It proposes that the three classes of electricity undertakings—viz., the fourteen companies which are purchasable on cheap terms by the London County Council in 1931, the fifteen undertakings which



the borough councils can retain in perpetuity under the present law, and the various neighboring company and municipal undertakings outside of the County of London—should all be acquired by a new controlling authority and combined. It further proposes that the new undertakings thus formed be leased to a company which is to provide part of the capital required for extensions, and this capital will apparently rank, so far as payment of interest and dividends are concerned, after only that provided by the controlling authority. The leasing company is to work under the general control of this authority under certain definite restrictions, including the limitation of dividends.—*London Elec. Eng'g*, July 30, 1914.

**Starting Rheostats.**—L. CACHOT.—Two profusely illustrated articles describing starting and regulating rheostats for direct-current motors.—*La Revue Elec.*, May 1 and June 5, 1914.

**Electricity Supply in Paris.**—E. IMBS.—After a historical sketch of the development of electricity supply in Paris prior to 1907, and an outline of the combination of the different "sectors" into a single supply system, a rather detailed description is given of the distribution network and of the two new generating plants in the north and the southeast of Paris.—*La Lumière Elec.*, June 13, 1914.

#### Electrophysics and Magnetism

**Direct-Current Brush Discharge.**—STANLEY P. FARWELL.—When there exists a large difference of potential between a wire and a neighboring conductor such as a similar and parallel wire or a coaxial cylinder the discharge phenomenon known as corona is likely to occur. The writer has been studying the corona as produced by continuous potentials for wires from 0.037 mm to 1.285 mm in diameter and tubes 3.50 cm and 4.45 cm in diameter. The relation between difference of potential and current flowing in the wire or tube has been studied for atmospheric pressure for the different sizes of wire; the critical voltage for visual corona has been obtained for pressures from somewhat above atmospheric down to 2 mm of mercury and the character of the discharge noted, and the effect of variation of voltage for a constant low pressure has been investigated. The object of the present paper is to present some of the phenomena observed at these lower pressures, the influence of a short arc in series with the apparatus upon the character of the discharge, and the increase of pressure in the tube due to the ionization.—*Phys. Review*, July, 1914.

**Magneto-Optics.**—R. W. WOOD AND G. RIBAUD.—An account of an experimental investigation of the magneto-optics of iodine vapor. Up to the present the magnetic rotations of the plane of polarization in the vicinity of absorption bands may be divided into two classes. First, anomalous rotations, in which the sign changes in crossing the band, as observed by Cotton for certain solutions and by one of the present authors for a solid film of a neodymium salt. Rotations of this nature appear to obtain in cases in which there is no change in the position of the band of absorption, but merely an alteration in velocities of right-handed and left-handed circular vibrations. Second, rotations in which the sign is the same on opposite sides of the absorption band, as at the D lines of sodium and the iodine lines. Rotations of this type are explained by the division of the line into a Zeeman doublet by the magnetic field. It seems probable, therefore, that there is a small Zeeman effect for the iodine, but it is doubtful if it can ever be detected as it is of the order of magnitude of the width of the lines, probably much less in fact. The study of the magnetic rotation of the vapor of sodium by the improved methods outlined in the present paper will un-

doubtedly give much more satisfactory results.—*Phil. Mag.*, June, 1914.

#### Telegraphy, Telephony and Signals

**New System of Wireless Telephony.**—LUDWIG KÜHN.—An illustrated description of a new system of wireless telephony, based on a kind of electric relay action that apparently any amount of antenna energy can

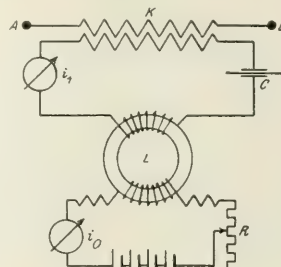


FIG. 1—PRINCIPLE OF ARRANGEMENT

utilized with this system. Experiments with this system have been successful over distances up to 600 km (360 miles). If a coil is wound around a closed iron core and direct current is passed through the coil, the self-inductance is a function of the permeability and therefore also of the magnetizing current. If such self-inductance is placed in an alternating-current system which is supplied with electric oscillation energy from a coupling transformer  $K$  (Fig. 1), it is possible to adjust the rheostat  $R$  and, therefore, the direct current  $i_0$  in such a way as to bring the alternating-current  $i_1$  circuit into resonance. Conversely, if resonance is established, a change on the direct current  $i_0$  will destroy the resonance and this will manifest itself by a decrease of the alternating current  $i_1$ . A further step, which the resonance capability of the system can be increased is shown in Fig. 2, where  $A$  is a high-frequency generator of constant period,  $M$  a condenser,  $B$  the coupling transformer with closed iron core,  $C$  the antenna,  $D$  two induction coils to choke off the high-frequency

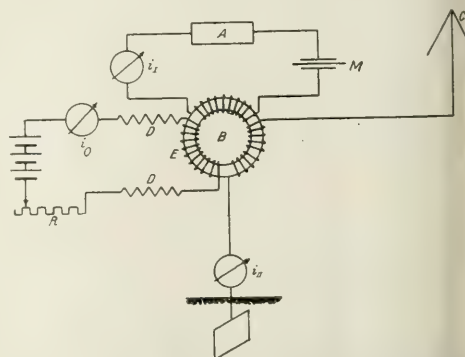


FIG. 2—ARRANGEMENT WITH INCREASED RESONANCE CAPABILITY

frequency currents from the auxiliary direct-current circuit, and  $E$  a third winding on core  $B$ . The generator  $A$  furnishes high-frequency current of constant wave-length. If the whole system is tuned to the wave-length, the direct current in the  $E$  circuit may be  $i_0$  and the current  $i_{11}$  in the antenna circuit may be  $i_{11}$ . If now the direct current  $i_0$  in the  $E$  circuit is i

increased or decreased by varying the rheostat  $R$ , the current  $i_{11}$  in the antenna will decrease, since the value  $i_0$  for the resonance condition is a maximum. By plotting the values of the direct current  $i_0$  as abscissas and the values of the antenna current  $i_{11}$  as ordinates, the curve shown in Fig. 3 is obtained. This is called a resonance curve, and is discussed by the author at con-

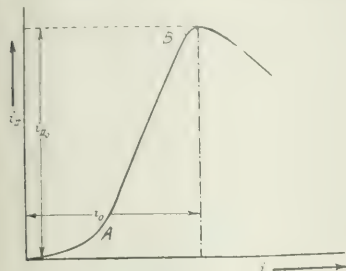


FIG. 3—RESONANCE CURVE

derable length. The system is being worked between the points  $A$  and  $B$  of the resonance curve, since in this range the differential quotient  $di_{11}/di_0$  has a large and constant value. The largeness of the differential quotient (the steepness of the curve) determines the efficiency of the system, while the constancy of the differential quotient determines the clearness of the sound reproduction. The final arrangement of the whole system is shown in Fig. 4, in which  $A$  is the high-frequency generator,  $B$  the high-frequency transformer and  $C$  the antenna.  $D_1$  and  $D_2$  are coils choking off the high-frequency current from the fundamental direct-current circuit  $E$  while  $F$  is the "sound-current circuit." The condenser  $G$  protects the sound-current transformer  $H$  against high frequency.  $M$  is the microphones,  $J$  the condensers,  $K$  the stabilizing resistances, and  $L$  is a source of direct current.  $D_3$  is an induction coil which

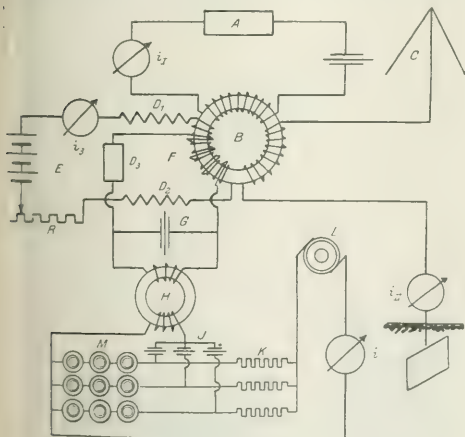


FIG. 4—FINAL ARRANGEMENT OF SYSTEM

chokes off the high-frequency from the sound-current circuit.—*Elek. Zeit.*, July 16, 1914.

**Wireless Telegraphy.**—Diagrams of wave trains and resonance curves obtained with the Helsby system of wireless telegraphy and some comparisons with the Marconi radiotelegraphic system.—*London Electrician*, July 24, 1914.

## Miscellaneous

**Electrical Purification of Milk.**—An abstract of a report by J. M. Beattie on a new system of electric treatment of milk now in use at the municipal milk depot in Liverpool. A rapidly alternating current is used with the addition of salt. By this means the bacterial content of the milk can be reduced to a minimum, while the chemical constitution of the milk is apparently unimpaired. The current used is slightly over 2 amp at about 4000 volts and no undue heating effect is produced.—*London Elec. Eng'ing*, July 30, 1914.

## Book Reviews

### A PRACTICAL TREATISE ON SUBAQUEOUS FOUNDATIONS.

By Charles Evan Fowler. New York: John Wiley & Sons, Inc. 814 pages, 477 illus. Price, \$7.50.

As a result of the author's wide experience, this work will readily commend itself to the engineering profession. The treatise is not a primer nor is it a college textbook, but the author's style is reasonably explanatory. The third edition is greatly augmented and revised, as compared with former editions, and the book is now quite up-to-date with present practice. Each type of construction in subaqueous structures—cribs, piling, metal construction, caissons, pumping and dredging, transportation, piers, retaining walls, foundations generally and those for piers, docks, dams, walls, locks, etc.—is discussed in detail. These discussions are further amplified by extensive illustrations and descriptions of actual operations widely scattered over the United States and to a limited extent over foreign countries. Chapter XXVI, on concrete, gives some valuable tables in the proportioning of this material, and the chapter dealing with the cost of operations is well developed. Several appendixes provide examples of specifications that were adopted in the erection of actual structures.

### MATHEMATICS FOR THE PRACTICAL ENGINEER.

By Charles H. Bromley and Henry R. Cobleigh. New York: McGraw-Hill Book Company, Inc. 220 pages, 75 illus. Price, \$2.

This book, which is composed largely of lessons from the engineers' study course printed in *Power*, is the result of a sincere effort to give the power-plant engineer the mathematical training that he needs in working out the problems of his daily routine. It presupposes that he is able to perform the fundamental operations of addition, subtraction, multiplication and division. From this it leads him through fractions, decimals, percentage, denominate numbers, powers and roots, ratio and proportion, formulas, mensuration, logarithms and trigonometry. For the greater part, the book covers the ground satisfactorily and well, but the chapter on trigonometry is too extended. It is safe to say that all ordinary problems can be solved by the aid of a table of sines, cosines and tangents; hence the statement of the value of each function in terms of the others, the signs of the functions in the different quadrants, and the functions of the sum and difference of angles are matters for which the operating engineer will find no application. The examples illustrating the application of the rules are appropriately chosen. As a whole the book is full of information of value to the engineer who is seeking a wider mathematical training; and, as he is his own teacher, he is at liberty to skip such parts as do not seem to have any immediate application in his work.



# New Apparatus and Appliances

## An Illustrated Descriptive Record of Recently Developed Manufactured Products of Interest to Electrical Readers

### Indicating Fuse Plug

An indicating fuse plug rated at 125 volts is being made by the Premier Electrical Manufacturing Company, Bridgeport, Conn. The device is a two-piece plug with a brass shell and is designed for standard cutouts and entrance switches. It is equipped with a phosphor-



FIGS. 1 AND 2—FUSE PLUGS BEFORE BLOWING AND AFTER BLOWING

bronze spring and a fiber piston to which a pin is attached. In case of blow-out or short-circuit the spring is released, forcing out the piston. The pin then protrudes about 0.25 in., indicating the fact that the plug has blown. In the accompanying illustrations, Fig. 1 shows the plug before and Fig. 2 after blowing.

### Counting Paper Money by Electricity

An electrically operated machine for counting paper money while it is being sorted was demonstrated last week at Gimbel Brothers', New York City, by a representative of the Buckley Bill-Counting Machine Company, Washington, D. C. As the bills are sorted on the machine table they are drawn between metal rolls which actuate counters and simultaneously feed the bills into compartments where they are stacked. If two bills which stick together are accidentally fed into the same rolls the entire machine will lock until one of the bills is pulled out. Folded single bills, on the contrary, pass through the rolls readily. Bills may be fed into the rolls at any angle, being automatically straightened out by the time that they reach the stacking compartment.

Each set of money-feeding rolls is connected in series with the magnet operating its respective counter so that separation of the rolls will de-energize the magnet, thereby advancing the counter one step. At the same time folding gates swing together to support the bill horizontally as it emerges from the rolls. As the rolls come in contact again the counter is set for the next movement and the gate is released, allowing the bill to fall squarely on those in the compartment beneath it. Each counter can be set to stack the bills in quantities of twenty-five, fifty or 100 as desired. If the rolls are separated more than the thickness of a bill, a contact is closed causing an electromagnetic brake to stop the machine after one-half the bill has passed through. So timed, the brake will not prevent a folded or wrinkled bill passing through. The compartments are arranged so that the last-counted money is separated from that previously counted until the count is checked. These machines can be built up in any number of sections, depending on the assortments desired.

### Skeleton Transformer Bell

Skeleton transformer bells in 8-in. and 10-in. sizes have recently been put on the market by the Empire Transformer Company, 2723 North Clark Street, Chicago. Features distinctive of these bells are the use of laminated cores to prevent lag from residual mag-



SKELETON TRANSFORMER SIGNAL BELL

netism and the adoption of what is known as a "hammer break" at the vibrator, which gives a long and powerful stroke. With the primary winding of the bell connected to either a 110-volt or a 220-volt circuit the secondary can be operated at either 14 volts or 20 volts, giving high efficiency on alternating-current circuits of any commercial frequency. The bells are designed for use as signals for mines, schools, factories, public buildings and fire-alarm systems.

### Motor-Driven Rolling Mills for Steel, Brass, Copper and Precious Metals

The accompanying illustrations represent a 90-hp cold-rolling steel mill and a 3.5-hp jeweler's rolling mill for brass, copper or precious metals. The large mill, which is driven through a triple train of gears, is equipped with ball bearings which make the energy consumption considerably less than with journal bearings. The housing rolls are 11 in. in diameter, while

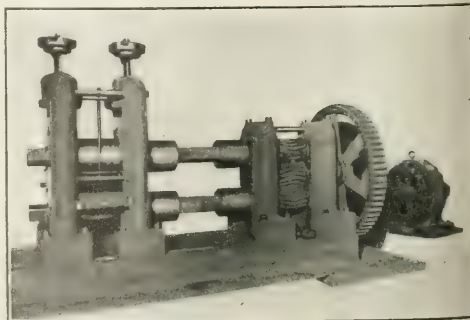


FIG. 1—MOTOR-DRIVEN COLD-ROLL MILL

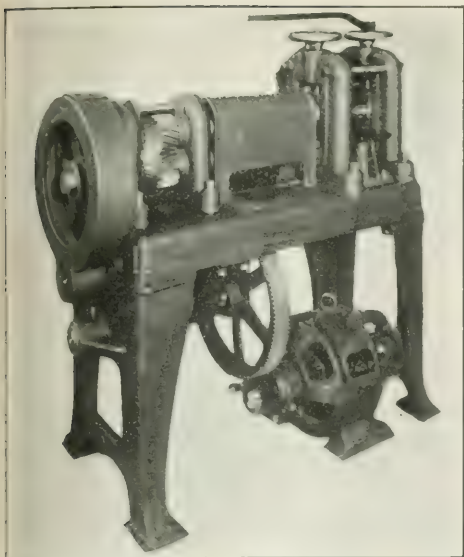


FIG. 2—JEWELER'S MILL WITH INDIVIDUAL DRIVE

The intermediate roll is 5 in. in diameter. Their faces are 5 in. wide. The small mill is equipped with a micrometer adjustment for setting the rolls for accurate work. With the motor installed as shown, the entire outfit occupies no more floor space than the mill alone, an advantage achieved through individual drive. Both of these mills are provided with controllers for varying the speed of the motor, between half and full speed. The mills were manufactured by the Standard Machinery Company, Providence, R. I., and the motors are furnished by the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.

### A Single-Lamp Advertising Sign

An evenly lighted electric sign 36 in. long for which single 60-watt tungsten lamp is the only source of illumination is being manufactured by the Advertogram

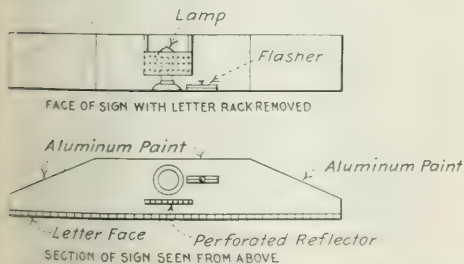
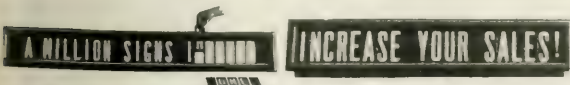


FIG. 1—SIGN WITH SINGLE LAMP AND PERFORATED REFLECTOR



FIGS. 2 AND 3—SINGLE-LAMP SIGN WITH LETTERS REMOVED AND COMPLETE

Company, 706 Hearst Building, Chicago, Ill. A perforated metal reflector 4.5 in. long, coated with aluminum paint, interposed between the light source and the interior letter face, distributes the light evenly over the face of the sign, the letters at the ends of the sign being equally bright with those directly in front of the lamp. The company also holds patents on the changeable-letter feature, the letters themselves being made of a blue material baked on a clear glass and backed by an inner white opal glass.

### Cable-Box Connector

The device shown herewith is used for fastening steel-armored cable to the panel box at the place it enters the box. The fastener consists of two parts, (1) an internally threaded collar attached to the end of the

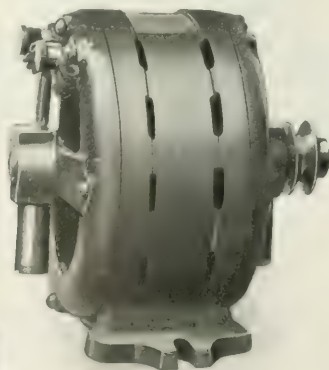


DEVICE FOR ATTACHING ARMORED CABLE TO PANEL BOX

armored cable and (2) an externally threaded bushing with an octagonal head which is fitted into the panel-box inlet and screwed into the collar. The collar is securely fastened to the armor by a set-screw the axis of which is inclined to give wedge action. The screw prevents the armor turning or pulling out because the greater the force tending to separate the collar and armor the tighter are they wedged together. The device, which is known as the "Kwikon," is manufactured by S. R. Fralick & Company, 15 South Clinton Street, Chicago, Ill.

### Small-Sized Self-Starting Alternating-Current Motors

Small-sized alternating-current motors rated at 0.1 hp and over are being placed on the market by the Electric Specialty Company, Stamford, Conn. These motors are of the split-phase, squirrel-cage, induction type, and are designed to operate quietly. No outside casing is used. The rise of temperature on any part of these



SMALL ALTERNATING-CURRENT MOTOR



machines, the manufacturers claim, does not exceed 30 deg. C. The bearings are made of phosphor bronze and are extra large. The smaller motors are equipped with oil-wick feed and those of  $\frac{1}{3}$ -hp rating or more with oil-ring bearings.

### Construction Cleats

According to the claims of the manufacturers, uniform and accurate placing of all outlets, whether ceiling, switch or bracket, is possible with the cleat shown in the accompanying illustrations. It permits the use



FIG. 1—CONSTRUCTION CLEAT

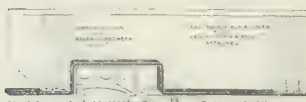
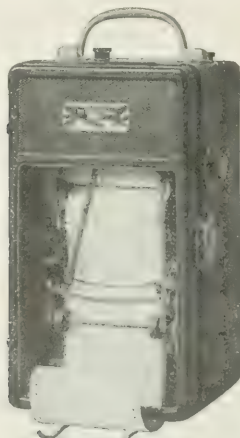


FIG. 2—CLEAT IN PLACE

of deep, round or square outlet boxes and ceiling plates with any standard fixture stud. The cleat can be fastened between joists, as shown in Fig. 2. This cleat is being made by the Alex. M. Knauber Company, 742 South Euclid Avenue, Oak Park, Ill.

### Graphic Meters for Seven-Day Continuous Operation

Light-weight graphic meters which are particularly adapted to purposes where both simplicity and accuracy of operation are required are being marketed by the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa. The operating mechanism of these



GRAPHIC METER WITH 168-HOUR TAPE

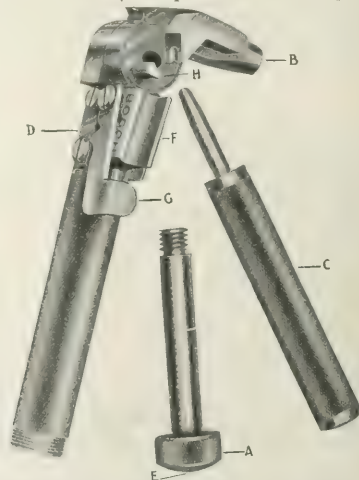
instruments consists of a solenoid core acting directly on the lever carrying the recording pen, under which a continuous strip of paper is moved uniformly by clock mechanism. The movement of the pen is controlled by a heavy spring which counterbalances the pull of the solenoid and also minimizes inaccuracies due to slight errors in leveling. An oil dash-pot is pro-

vided to damp the movement of the pen with fluctuating currents or potentials. On circuits not subject to excessive fluctuations no oil need be placed in the dash pot.

The pen is in the form of a pointed V-shaped trough which, as the ink is used, is refilled by a wick having one end immersed in a glass ink reservoir. The recording paper is 3.25 in. wide, but a width of only 2.25 in. is calibrated. The hours are stamped along the left-hand side of the scale and the remainder of both margins is perforated to mesh with the driving mechanism, thereby preventing slippage. The tapes are made for 168 hour continuous operation.

### Terminal Tool

A tool for making terminals on wires or small cable used in connection with automobile and marine engine is shown herewith. This tool will strip the insulation for the required distance and force into place a terminal. For high-tension wiring this terminal consists of a straight brass tube or sleeve of such a diameter as to fit snugly over the stranded wire generally employed for this service. For low-tension work there is used a tube with one end expanded so as to slip over the insulation and form the terminal into a loop. The insulation is cut by the knife blade *G* shown in the illustration. After slipping the terminal tube over the bar wire, the latter is inserted in the hole *E* at the end of the handle *A*, which is screwed into the movable part of the tool *B*. By forcing the cable down the terminal is pushed under the insulation until the end of the hole is flush with the conductor. The cable is next laid in the measuring groove *F*, and is forced forward until the end of the insulation comes against the stop *H* when the pin *C* is inserted from the right into the center hole and worked or forced into a vertical position. By pulling the handle *A* around toward the operator in a clockwise direction, a loop is formed. Re-opening the



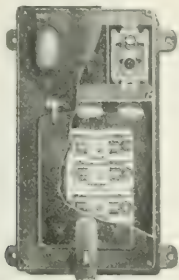
TOOL FOR MAKING CABLE TERMINALS

handle and withdrawing the pin *C*, the operation is completed. When not in use the pin *C* can be enclosed in the handle of the instrument and the handle *A* can be screwed into the end.

This tool is being manufactured by the Bosch Magneto Company, 223 West Forty-sixth Street, New York.

### Weatherproof Combination Switch Box

Illustrated herewith is a weatherproof combination cutout and push-button switch box especially adapted for use in abattoirs, packing houses, mines, green-houses and other damp places. The box, which is made of cast iron with a heavy, baked, black-enamel finish is designed to accommodate either plug or cartridge-fuse

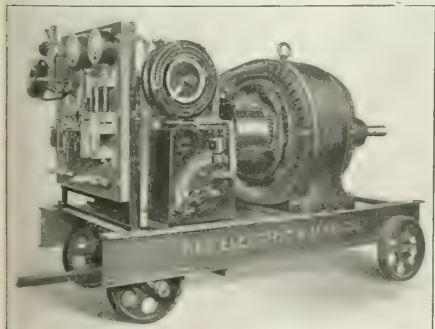


WEATHERPROOF CABINET CONTAINING SWITCHES AND FUSE CUTOUTS

cutouts and flush-type push-button switches. The cover is fastened with six brass screws and is made watertight with a heavy rubber gasket. Additional hinged covers protect the entrance to the push-buttons from dust and moisture. The entrance to the cutouts is similarly protected by a hinged door (gravity-closing) provided with a rubber gasket and an attachment for a lock and key. This switch and fuse box is manufactured by the V. V. Fittings Company, Philadelphia, Pa.

### Portable Welding Apparatus

Portable electric-arc welding outfits, each consisting of a dynamotor, control apparatus and two welding circuits, have been placed on the market by the C. & C. Electric & Manufacturing Company, Garwood, N. J. The apparatus is mounted on heavy iron trucks, and the dynamotor will operate on 110-volt energy or may be belt-driven by some auxiliary prime mover. It is designed to furnish 14 kw at 70 volts. When electricity



PORTABLE ELECTRIC ARC WELDER

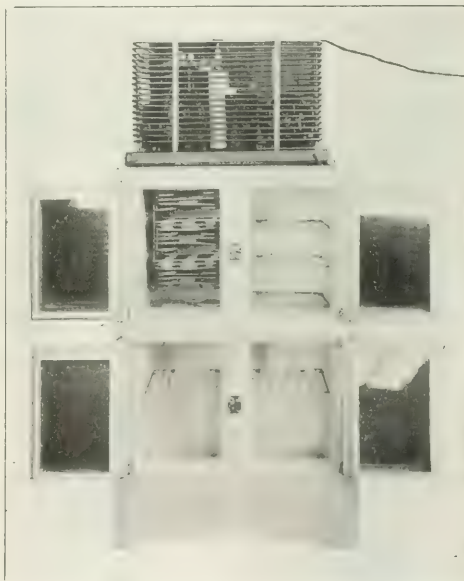
is not available for driving the dynamotor a pulley may be slipped over its extended shaft and a steam or internal-combustion engine employed to drive it through belt. With graphite electrodes connected to the dynamotor leads a temperature of 4000 deg. C. can be obtained at the arc for cutting or preheating metal preparatory to welding. A bar of metal or flux has to

be used in conjunction with the carbon electrodes when welding. If metallic electrodes are employed no auxiliary bar is required and welding may be done on vertical and overhead work. The switchboard contains a main-line circuit-breaker and switch and automatic-control relays which regulate the amount of ballast resistance in series with the arc circuit.

### Electric Refrigerating Outfit Applicable to Any Ice-Box

A motor-driven refrigerating outfit which can be attached to any ice-box or used in conjunction with a specially insulated box designed to maintain very low temperatures has been developed by the Mechanical Refrigerator Company, 1020 Willow Street, Chicago, Ill. The set consists of a 0.33-hp motor driving a compressor which delivers gas under a pressure of 70 lb. per sq. in. to radiating coils and thence to expansion coils installed in the refrigerator. The radiating coils, which consist of 100 ft. of 0.375-in. copper tubing, form a guard around the motor and compressor. One hundred and thirty feet of the same size of copper tubing forms the cooling coils. These are installed in the compartment usually devoted to ice. A thermostat which can be set to open or close a contact at any temperature in the neighborhood of 32 deg. Fahr. is employed to control the motor. No water is required to cool the compressed gas.

At ordinary electric-service rates the 100-lb. town-house-size refrigerating plant will operate at a cost of 5 cents to 10 cents per day, and the country-home 200-lb. size at 10 cents to 15 cents per day. It is de-



ELECTRICAL REFRIGERATING OUTFIT

clared that a well-insulated box measuring 5 ft. by 3 ft. by 2.5 ft. may be kept at a temperature of 17 deg. Fahr. with the smaller-sized apparatus. A test conducted by Mr. R. W. Brown, of the Spring Valley (Ill.) Utilities Company, over a period of thirty-four days, is said to have shown that this outfit will consume practically 1 kw-hr. a day in hot weather.



### Indirect-Lighting Fixture

An indirect-lighting fixture without chains is being made by the Illinois Electric Company, 308 West Madison Street, Chicago, Ill. The bowl is of white porcelain-enameled steel and the other parts are of brass. The



INDIRECT LIGHTING FIXTURE WITH PORCELAIN BOWL

bowl can be easily removed for cleaning without disturbing any of the other parts. This fixture, which is called the "illinite," is designed for 750-watt and 1000-watt tungsten lamps. The length of the fixture is 36 in., and the diameter of the bowl for the 1000-watt lamps is 24 in. and for the 750-watt units 22 in.

### Long-Burning Inclosed Flame-Arc Lamps

The inclosed flame-arc lamps illustrated herewith are declared to burn 100 hours at a single trimming. They operate on either direct or alternating current, and they can be worked singly at 65 volts or in series of two

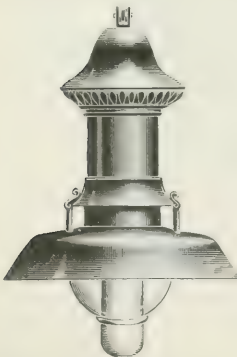


FIG. 1—FLAME-ARC LAMP, ENAMELED REFLECTOR

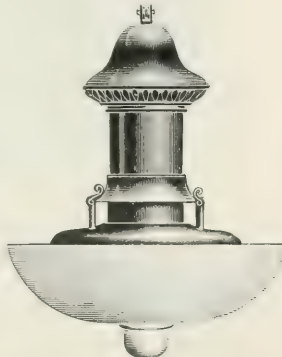


FIG. 2—FLAME-ARC LAMP WITH DIFFUSING GLOBE

units at 110 volts or four units at 220 volts. The body of the lamp consists of an air-tight tubular frame, inclosed at the upper end by a solenoid and at the lower end by the inner globe. The parts of the lamp subject to the magnetic field are of nickel-plated iron. All other materials in the body of the lamp are of brass or copper. The series coil is wound with bare aluminum wire insulated by a method of oxidation devised by the manufacturers. The shunt coil, which is wound with many turns of fine wire, is said to require only 0.2 amp to energize it. Energy is led to the upper electrode through a copper spiral cord which connects to the carbon holder. When a certain length of the top carbon has been consumed the arc is cut out automatically, the carbon holder being prevented from falling below a certain point. The magnetic core is a combination of dash-pot and carbon clutch mounted in the center of the lamp. The covers are rain-proof and are insulated from the lamp frame. With the lamps in series the resistance is separate from the lamps, one set being sufficient for each series group. In the case of single lamps arranged in parallel the line resistance is placed inside the lamp. These lamps are manufactured by the Regina Bogenlampen-Gesellschaft, Köln-Klettenberg, Germany, and Mr. W. E. Güssefeld, 136 Liberty Street, New York City, is the importing agent in this country.

### Reversible-Bowl Pendant Fixtures

Pendant lighting fixtures having bowls which may be supported in either of two ways to give respectively direct or indirect illumination are being marketed by the F. W. Wakefield Brass Company, Vermilion, Ohio. They are furnished with either opalescent-glass or enameled-steel bowls supported by flexible attachments which permit the bowl to assume a symmetrical position with respect to the central axis. Metal straps following the contour of the bowl and attached to metal bands around its rim and apex give an artistic appearance to the fixture and provide means for supporting the bowl. By detaching one of the supports it is possible to lower the bowl for cleaning. Lamps of 1000 watts can be accommodated in this fixture by using "mogul" sockets, while units as large as 250 watts can be employed with regular sockets. These fixtures are also adapted to hold nitrogen-filled lamps. Being equipped with insulated ceiling canopies, the fixture may be attached to any standard outlet box or directly to the ceiling without additional insulation.



FIG. 1 — BOWL IN INDIRECT POSITION

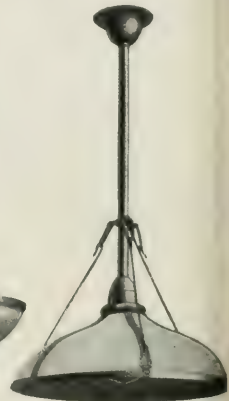


FIG. 2—BOWL REVERSED

# Jobber, Dealer and Contractor

## Fluttering-Moth Effect for Window Display

Novel show-window displays are constantly being installed to attract the public to the products sold within. The proprietors of a certain hardware and electrical supply store in New York have had one of their show



DISPLAY REPRESENTING FLUTTERING MOTHS

windows equipped to represent varicolored moths hovering around an electric-lamp fixture. The display attracts considerable attention and yet it was simple and inexpensive to install. Stretched on a wire frame supported by the electric fixture is a balloon-shaped bag made of mosquito netting. The lower end of this converges and is attached to the periphery of the wire guard on an electric fan whose axis is vertical. A piece of netting is also stretched over the guard. The hovering-moth effect is produced by suspended confetti, which are caused to flutter around the lamp by the breeze from the fan.

## A Shrewd Contractor

During a lively house-wiring campaign at Danville, Ill., the central-station solicitors were graded according to the business they were able to secure, the least productive members of the organization being eliminated from time to time. One of the salesmen, knowing that his grade had been low for some time, became desperate in his quest for business and even went to the extent of trying to secure a wiring contract from a local electrical contractor who was at that time erecting a house for himself. After several calls the salesman secured the signed contract. This order was taken to the lighting company's office, put through the regular routine, and returned to the contractor, granting him permission to wire his house and to pay the company for the work on easy terms. The work was done and the payments made in regular course, the shrewd contractor thus profiting by twelve months' use of the lighting company's investment in his own wiring.

## Convention Outing of Wisconsin Contractors

The Electrical Contractors' Association of Wisconsin held its summer convention outing on Aug. 13, 14 and 15. Members, with their wives, assembled in Oshkosh at the Hotel Athearn at 8 p. m. on Aug. 12 for an informal dinner. The following morning they went aboard the *Mayflower, Jr.*, for a three-day lake-and-river trip to New London, Winneconne, Omro and Berlin, returning to Oshkosh in the afternoon of Aug. 15.

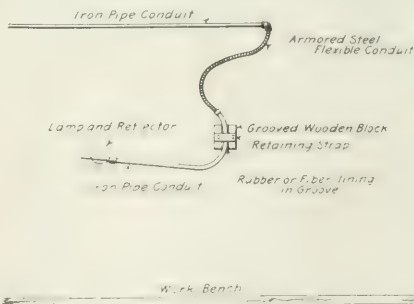
## Registration of Contractors in Chicago

In reference to the registration of electrical contractors, Mr. Ray Palmer, commissioner of gas and electricity for the city of Chicago, has this to say in his recent annual report: "An amendment to the city ordinance which went into effect on Nov. 1, 1913, provides for the registration of all companies or persons obtaining permits for electrical work. The essential requirement of this ordinance is that the electrical work must be done under the supervision of a thoroughly competent electrician. On Dec. 1, 1913, 690 certificates had been issued." The number of contractors registered on Aug. 8, 1914, was 1031.

## A Handy Swinging Bench Lamp

Notwithstanding the fact that legitimate electrical contractors are universally interested in good wiring and good illumination, their own workbenches, which are generally at the rear of their shops, are almost invariably subject to unsatisfactory working conditions as far as artificial lighting is concerned. A sketch herewith shows a method of equipping such workbenches with lighting units which will not only supply general illumination but will also enable workmen to concentrate the light at any desired point. The entire outfit is inexpensive and can be made and installed easily. An iron pipe conduit is brought along the wall and terminates at a point above the center of the bench. To this conduit is attached a 3-ft. piece of steel-taped conduit leading to the curved pipe which serves as the fixture.

To provide the desired freedom of motion for the lamp, the curved portion of the improvised fixture is held rather loosely in the fiber-lined groove of a small



SWINGING LAMP FOR WORKBENCH

wooden block. A retaining strip of fiber which fixes the bent conduit in place is made not wide enough to obstruct vertical movement of the pipe, but yet of such size as to hold the pipe in place under the weight of the lamp, fixture and conduit. The lamp is thus not only allowed free movement in the horizontal plane but is also permitted to be shifted vertically.



# Industrial and Financial News

## Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

**Map of European War Operation.**—Pass & Seymour, Inc., Solvay, N. Y., have issued a pocket-sized map of the war zone of Europe and are distributing these maps to their patrons.

**Large Lighting Fixture.**—A large lighting fixture of compositura measuring 10 ft. in diameter and 8 ft. high clear of its suspensions, which is now installed in a Chicago theater, and is said to be the largest ever made, is described in a pamphlet issued by R. Williamson & Company, of Chicago, makers of the fixture.

**Electric Company Moving to Newark.**—The Star Electric Company, of Binghamton, N. Y., manufacturer of fire alarms and police telephone systems, has notified its employees, it is reported, that the plant will be moved to Newark, N. J. The company employs about 160 workmen, many of whom will probably accompany the plant to its new location.

**New Business in Bylesby Properties.**—A gain of 218 kw in lighting load and 896 hp in motors is shown by the combined report of all Bylesby electric properties reporting for the week ended July 31. New business contracted for—but not yet connected—included 886 customers with 497 kw lighting load and 669 hp in motors. Electric output of the properties for the week was 7,187,856 kw-hr., a gain of 11.6 per cent over the corresponding week of 1913.

**Home Exposition in Chicago.**—A "Home Exposition" is to be held in the Coliseum, Chicago, Sept. 16 to 26. Among the prospective exhibitors, as announced by the management, are the American Ironing Machine Company, Capital Electric Company, Chicago Electric Motor Company, Conlon Electric Washer Company, Eden Electric Washer Company, Federal Sign System (Electric), Franz Premier Electric Company, and Judd Laundry Machine Company.

**War Will Handicap German Electrical Trade for Ten Years.**—Mr. Cummings C. Chesney, general manager of the Pittsfield (Mass.) branch of the General Electric Company, recently returned from a trip through Germany and other European countries, and in a recent newspaper interview declared that the present war will impose a handicap of at least ten years' time on the future development of Germany's electrical manufactures. In the meantime, according to Mr. Chesney's prediction, the electrical manufacturers of this country will be greatly benefited.

**Canadian Electric Company's Patriotic Offer.**—The Canadian General Electric Company has offered to raise, equip and pay the salaries of a company of twenty-five skilled electrical and mechanical workmen for service in Canada under the control of the Dominion Department of Militia. In response to President F. Nicholls' telegram tendering the services of these men the Canadian Premier expressed the government's appreciation of the company's patriotic offer and explained that the telegram had been submitted to the Minister of Militia, who would communicate with Mr. Nicholls regarding it.

**Gas Producer Supplanted by Central-Station Drive in Ice Factory.**—The Boren Ice Company, of Chicago, has recently abandoned its gas-producer equipment and has entered into a contract with the Commonwealth Edison Company for electric service. The rated capacity of the plant is 50 tons of ice a day, and since all operations are to be conducted electrically, 200 hp in three-phase motors will be installed. With this plant added to its lines the Commonwealth Edison Company will be operating a total of seventeen ice plants, the aggregate rating of which is 1628 tons of ice a day. The operation of these seventeen plants, according to a statement by Mr. G. H. Jones, power engineer, requires 5722 hp in three-phase motors.

**Electrical Equipment for Automobiles.**—The McFarlan Motor Car Company, Connerville, Ind., has adopted the Westinghouse starting, lighting and ignition systems for its 1915-model car. This equipment consists of a starting motor and switch and combination ignition and lighting generator complete with switches and meters. The Vulcan Manufacturing Company, Painesville, Ohio, will also use the Westinghouse starting, lighting and ignition systems on its cars. This equipment will consist of a starting motor with Bendix screw-shift reduction gears and housing, a combination ignition and lighting generator, switches, etc. Other companies which install the Westinghouse apparatus on their cars are the Speedwell Motor Company, Dayton, Ohio; the Briggs-Detroit Company, Detroit, Mich.; and the Kissell Motor Car Company, Hartford, Conn.

**Central-Station Business for May—Summary of Data.**—Throughout the country as a whole there were no abnormal factors affecting the output of the central stations during the month of May last, and the expansion over the same period last year has been about on a par with the rates of increase obtaining in previous months of this year. Here and there slumps have been noticed, while other sections of the country have reported abnormally heavy increases. Such instances have been already noted in the *Electrical World*, in the weekly review of the condition of the business in the various groups of states; and, for convenience, the segregated data for these groups are collected here in Table I. It will be seen that the May figures for very nearly 200 operating systems are included, and between them these companies generate about one-half of all the energy distributed by the electric service systems of the country. Perhaps the only necessary comment upon this tabulation is in regard to the increased rate for energy output registered by the companies in the Middle West and in the New England States. For the central-station industry in the Middle West generally the value developed from the *Electrical World* returns is too high for a true average; while for New England as a whole the *Electrical World* figure is considerably too low. Though it may be true that some of the larger companies in the Central States are this year distributing probably 15 and 20 per cent more energy than they did last year, yet a fair average for the section cannot be more than 10 to 12 per cent, at least so far as the cities of less than 50,000 population are concerned; while from New England the *Electrical World* has received concrete evidence to show that it practically all the larger cities there is an increased output this year of at least 9 or 10 per cent. The opinion may safely be hazarded that if the figures for energy demand on the part of the industries may be depended upon as a barometer of trade, then the Middle West as a whole is, from an industrial standpoint, considerably busier than New England as a whole; and at the present time the smaller cities in the latter section seem to be calling for very little more energy in their industries than they did last year. From the table it might appear that the Pacific is as active just now as the Atlantic. Actually the returns from the Pacific States given in this table are so little representative of the industry on the coast as a whole that it would be unwise to base any general conclusion upon the data. It is known that the Pacific companies which are really registering satisfactory increase over last year are very few in number, and it must be confessed that the signs of any substantial uplift in the industries there have not yet become very obvious. Table II shows again that May has been a fairly normal month. Therein are tabulated the combined totals for gross income and energy output of all the companies reporting to the *Electrical World*. Data for May are available for 156 companies or groups of companies, and it will be seen that there has been

an increase in income for the month from \$12,889,000 in 1913 to \$14,071,900 in 1914, or at a rate of 9.1 per cent; while energy output increased in the same time from 590,994,257 kw-hr. to 658,708,198 kw-hr., or at a rate of 11.5 per cent. The totals for May for all companies reporting to the *Electrical World* (shown in Table II) are somewhat higher than the combined totals of the segregated properties shown in Table I, for the reason that many of the data received relate to groups of operating companies controlled by a syndicate or holding company and scattered in various parts of the country. Of course, no geographical segregation of such returns can safely be attempted. Figures from these groups are included in the second table, and the 156 returns therein relate to considerably more than 200 individual operating companies. Earnings of street-railway properties are not included in the figures for income, but energy sold by central stations for the operation of electric railways is, of course, regarded as strictly central-station output and is included with the energy distributed in the lighting and motor-service field. Some explanation should be given of the fact that, in point of magnitude, the totals for May appear so much less representative than for the two previous months in spite of there being a larger number of companies reporting for the last month. Three factors will account for this condition. One or two of the larger companies included in March and April have not yet rendered any statement as to their May operations, and between them these companies handle an amount of business equal to from twenty to thirty of the smaller utilities now included in the list. In addition to this, there was some artificial swelling of the April and March totals owing to a certain amount of inevitable overlapping of returns. In one or two cases figures from an individual operating company were thrown into the totals, when actually the same figures were being returned by the parent company in its report for a large section of country in which that particular subsidiary operated. Such duplication has, it is believed, been entirely eliminated from the May aggregate. There remains, of course, the third reason, that, for the country as a whole, the energy demand upon the central-station companies is less in May than in April, in spite of the extra day which is reckoned in the former calendar month. The figures for gross income never move strictly in step with

ful proportions of a general European fight-to-a-finish, involving one great nation after another, completely shattering the entire financial system of the whole continent, and even seriously imperiling the financial equilibrium of this country, the immediate future of all utility financing here has become gravely threatened. Leaders in the electric-service field have given public expression to their views that the outlook may be faced with perfect confidence; but at least it is certain that from a financial standpoint the next few months are going to prove a more serious trial to the operators than any which they have ever experienced. No financing of any kind is being carried out at present, and it would seem questionable whether any utility underwriting worth mentioning can be carried out for some months at least. For the present, maintenance, construction and any

TABLE II—COMPARATIVE INCOME AND OUTPUT FOR MARCH, APRIL AND MAY, 1911, FOR ALL COMPANIES (OR GROUPS OF COMPANIES) REPORTING TO THE ELECTRICAL WORLD

	GROSS INCOME FROM SALE OF ENERGY			TOTAL ENERGY OUTPUT IN KWHR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
March—10 companies	\$16,891,235	\$15,559,191	8.7	730,843,220	642,291,006	13.8
April—140 companies or groups	18,027,619	16,359,594	10.2	722,952,419	634,005,739	14.1
May—156 companies or groups	14,071,900	12,889,000	9.1	658,708,198	590,994,257	11.5

necessary extensions will have to be performed from earnings, and no serious trouble may result from this so long as earnings can be maintained. That, unfortunately, is beyond the control of the operator; and there are already indications that in some sections of the country the industrial demand is to be curtailed until Atlantic shipping facilities are once more in a normal condition. The most hopeful feature of the situation is that such a state of affairs is not likely to be very long delayed. When that point has been reached it is unlikely that there will be any widespread falling off in the gross income of the electric utilities. Uncertainty as to the future is the worst foe of the investment market, however. Until the average American investor can see much more clearly than he can now what is likely to be the earning power of any utilities whose securities he may be considering it is unlikely that he will be willing to lend the support of his capital as readily as he has in the past. With the supply of European funds completely cut off, American properties from now on will have to rely upon domestic capital to a far greater degree than formerly. That inevitably entails a certain amount of adjustment, and adjustment takes time.

TABLE I—CENTRAL STATION DATA FOR MAY, 1914 AND 1913. COMPARATIVE INCOME AND OUTPUT OF COMPANIES REPORTING TO ELECTRICAL WORLD, BY GROUPS OF STATES

	GROSS INCOME FROM SALE OF ENERGY			TOTAL ENERGY OUTPUT IN KWHR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
Atlantic (75 companies)	\$6,121,907	\$5,670,820	8.0	221,356,523	205,696,988	7.8
Central (64 companies)	3,264,178	2,900,150	12.7	194,285,892	164,174,157	18.3
New England (41 companies)	1,745,160	1,609,234	8.4	52,752,247	50,779,103	3.9
Pacific and Mountain (15 companies)	1,332,715	1,238,407	7.7	127,428,335	118,352,240	7.7

those for output, and it may even be that in May the companies collected more money on their monthly bills than in April for a reduced output. It will be seen that, for the companies included in the table, there was an increase in gross income for the month of \$1,182,000 as compared with last year; and as these utilities between them represent about one-half of the entire light and motor-service field, it is safe to say that there was an increase for the whole industry of well over \$2,000,000. There remains the big question of how a monthly expansion of this magnitude is now going to be financed. Directly the possibility of even a localized European war first loomed up the bankers here became very apprehensive as to the effect which such a calamity might have upon the foreign market for American electrical securities. Now that the trouble has assumed the aw-

#### NEW YORK METAL MARKET PRICES

Copper	Aug 11		Aug 18	
	Bid	Asked	Bid	Asked
Standard spot*	Selling Prices		Selling Prices	
London, standard spot*	12.50	to 12.55	12.50	to 12.62 1/2
Prime 1.5	12.50	to 12.55	12.25	to 12.37 1/2
Electrolytic	12.12 1/2	to 12.25	12.10	to 12.20
Casting	13.75	to 14.00	13.75	to 14.00
Copper wire base	13.75	to 14.00	13.75	to 14.00
Lead	3.50	to 3.50	3.50	to 3.50
Nickel	40.00	to 45.00	40.00	to 45.00
Sheet zinc, f.o.b. smelter	7.00	to 7.00	7.25	to 7.25
Spelter, spot	5.40	to 5.50	5.75	to 5.85
Aluminum	20.00	to 21.00	20.00	to 21.00
Pyromet delivery	20.00	to 21.00	20.00	to 21.00

#### \*COPPER EXPORTS

Total tons to June 30, 1913 1912

\*From daily transactions on the New York Metal Exchange.

†Nominal.

NOTE.—The New York Metal Exchange and the London Metal Exchange have been closed until further notice. No reliable quotations on old metals can be obtained for the present. There is no buying in this market.



## Corporate and Financial

**International Power Company.**—Chancellor Walker of New Jersey has granted a continuance of the receivership proceeding against the International Power Company upon representation that the company's officials had agreed to comply forthwith with a mandamus from the Supreme Court directing the company to produce its books and records for examination.

**Laurentide Company Special Meeting.**—A special meeting of the Laurentide Company, Montreal, Quebec, is being called for the purpose of obtaining the necessary authority to issue 6 per cent bonds to enable the company to carry out financial plans decided on when the last issue of common stock was made. The issue will be sufficient for the taking up of the present issue and also to provide money for additions to the paper plant and the power development under way and at the same time leave a large sum in the treasury.

**Public Utility Securities.**—Messrs. William, Dunbar & Coleman, New York, dealers in public utility securities, have made the following statement regarding the effect of war upon public utilities: "Public utilities in the United States cannot materially be affected by any war outside of this country, and earnings will continue to increase as they have in the past. Gas and electricity must be used in the home, office, factory and numerous institutions, and this will insure good earnings and continuous profits. Reports during the week from several public utility corporations confirm the continuous growth of this class of corporations and indicate clearly the undisturbed underlying condition of these public service organizations."

**War Brings Benefits to Public Utility Investors.**—In speaking of the benefits accruing to the investor in public utility securities as a result of the present European conflict, Mr. J. J. Bodell, a New England banker, is quoted as saying that "We are soon to see security prices well above those of the last few days of liquidation. It is public utility securities, however, to which I would particularly draw the attention of the investor. The companies issuing them are furnishers of necessities, of light, of heat, of power and of urban transportation. Because of the war there will be no diminution of electric energy used, and the industrial activity which is bound to come will call for additional power loans by our industrial establishments, all going to make up larger earnings for these companies."

**Consolidated Gas, Electric Light & Power Company of Baltimore.**—The company has increased the quarterly dividend on the common stock from 1½ per cent to 1¾ per cent, thus placing the stock on a 7 per cent basis. The company has sent out a plan for the exchange of preferred stock into common stock. On or before Sept. 19 all holders of preferred stock may exchange share for share their preferred stock for common stock, and in so doing receive the quarterly dividend of 1¾ per cent declared on the common stock Aug. 13. The preferred stock is 6 per cent stock. The maximum amount of debenture stock that can be issued under existing conditions is outstanding; \$4,000,000 of debenture stock has been sold by the company abroad, where that class of security has been popular.

**Pacific Gas & Electric Company Plan Declared Effective.**—The permanent financing plan of the company as set forth in the *Electrical World* of June 20 has been declared operative. Of the \$12,500,000 new preferred stock, it is announced that \$8,750,000, or 70 per cent, has been subscribed for by 3000 persons. It has also been announced that owing to the existing financial conditions payment of the second instalment of \$15 a share has been postponed from Aug. 15 to Oct. 15, and the third payment of \$12.50 a share has been put back from Oct. 1 to Nov. 15, the final instalment being due Jan. 15 instead of Jan. 1. As a further effort toward the consummation of their permanent financing plan after the stockholders had made their subscriptions and 40 per cent of the company's permanent staff had become stockholders the privilege was given to the customers of the company of subscribing on the same terms as the others to the 6 per cent preferred stock. This stock is offered at \$82.50, thus yielding 7.27 per cent on the investment.

**Cities Service Company's Letter.**—As was noted in our issue of Aug. 8, the Cities Service Company has decided, in view of the present unsettled condition of the money

market, to issue from time to time a letter to the stockholders thereby keeping them definitely in touch with the company. We are quoting herewith in full the second letter, sent out by President H. L. Doherty: "Your directors adjourned the meeting planned to be held on Friday, Aug. 7, until Monday, Aug. 10, to secure the presence and advice of Messrs. Mitchell and Brown, who were passengers on the *Mauretania* from England and were delayed in their arrival in New York. At the meeting to-day the general financial and business situation as it now exists and the probable outcome were carefully considered. The situation to-day can be summed up by the statement that practically every stock and commodity exchange in the world is closed, a moratorium has been declared in Great Britain and France until the end of August, and a moratorium in effect practically exists in every financial center of the world. It was the opinion of all that events subsequent to the last meeting of the board of directors fully justified the wisdom of the action of your directors in deferring the payment of further cash dividends for the present. It is still practically impossible to transfer money from one country to the other for the payment of dividends or for any other purpose. Your directors therefore decided to postpone further action until future developments would enable an accurate forecast to be made, and instructed the executive committee to keep in close touch with the general situation and the affairs of the company and to be prepared to make definite recommendation to the board at the earliest opportunity. Many of our stockholders were not in close touch with the financial situation as it existed at the time your directors decided to defer the payment of cash dividends and are only now awakening to the severity of the disturbance and may be led to believe that the situation is growing worse instead of better. Your directors are of the opinion that the situation is improving daily, and much credit is due to the administration in providing governmental aid by the prompt supply of emergency currency. Our managers generally report that business continues to be good but that some difficulty is being experienced in making collections from large customers. Our manager at Galveston however reports that shipping from that port is at a complete standstill. Galveston is the second largest export port in the United States. Unless this condition is long maintained we anticipate no serious diminution in the earnings of the Galveston company. Of course it is impossible at this time to predict accurately the effect upon collections and earnings, but your directors see no reason to be alarmed over the probability of the earnings of the subsidiary companies being seriously affected—in fact, they feel that recent developments are rather favorable than otherwise. When the board last met the entire export business of this country was seriously threatened, while to-day there seems to be the possibility of normal shipping facilities being established in the near future. While your directors deeply deplore the results which are bound to be experienced from the present situation, they feel that the holders of public utility securities will have every reason to feel that they have been fortunate in their choice of investment, and especially in their holdings of stocks in companies, such as Cities Service Company, which represents a wide diversity of several lines of effort in widely scattered communities from seaboard to interior cities principally dependent upon agriculture. The stockholders of the company may feel sure that everything will be done to protect and promote their interests, and that the management will be in touch with every turn that the general situation may take. We have been at all times in exceptionally close touch with the European situation, and, while it is no longer possible to communicate by cable using private codes, we will be as close to the developments there as anybody can be. While we may have seemed to be the first to be alarmed over the situation, we think that this was due to our closer and more intimate contact with events. What has seemed such bad news to many people during the last week or ten days is rather encouraging to us than otherwise; and, bad as the present situation may seem, it is, on the whole, vastly improved—and we believe that we can predict that recent developments insure further improvement. We will keep our stockholders advised from time to time, and hope that subsequent developments will permit us to continually give more encouraging reports."

## Business Notes

The Splittorf Electrical Company of Newark, N. J., has appointed H. R. Curtis manager of its Boston office.

M. R. Johnson, formerly with the Caldwell Electric Company, of Champaign, Ill., has gone into business for himself at 84 North Neil Street, Champaign.

Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.—C. C. Curry has been appointed acting manager of the Minneapolis office of the Westinghouse company.

The Electric Supply & Equipment Company, Hartford, Conn., announces that J. O. Morris has been elected secretary and sales manager to fill the vacancy caused by the resignation of T. J. O'Brien.

The General Motors Truck Company.—Z. C. Elkin, formerly manager of the Thos. B. Jeffery Company's Chicago branch, has been appointed manager of the Chicago branch of the General Motors Truck Company.

The Pittsburgh Transformer Company, Pittsburgh, Pa., has opened a branch office at 724 Harris Trust Building, Chicago, Ill. The office will be in charge of C. R. Lininger, who will be manager of the Western district.

The H. W. Johns-Manville Company.—Frank E. Brown has joined the staff of the H. W. Johns-Manville Company as special representative to devote his attention to the sales development of "Noark" service-meter protective devices. Mr. Brown was for twenty years (1889 to 1909) electrical engineer for the Department of Water Supply, Gas and Electricity, New York City.

Becker Brothers, of Chicago, have incorporated their partnership business. The company manufactures carbon, graphite and metal brushes, and also does an extensive repairing business. It controls the American Maintenance Company. The board of directors is composed of C. J. Becker, W. F. Becker and O. E. Becker. O. E. Becker is president and treasurer and C. J. Becker is vice-president and secretary.

The National Electrical & Engineering Company, Ltd., which has recently opened an office at 202 Hereford Street, Christchurch, New Zealand, reports that it is now in a position to establish business relations with American manufacturers. This company is sole agent for the General Electric Company, the British Thomson-Houston Company and the British Insulated & Helsby Cables, Ltd. Nelson Jones is manager and engineer for the company.

## New Industrial Companies

The Engeln Electric Company, of Cleveland, Ohio, has been incorporated with a capital stock of \$25,000 by H. K. Zelchi, W. M. Findley, B. J. Cuthery, R. E. Williams and H. W. Kodel. The company purposes to deal in electrical supplies.

The American Electric Clock Company, of Cleveland, Ohio, has been chartered with a capital stock of \$100,000 to manufacture electric time-keeping systems and similar devices. The incorporators are J. G. and R. H. Bricker, L. R. Houston and J. A. Dunn.

The Coe-Halstead Company, of Portland, Maine, has been incorporated with a capital stock of \$1,000,000 to do a general electrical and civil engineering business; also as machinists, toolmakers, etc. A. F. Jones is president and T. L. Croteau treasurer, both of Portland, Maine.

The Hughes-Lippincott Company, of Camden, N. J., has been incorporated by W. Lippincott, of Haddon Heights; J. W. Hughes, of Narberth, Pa., and A. M. McNutt, of Collingswood. The company is capitalized at \$125,000 and purposes to do a general consulting engineering business.

The Commonwealth Electric Tool Company has filed articles of incorporation under the laws of the State of Delaware with a capital stock of \$200,000 for the purpose of manufacturing and dealing in electrically operated tools, motors, controllers, etc. The incorporators are H. E. Latter, O. F. Reichard and N. P. Coffin, of Wilmington, Del.

## Trade Publications

Turbines.—"How the Chief Engineer Was Convinced" published by the B. F. Sturtevant Company, Boston, Mass., describes and illustrates Sturtevant turbines.

Wiring Accessories.—Loose-leaf catalog fillers containing the prices of wiring accessories have been prepared by the Illinois Electric Company, Los Angeles, Cal.

Train Dispatching.—The Western Electric Company has issued a booklet describing in detail the part played by the telephone in modern methods of train dispatching.

Tamping Machines.—Engine-driven machines for tamping trenches are described in Bulletin No. 8 prepared by the Pawling & Harnischfeger Company, Milwaukee, Wis.

Plugs and Receptacles.—Interchangeable two and three-wire plugs and receptacles are described in a folder being distributed by Harvey Hubbell, Inc., Bridgeport, Conn.

Switch Boxes.—Methods of installing "Bauer" switch boxes are described in a folder being distributed by the Bauer Switch Box Manufacturing Company, Cleveland, Ohio.

Diesel Oil Engines.—Bulletins No. 51, 53 and 54 issued by the McIntosh & Seymour Corporation, Auburn, N. Y., describe Diesel oil engines with individual and box frames.

Jet Condensers.—Eductor and multiple-jet condensers made by the Schutte & Koerting Company, Philadelphia, Pa., are described in Catalog 5, Section AB, issued by that company.

Improved End-Cell Switch.—An improved end-cell switch developed by the Electric Storage Battery Company, Philadelphia, Pa., is described in Bulletin No. 145 issued by that organization.

Polyphase Induction Motors.—Squirrel-cage and wound-rotor polyphase induction motors are described in Bulletin No. 1087, issued by the Allis-Chalmers Manufacturing Company, Milwaukee, Wis.

Axle-Driven Lighting Generator.—A constant-voltage axle-driven generator for railway-car lighting is described in Bulletin No. 144 issued by the Electric Storage Battery Company, Philadelphia, Pa.

Kerosene-Engine-Driven Generating Sets.—Unit-type kerosene-engine-driven generating sets built by the Allis-Chalmers Manufacturing Company, Milwaukee, Wis., are described in its Bulletin No. 1085.

Lamp Standards.—Sectional pressed-metal reinforced lamp standards manufactured by the Union Metal Manufacturing Company, Canton, Ohio, are described in a circular prepared by that company.

Power Transmission Machinery.—The Cresson-Morris Company, successor to the George V. Cresson Company, 90 West Street, New York City, has prepared Catalog A, illustrating shafting, bearings, pulleys and gearing.

Lead Batteries.—The Titan Storage Battery Company, Newark, N. J., has issued a booklet describing the construction and action of its lead storage batteries, which are designed for ignition, starting and lighting purposes.

Batteries for Yachts and Power Boats.—Information regarding storage batteries especially adapted for operating apparatus aboard boats is contained in Bulletin No. 147 issued by the Electric Storage Battery Company, Philadelphia, Pa.

Batteries for Locomotives.—The methods of determining the type of battery to be used with a locomotive operating under known conditions are explained in Bulletin No. 146 prepared by the Electric Storage Battery Company, Philadelphia, Pa.

White-Metal-Alloy Die Castings.—The accuracy of white-metal die casting and the facilities of the Doehler Die Casting Company, Court and Ninth Streets, Brooklyn, N. Y., for producing these castings are pointed out in Bulletin No. 105 issued by that company.

Insulated Aluminum Cable.—The British Aluminum Company, Ltd., 109 Queen Victoria Street, London, has prepared an illustrated booklet containing information on the relative cost, construction, installation, scrap value and rating of high-tension and low-tension insulated aluminum cables.



## Personal Mention

Mr. Albert Buchler resigned Aug. 10 as superintendent of the municipal electric-lighting plant at St. Mary's, Ohio.

Mr. F. Leslie Foss has been appointed purchasing agent of the Greenfield (Mass.) Electric Light & Power Company.

Mr. H. M. Benson has superseded Mr. H. Morrison as superintendent of the Sioux City (Iowa) Service Company.

Mr. George D. Locke has succeeded Mr. N. W. Fellows as president of the Harrison (Ark.) Electric Light & Ice Company.

Mr. J. F. Pickett has succeeded Mr. C. N. Thielen as manager of the Riceville (Iowa) Electric Light & Power Company.

Mr. G. D. Remer has succeeded Mr. E. A. Huntoon as superintendent of the Dows (Iowa) electric light and power plant.

Mr. A. Holger has been appointed manager of the Rushford (Minn.) Power Company as successor to Mr. C. H. Grieser.

Mr. L. A. Fitts has been appointed chief power plant engineer of the Greenfield (Mass.) Electric Light & Power Company.

Mr. W. P. Berry has succeeded Mr. S. W. Henderson as president of the Lufkin (Tex.) Electric Light & Power Company.

Mr. L. E. Thorne has succeeded Mr. Claude F. Blakeslee as superintendent of the Oakes (Neb.) Light & Power Company.

Mr. L. J. Clark has succeeded Mr. P. D. Rensonhouse as auditor of the Tri-County Light & Power Company, Alledo, Ill.

Mr. F. C. Baldrige has succeeded Mr. J. L. Longino as superintendent of the Merchants' Lighting Company, Little Rock, Ark.

Mr. William H. Redman has succeeded Mr. G. H. Corwin as manager of the municipal electric plant at Greenport, N. Y.

Mr. Bert Lund has succeeded Mr. J. G. W. Johnson as superintendent of the Consumers' Power Company, Stillwater, Minn.

Mr. F. W. Hines has been appointed superintendent of the municipal electric plant, Salem, Ill., as successor to Mr. O. E. Wade.

Mr. H. M. Benson has been appointed superintendent of the Sioux City (Iowa) Service Company as successor to Mr. H. Morrison.

Mr. H. P. Harris has succeeded Mr. C. J. Chapman as superintendent of the Conant-Bryant Power Company, Wilson, N. Y.

Mr. W. Roy Gray has succeeded Mr. D. R. Cowman as manager of the municipal water and electric-light plant at Greenfield, Ohio.

Mr. Charles Burgess has been appointed superintendent of the municipal electric plant at Perry, Kan., as successor to Mr. L. L. Bell.

Mr. Thomas Rhodes, formerly manager of the Consumers' Power Company, New Orleans, La., is now commercial manager of the New Orleans Railway & Light Company, of that city.

Mr. T. W. Siemon, who resigned as treasurer and assistant secretary of the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., has been elected secretary and treasurer of the Union Switch & Signal Company, Swissvale, Pa.

Mr. Howard S. McNair has been appointed secretary and treasurer of the American Cities Company, New Orleans, La., succeeding Mr. R. E. Slade. Mr. McNair was formerly secretary to President Hugh McCloskey of the New Orleans Railway & Light Company.

Mr. F. O. Dolson, formerly superintendent of construction with the Southern Sierras Power Company, has superseded Mr. D. R. Kennedy as superintendent of generating plants for the Nevada-California Power Company and the Southern Sierras Power Company, Bishop, Cal.

Sir Adam Beck, chairman of the Hydro-Electric Power Commission of Ontario, Canada, and who is also chairman of the Canadian Militia Remount Commission, has offered his services to the Canadian Militia Department and has been called to Ottawa to confer with the government regarding the horse supply for the British army in the present war.

Mr. J. L. Longino, formerly superintendent of the Merchants' Lighting Company, Little Rock, Ark., has become secretary and engineer in charge of construction work for the Arkansas Power Company, Malvern, Ark. This company controls the Arkadelphia (Ark.) Electric Light Company and the Standard Ice & Light Company, Magnolia, Ark.

Mr. Milton Rich, until recently a member of the engineering staff of the Commonwealth Edison Company of Chicago, has resigned to become connected with the Kellogg Toasted Corn Flake Company. Mr. Rich was secretary of the N. E. L. A. section of the company last year and was popular with his associates, who arranged two farewell dinners in his honor at the time of his departure.

Mr. Douglas S. Martin, of the editorial staff of the *Electrical World*, sailed for England Aug. 19 on the Cunarder *Laconia*, preparatory to enlisting in the volunteer service of his native country. Before joining the staff of this paper Mr. Martin was the editor of the *General Electric Review*. He is a brother of Mr. T. C. Martin, formerly editor of the *Electrical World*, and now executive secretary of the National Electric Light Association.

Mr. George Daugherty, until recently manager of the Trumbull Public Service Company, Warren, Ohio, has retired from active service to engage in the real-estate business. Mr. Daugherty was engaged in public utility work for more than twenty-eight years, beginning as foreman of a crew laying gas mains for the Warren Water & Light Company. Later appointed manager, he was retained in that capacity when the company was taken over by the Doherty syndicate in 1911 and renamed the Trumbull Public Service Company. Under the direction of Mr. Daugherty the electric service properties in Warren and the surrounding country were connected by high-tension transmission lines, and practically all of the plants rehabilitated to make a modern system. Within the last year Mr. Daugherty has feared that indoor work was affecting his health, and his resignation has come about from a desire to spend more time out of doors.

Dr. Edward B. Rosa, chief physicist of the United States Bureau of Standards, Washington, D. C., has directed much important work in the absolute measurement of electrical quantities, as well as in the solution of problems in practical electrical engineering.



DR. EDWARD B. ROSA

In reviewing the vast array of scientific work done by the electrical division of the bureau under Dr. Rosa's charge, mention may be made of his redetermination of the ratio of the units of electrical measurement, his measurement of the electrochemical equivalent of silver, his invention of methods for measuring capacity and inductance, calculations of the electrical characteristics of coils, specification of the international candle, etc. Dr. Rosa was born in 1861 and in 1886 was graduated from

Wesleyan University, receiving the degree of Ph.D. from Johns Hopkins University in 1891. Returning to Wesleyan, he became professor of physics, and meanwhile devised and invented a number of instruments, besides conducting important investigations in dielectric measurements, alternating-current wave-forms, electromagnetic units, etc. Dr. Rosa is a fellow of the A. I. E. E., a former director of the Illuminating Engineering Society and a member of many other scientific organizations. He is a member of the International Electrical Commission and is the honorary secretary of the International Electrical Congress to be held next year at San Francisco.

## Construction

### New England

**WATERBURY, MAINE.**—The Essex power station of the Central Maine Co. was damaged by fire recently, causing a loss of from \$250,000 to \$400,000.

**WILMINGTON, MASS.**—The owners of the former MHS, it is reported, are contemplating the erection of a new power station at the house. The power plant is at the Woods and Webster department.

**LEOMINSTER, MASS.**—Arrangements to be made by the Leominster El. Co. to take out for extensions to the street and the station in Leominster.

**WALTHAM, MASS.**—The Edison El. Co. of Boston has submitted a proposition to the Council for replacing the present lamps on Main and Moody Streets with new magnetic arc lamps.

**HARRISVILLE, R. I.**—The village of Harrisville has entered into a contract with the Pascoag Fire District for street-lighting for a period of three years. The contract provides for the installation of 60 lamps of 60 cp. Electricity for commercial and residential lighting will also be furnished. New transformers will have to be installed and new wire and poles

**HARTFORD, CONN.**—Bids will be received by the board of contract and supplied at the Mayor's office, City Hall, Hartford, until Sept. 8 for lighting the section of the new outfall of the city covered by the present ornamental lighting system for the year ending June 1, 1919. Plans and specifications can be obtained from the superintendent of streets.

**NEW HAVEN, CONN.**—The contract for work on the new building of the Broadway Bank & Trust Co., to be erected Broadway, has been awarded to Herbert C. Wallingford.

**NEW LONDON, CONN.**—The contract for the installation of electric fixtures and electric wiring in the first group of buildings of the Connecticut College for Women has been awarded to the New Engineering Co. of New London. The cost of equipping the first three buildings is estimated at \$18,000 to \$100,000.

### Middle Atlantic

**BATH, N. Y.**—Bids will be received by Joseph A. Goulden, president of board of trustees, New York State Soldiers and Sailors' Home, Bath, until Sept. 22, for 125-hp boilers for the New York State Soldiers and Sailors' Home at Bath. Drawings and specifications may be consulted and blank forms of proposal may be obtained at the New York State Soldiers and Sailors' Home, Bath, at the Department of Architecture, Capitol, Albany, and at the New York office of the Department of Architecture, 100 Broadway Building, New York, N. Y. William H. Nichols is secretary.

**GLENS FALLS, N. Y.**—Bids will be received at the office of Charles E. Bullard, Glens Falls, until Sept. 2, for the general construction and mechanical work, including heating and ventilating, plumbing and electric wiring, of a school building in Glens Falls. Copies of plans and specifications can be obtained at the office of Tooker & Marsh, architects, 101 Park Avenue, New York, N. Y., and at the office of Charles E. Bullard, Glens Falls.

**ORWELL, N. Y.**—The Public Service Commission has granted the Salmon River Pwr. Co., an operating subsidiary of the Niagara, Lockport & Ontario Pwr. Co., permission to issue \$300,000 in bonds, to be sold at not less than \$5. Part of the proceeds will be used to complete construction work.

**SENECA FALLS, N. Y.**—The Seneca Pwr. Co. we are informed, does not contemplate the construction of a power plant as reported in the issue of Aug. 1.

**WEST HAVERSTRAW, N. Y.**—Bids will be received by George Blason, president of board of managers, New York State Hospital for Cripple and Deformed Children, West Haverstraw, until Sept. 5, for construction, heating, plumbing and electrical work for a solarium at the New York State Hospital for Cripple and Deformed Children, West Haverstraw. Bids are to be submitted on each division of the work and no combination of bids will be considered. Drawings and specifications may be seen and blank forms of proposal obtained at the hospital, West Haverstraw, at the Department of Architecture, Capitol, Albany, and at the office of the Department of Architecture, 1224 Woolworth Building, New York. Lewis F. Pilcher is state architect.

**BUTLER, PA.**—The West Penn El. Co., it is reported, is contemplating extensive improvements to its plant on Spring Street.

**ELWOOD, PA.**—The State Utilities Commission has ruled that the borough of Elwood City could not enter into a contract with the Harmony El. Co. to supply electricity to the borough and has given its approval of a contract to be made with the Pennsylvania Pwr. Co.

**PHILADELPHIA, PA.**—The contract for electrical work for the South Philadelphia High School has been awarded to Cates & Shedd, of Philadelphia, at \$28,500.

**PITTSBURGH, PA.**—Bids will be received at the office of the city controller, Municipal Hall, Pittsburgh, for the electric wiring for the two new pavilions and the present cottage buildings at the City Home and Hospital, at Marshfield Station, Pa. Plans and specifications can be obtained at the office of John P. Brennan, city architect, North Side Municipal Building, corner Ohio and Federal Streets.

**PITTSBURGH, PA.**—The ten-year lighting contract between the city of Pittsburgh and the Citizens' El. Ilg. Co. has been approved by the Public Service Commission. The contract, effective from Jan. 1, 1915, and the company, it is understood, will start immediately to install new General Electric lamps.

**KEYPORT, N. J.**—Preparations are being made by the Middlesex & Monmouth El. Lt. Ht. & Pwr. Co. of Keyport for the construction of a new transmission line to the city pumping plant in Mechanicsville. The company was recently awarded a contract to furnish cement and Federal Street.

**PLAINFIELD, N. J.**—The Commonwealth Wtr. & Lt. Co. has been awarded a contract by the Warren Township committee for street lighting, which provides for 100 new street lamps at a cost of \$1,700 per year. The company has made application for a 50-year franchise.

**TRENTON, N. J.**—Bids will be received by the City Commission until Aug. 28 for electric wiring, power and light at the filtration plant and for changes in the electric-lighting system at the pumping station. Plans and specifications are on file in the office of the engineer at the filter plant.

**RIDGELY, MD.**—Contract has been awarded by the St. Gertrude's Academy to the McVey Construction Co., Law Building, Baltimore, for the erection of chapel, three stories (39 ft. by 200 ft.), academy building, four stories, 72 ft. by 144 ft.) and power house.

**FAIRMONT, W. VA.**—Contracts have been awarded by the Monongahela Valley Trac. Co. of Fairmont, it is reported, for aqueducts for the city of Fairmont. The house to be erected at Hutchinson, at a cost of about \$300,000. The equipment includes four 250-hp gas engines. The company's plant at Jayville will be abandoned, owing to acid in the waters of the West Fork River.

**FAYETTE, W. VA.**—Preparations are being made by the Fayette & Fayetteville Trac. Co. for the construction of a power plant at the site of the plant in connection with the completion of its proposed electric railway between Fayette and Fayetteville, for which \$50,000 in bonds were recently authorized.

**MORGANTOWN, W. VA.**—Bids will be received by the board of education of Morgantown until Sept. 8 for construction of high school building in accordance with plans for the preparation of the city of W. Bates, architect, Wheeling. Separate bids to be submitted for general contract, heating, plumbing and wiring. Plans and specifications may be seen at the office of the architect and at the office of the superintendent in Morgantown. W. S. John is secretary of board.

**WHEELING, W. VA.**—A permit has been granted by the Wheeling El. Co. for the erection of a new power plant at Water and Forty-first Streets to cost about \$260,000. J. M. Hopwood, electrical engineer, will have charge of the work.

**CLARKSVILLE, VA.**—The installation of a street-light plant (to cost from \$5,000 to \$10,000) in Clarksville is reported to be under consideration. The lighting committee would like to receive estimates of equipment, including gas producers, oil or steam power.

**WASHINGTON, D. C.**—Bids will be received at the office of the chief signal officer, War Department, Washington, D. C., until Sept. 1, for the construction of complete iron poles, under Proposal 718.

### North Central

**DETROIT, MICH.**—The power plant of the Hotel Tuller, it is understood, is to be enlarged. An addition (containing more

than 100,000 sq. ft. of space) is to be added to the hotel.

**LANSING, MICH.**—The Lapeer Gas-Electric Co. is planning to install a steam-heating system. Exhaust steam from the electric-light plant will be used.

**YPSILANTI, MICH.**—The Peninsular Paper Co. has begun work on the construction of a large power plant at its mills on the Huron River, about 1 mile north of the city.

**CANTON, OHIO.**—The City Council has voted to replace 55 street arc lamps with 250-cp nitrogen lamps, with the understanding that if they are not satisfactory at the end of six months the city can return to the old lamps.

**CINCINNATI, OHIO.**—Bids will be received by the new court house commission of Hamilton County until Sept. 1 for heating and ventilating, elevator equipment and a power plant for the new court house and county jail. Rankin, Kellogg & Crane, 1012 Walnut Street, Philadelphia, Pa., are the architects; James A. Green is president of the board of building commissioners.

**DAYTON, OHIO.**—The Dayton Pwr. & Ltg. Co. has secured contracts for street-lighting in New Carlisle, Fairfield and Osborn. The main transmission lines will be tapped at the plant and distributing New Carlisle 50 street lamps will be furnished, 60 street lamps in Osborn and 12 street lamps in Fairfield. Electricity for commercial and residential lighting will be supplied. The company has also secured a franchise to supply electrical service in Bowersville. A transmission line will be erected from Xenia to Wilmington.

**LOVELAND, OHIO.**—The Loveland Lt. & Wtr. Co., recently incorporated with a capital stock of \$50,000 will take over the water and light plant in Loveland. The new company, it is understood, proposes to make improvements to the plant and distributing system. The incorporators are Stanley Matthews, J. A. Bethel and others.

**PEMBERVILLE, OHIO.**—Owing to Bushman Brothers, owners of the local electric-light plant, having decided to close down their plant, the city of Pemberville is advertising for bids for lighting the streets of the town.

**YOUNGSTOWN, OHIO.**—Bids will be received by the clerk of board of education, 20 West Wood Street, Youngstown, until Aug. 24 for vacuum cleaning system for the Washington Tod Memorial and Lansingville buildings.

**BOWLING GREEN, KY.**—The Kentucky Pub. Ser. Co. has erected 41 nitrogen lamps in the central part of the city. The lamps replace the old arc lamps and will be used throughout the city as soon as the change can be made. The City Council has voted to let the city engineer erect a light plant and has contracted with the Kentucky Pub. Ser. Co. to light the streets of the city.

**EVANSVILLE, IND.**—Negotiations are under way between the City Council and the Evansville Public Ser. Co. for a new street-lighting contract to go into effect Aug. 15, 1915, which provides for a complete new street-lighting system. The company, it is understood, contemplates the installation of a new 5000-kw turbine and other equipment, including four new boilers of 600 hp. next spring. A. C. Blinn is president and manager of the Evansville Public Ser. Co.

**HUNTINGTON, IND.**—Bids will be received by the Board of Public Works of Huntington, at the office of the city clerk, 310 West 10th St., until Sept. 1, for the equipment for the municipal electric-light and water-works plant: One high-duty flywheel pumping engine, condenser for pumping unit, two centrifugal pumps, condenser for generating unit, two water-tube boilers, one feed-water heater, one stack, one switchboard, one engine-driven generator, and transformers and lamps or lighting equipment in accordance with plans and specifications on file in the office of the city clerk. Instructions to bidders, specifications and blank proposals may be obtained from the city clerk, or from C. H. Brossman, consulting engineer, Merchants' Bank Building, Indianapolis, Ind. H. I. Young is city clerk.

**SOUTH BEND, IND.**—The Indiana & Michigan El. Co. of South Bend, Ind., has applied to the Public Service Commission for permission to issue \$150,000 in bonds.

**ATWOOD, ILL.**—The installation of a municipal electric-light plant in Atwood is under consideration.

**CHICAGO HEIGHTS, ILL.**—Preparations are being made by the Chicago Southern Trac. Co. for the construction of a new power house in Chicago Heights.

**PRAIRIE DU ROCHEP, ILL.**—The city of Prairie du Rocher is considering the question of installing a municipal electric-



light plant, to cost about \$20,000. C. F. Phillips, Liggett Building, St. Louis, Mo., is consulting engineer.

**VIOLA, WIS.**—Work has been started on the Viola Lt. & Pwr. Co. expects to have in place a switchboard, recording wattmeter, one portable recording voltmeter, one portable stranded wattmeter and one voltage regulator. C. H. Smith is superintendent.

**ALBANY, MINN.**—The city of Albany has awarded the construction of power house has been awarded to John A. Metherell, New Albany, Ind., \$2,886.

**MILROY, MINN.**—J. W. Dwyer, of Milroy, who has recently installed a 60-volt storage-battery plant, would like to receive prices on electric supply, including 60-volt watt-hour meters, fans, irons, etc.

**OWATONNA, MINN.**—The State Board of Control, it is reported, has awarded the contract for heating, plumbing and lighting the State Public School in Owatonna to the Clefion Co., of Owatonna, for \$16,467.

**ST. PAUL, MINN.**—Victor H. Paul, director of the testing laboratories, has recommended the installation of 20 ornamental standards and lamps on the Earl Street bridge.

**WESTBROOK, MINN.**—Bids will be received by P. G. Hiebert, secretary of the Westbrook El. Lt. & Pwr. Co., of Westbrook, until Oct. 1, for construction of electric-lighting system as follows: (1) For furnishing and installing one 37½-kva, three-phase, 60-cycle, 1200-r.p.m. alternator with belt driven switchboard; (2) for furnishing and erecting poles, wires, street lamps, etc., for electrical distribution system in the village of Westbrook; (3) for furnishing, but not erecting, material for electrical distribution system. Separate bids must be submitted on each division of the work. Plans and specifications are on file in the office of the secretary at Westbrook, and also in the office of Earle D. Jackson, consulting engineer, Capital Bank Building, St. Paul, Minn.

**ARLINGTON, IA.**—C. Miller, of the Turkey River Pwr. & Lt. Co., of Clermont, is negotiating with the City Council for franchise to furnish electricity in Arlington.

**DAYTON, IA.**—At an election held recently the proposal to grant a franchise to the Central Lt. & Pwr. Co., of Boone, to install an electric-light system in Dayton was carried.

**LA MOILLE, IA.**—Bids will be received by John Huff, president of the Independent and Consolidated School District of La Moille until Sept. 25, for construction of a two-story school building. Separate bids to be submitted for heating, plumbing and electric wiring.

**MANCHESTER, IA.**—The contract for construction of a new cement dam at the Quaker Mills, owned by the Quaker City Lumber Co., is being negotiated by J. H. Johnson. The new dam, it is understood, will furnish power to operate an electric-light plant which Mr. Hutchinson proposes to install in the new town.

**GLADSTONE, MO.**—Plans are being prepared by Tuttle & Pike, Kansas City, Mo., for the erection of an electric transmission line from Gladstone to Armstrong. Bids for construction work will soon be asked for.

**HOPKINS, MO.**—The Hopkins El. Lt. & Ice Co. is installing an electric-light plant. The equipment will consist of a 60-hp to 70-hp crude-oil engine, one 50-kw, three-phase, 2300-volt generator, switchboard, about seven transformers, and wire. About 10 miles of wire and 400 cedar poles will be required for overhead distribution system. About 100 meters will be installed at first. Contracts will be let for material except for street-lighting system and meters. G. D. Henderson, of Hopkins, is engineer in charge.

**MARMARTH, N. D.**—Steps have been taken by local business men to organize a company to install and operate an electric-light plant. Application has been made to the Village Board for a franchise.

**PARKER, S. D.**—Bids will be received by the city of Parker until Sept. 4 for furnishing material and labor for extensions to water-works dam and construction of new electric-light plant as follows: (1) For extensions to water-works distribution system, with all accessories, to be installed complete; (2) construction of a new electric-light plant with all accessories; (3) for furnishing and installing oil engines, auxiliary apparatus, etc.; (4) generators, excitors, switchboards, motor and pump; (5) material and erecting pole line and wiring, street-lighting system, together with all accessories, in accordance with plans and specifications prepared by J. F. Drury, engineer, of the Oscar Clausen Engineering Co., Commercial Building, St. Paul, Minn., which may be seen at the office of the city auditor at the office of C. L. Jones, city auditor, Parker.

**NORTH BEND, NEB.**—Bonds to the amount of \$37,000 for the installation of a municipal electric-light plant and sewer

system were voted at the election held Aug. 7.

**ALTON, KAN.**—The City Council is reported to have awarded the contract for the construction of a combined water and light plant to the Commercial Construction Co., of Kansas City, Mo., at \$20,018. Rollins & Westover, Midland Building, Kansas City, Mo., are engineers.

**TOPEKA, KAN.**—The city of Topeka is planning to install a 250-kva, 60-cycle, three-phase, 2300-volt turbo-alternator with exciter (directly connected) in the municipal electric-light plant. Contract will probably be awarded about Oct. 1. E. G. Stahl is superintendent.

**WINFIELD, KAN.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Sept. 3 for construction complete, including mechanical equipment, lighting fixtures and approaches, of the United States post office at Winfield, Kan. Drawings and specifications may be obtained at the above office or from the custodian of site at Winfield. O. Wenderoth is supervising architect.

## Southern States

**RALEIGH, N. C.**—The installation of an ornamental street-lighting system in the business section is under consideration.

**AUGUSTA, GA.**—Bids will be received by the special hospital building committee of the City Council of Augusta, until Sept. 1, for furnishing and installing X-ray apparatus at the University Hospital in Augusta. Specifications may be obtained on application to W. C. Lyle, M.D., vice-dean.

**ROCKMART, GA.**—Preparations are being made for the installation of a 125-kw alternating-current generator and a four-volt automatic non-condensing engine (directly connected) and one-panel switchboard in the municipal electric-light plant, work on which will begin about Sept. 1. J. B. Cooper is superintendent.

**APOKA, FLA.**—At an election held recently the proposal to issue \$15,000 in bonds for the installation of a municipal electric-light plant was defeated.

**JACKSONVILLE, FLA.**—Bids will be received by the Board of Bond Trustees of the city of Jacksonville until Sept. 15, for furnishing 1000, more or less, induction recording wattmeters, both single-phase and multi-phase, for 110 volts or 220 volts, on the basis of one-half unit of 1000 meters to be shipped by month as needed. For further information apply to R. N. Ellis, purchasing agent, City Hall, Jacksonville.

**CHATTANOOGA, TENN.**—Extensive changes are being made in the hydroelectric plant of the Chattanooga & Tennessee River Pwr. Co. at Hale's Bar in the Tennessee River to enable construction of its transmission lines and those of the Tennessee Pwr. Co., a subsidiary of the Tennessee Ry., Lt. & Pwr. Co. The voltage of the Hale's Bar plant is being changed from 40,000 to 50,000 volts, the same as used on the transmission lines of the Tennessee Pwr. Co.

**JACKSON, TENN.**—Beare Brothers Ice & Coal Co., of Jackson, it is reported, would like to receive estimates on two electric refrigerators.

**BAY MINETTE, ALA.**—Bids, it is reported, will be received by the city of Bay Minette for the construction of an electric-light plant and water-works system. A bond issue of \$5,000 was recently voted for electric plant and \$14,000 for water-works system. Edgar B. Kay, of Tuscaloosa, is consulting engineer.

**GLENWOOD, ARK.**—John H. Fedan, of Hot Springs, recently granted a franchise to install an electric-light plant in Glenwood, will begin work at once on installation of same.

**ARDMORE, OKLA.**—The Ardmore Ice, Lt. & Pwr. Co. it is reported, contemplates the construction of an electric-light plant and ice factory in Ringling. H. E. Foster is manager.

**MCALISTER, OKLA.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Sept. 4 for the installation of an electric elevator in the United States post office at McAlester. Drawings and specifications with plans and specifications copies of which may be obtained at the above office. O. Wenderoth is supervising architect.

**OKLAHOMA CITY, OKLA.**—Bids will be received at the office of the Young Men's Christian Association, 333 Iowa Building, Tulsa, until Sept. 7 for heating, plumbing and electric wiring for the Young Men's Christian Association Building, Tulsa. Drawings and specifications may be secured at the above office. C. E. Buchner is secretary.

**BRYAN, TEX.**—The City Council has granted O. E. Gammit permission to install an electric power plant for the Bryan-College Interurban railway, but refused him the right to sell electricity within the city limits.

**DALLAS, TEX.**—The Board of City Commissioners have decided to install an electric elevator in the new city hall, instead of a hydraulic lift as planned.

**LAMPASAS, TEX.**—The Lampasas Lt. & Pwr. Co. is contemplating installing a 50-kw generator about Jan. 25, 1915. Emil Haby is owner and manager.

**LA PORTE, TEX.**—The La Porte Wtr., Lt. & Ice Co. expects to purchase within the next nine months one 100-hp engine and two 75-hp compound engines, and to erect 3 miles of transmission lines, two 50,000-gal. water towers and tanks, and install water mains, etc. Philip J. Pfeifer is president.

**PARIS, TEX.**—The Texas Pwr. & Lt. Co. has begun work on the erection of a new electric power plant on its property adjoining the new gas plant. The equipment will consist of two 500-hp compound engines, 60-cycle switchboards, etc. The plant when completed will furnish electricity in Paris and to towns between here and Bonham, and probably in other directions. The company, it is understood, will rebuild its local lines. Contracts have been awarded for construction of building and equipment. W. G. Moore is local manager.

**UVALDE, TEX.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Oct. 6 for construction complete, including mechanical equipment, lighting fixtures and approaches, of the United States post office in Uvalde. Drawings and specifications may be obtained from the above office or from the custodian of site at Uvalde. O. Wenderoth is supervising architect.

**WACO, TEX.**—The Brazos Valley Tel. & Tel. Co. is planning to erect a telephone exchange building in Waco, to cost from \$75,000 to \$100,000, and also to rebuild its wires and cables.

## Pacific States

**PE ELL, WASH.**—Arrangements are being made by the Centralia Lt. & Pwr. Co. for the construction of a new dam near Pe Ell, to cost about \$20,000. The company, it is understood, also contemplates improvements and additions to its local plant. The main office of the company is in Centralia, Wash.

**CORVALLIS, ORE.**—The local substantially completed by fire, causing a loss of about \$5,000. A large generator, it is understood was destroyed.

**PORTLAND, ORE.**—The Portland Ry., Lt. & Pwr. Co. has awarded the contract for the construction of a transmission line from Sandy to Bull Run to F. L. Mack of Portland. The company was recently granted a franchise to supply electricity in the city.

**SUMMERVILLE, ORE.**—The Kleiss El. Co. has filed application for water rights on Milk Creek, a tributary of the Grand Ronde River, sufficient to develop 200 hp. The company is under consideration to furnish electricity in Summerville.

**LOS ANGELES, CAL.**—The City Council has instructed City Electrician Manahan to take steps at once to provide additional lamps for Echo Park and other parks in the city.

**PETALUMA, CAL.**—The City Council has decided to issue \$10,000 in bonds for electrolights. An election will be called in the month of September to submit the proposal to the voters.

**SAN FERNANDO, CAL.**—The San Fernando Tel. & Tel. Co., recently incorporated with capital stock of \$50,000, will take over the telephone system and franchise of the Consol. Securities Co. The system will be almost entirely rebuilt under the new franchise metallic circuit must be installed.

**SAN FRANCISCO, CAL.**—Steps have been taken by the Fourth and Fifth Street Improvement Club for the installation of ornamental street lamps on Fourth and Fifth streets, between the Third and Fourth Streets. The present plans provide for 95 lamps. The club has also decided to petition the Board of Supervisors to extend the Stockton Street municipal car line along Fourth Street to Townsend Street.

**SALT LAKE CITY, UTAH.**—The City Commission has granted the Dooly Building Pwr. Co. a franchise to supply electric power in this city. The franchise is limited to the territory between North Temple Street, Fifth South Street, Second East Street and First West Street.

TEMPE, ARIZ.—L. C. Kempe, consultant of Phoenix, has been ordered by the City Council to prepare plans for the installation of a municipal electric light and power plant in Tempe.

TOLUCAHO, ARIZ.—Application has been made to the United States Land Office at Phoenix by F. J. Ramm, engineer, 1101 Chronicle Building, San Francisco, Cal., for a permit to utilize the water-power of the Little Colorado River. The company proposes to erect two dams on the river near Tolucaho and to build hydroelectric power plants and erect a 17-mile transmission line to Globe, Ray and Hayden.

VALLEY, ARIZ.—The Arkansas Valley L. & Pwr. Co. of Pueblo, has closed a contract with the Vineland Consolidated Mining Co. covering 285 hp in motors for operating an air compressor, which will be operated 16 hours a day.

CARSON CITY, NEV.—Preparations are being made by the Canyon Pwr. Co. of California, which has leased the government hydroelectric power plant at Lahontan, for making surveys for the extension of a transmission line from the Lahontan dam to Hazen and Lovelock and thence to Rochester, a distance of 100 miles. The company proposes to furnish electricity to the mining interests and other industries in that territory. W. H. Ledinghaus is chief engineer.

Canada

CALGARY, ALTA.—Plans, it is reported, are being prepared by Theodore Kröner Trust Building, Winnipeg, for the construction of a power house for the Western Canada Flour Mills, Ltd.

ST. JOHN'S, N. B.—The New Brunswick Hydro-Electric Co. has applied to the provincial government for permission to issue \$1,000,000 in bonds.

NEW GLASGOW, N. S.—The Canadian Provincial Pwr. Co. of New Glasgow, recently incorporated, is contemplating the construction of a power plant on the East River at Sheet Harbor and the erection of transmission lines (aggregating 42 miles) to the towns of New Glasgow, Stellarton, Westville and Trenton.

BELLEVEILLE, ONT.—At an election held Aug. 3 the ratepayers voted to confirm the agreement between the city and

the Trenton El. & W. Co.

PORT ARTHUR, ONT.—Work has commenced on the transmission line which is erected in the east city limits by Oliver & Edwards, to cost \$10,074. Transformers and lightning arresters, it is reported, will be required. L. M. Jones is engineer.

WALKERVILLE, ONT.—The Hydro-Electric Power Commission of Ontario is reported to have purchased the plant and property of the Walkerville Lt. & Pwr. Co., at \$34,500. The property will be taken over at once and operated by the commission until the Hydro-Electric lines are extended to Walkerville, which will be very soon.

MOOSE JAW, SASK.—Bids will be received by J. D. Peters, electrical superintendent, for high-pressure steam pipe for a 3500-hp. plant for the city.

New Incorporations

BURKESVILLE, KY.—The Burkesville Lt. & Pwr. Co. has been chartered with a capital stock of \$2,000 by J. P. Smith, C. W. Alexander, D. McComas and George Greenup.

MANISTIQUE, MICH.—The Schoolcraft County Pwr. Co. has been incorporated with a capital stock of \$5,000 to develop the water-power of the Manistique River.

MONROE, MICH.—The River Basin Hydro-Electric Co. has been incorporated with a capital stock of \$75,000 to develop water-power on the River Basin.

NEW LEBANON, N. Y.—The Lebanon Valley Ltg. Co. has been chartered with a capital stock of \$10,000, by F. W. Munch, of Dalton, Mass.; M. L. Munch, of Indian Orchard, Mass., and H. W. Munch, of Binghamton, N. Y. The company proposes to generate and distribute electricity for lamps, heaters and motors in Lebanon Springs, New Lebanon and West Lebanon.

POMEROY, OHIO.—The Ohio River El. Ry. & Pwr. Co. of Pomeroy, has been incorporated with a capital stock of \$10,000 to build an electric railroad. The incorporators are: L. Oppenheimer, J. W. Wolfe, D. W. Hennessey, George Wanger and W. H. Plantz.

HARRISBURG, PA.—Charters have been granted for four electric companies, which will take the names of the districts within which they operate as follows: Greene Township Lt. Co., Greene Township; Hanover Lt. Co., Hanover Township; Racoon Township Lt. Co., Racoon Township; and Independence Lt. Co., Independence Township. Each company will be capitalized at \$5,000 and the offices will be at New Brighton. The directors are: W. Stevenson, A. W. Robertson, J. R. McNary, E. W. Washbaugh and L. F. Kane, of Pittsburgh.

HARRISBURG, PA.—Charters have been granted by the State Department to the following electric-light companies: The Hellertown, Bethlehem Township and Freemansburg El. Lt. & Pwr. companies; each company is capitalized at \$5,000, and takes its name from the district it is to operate in. Charles N. Wagner, of Allentown, is treasurer. Also to the Turbotville, Lewis Township and McEwensville El. companies, with offices in Sunbury; the companies are capitalized at \$5,000 each; L. K. Bingen, of Sunbury, is treasurer. Also to the East Taylor Township Pub. Ser. Co., with a capital stock of \$5,000; H. E. Thompson, of Johnstown, is treasurer.

NEW HOLLAND, PA.—The New Holland El. Co. has been granted a charter with a capital stock of \$5,000 to supply electricity for lamps and motors in New Holland and vicinity. The incorporators are John S. Galt, treasurer; S. R. Zimmerman and J. Guy Eshelman.

WEST DEER, PA.—The West Deer Township El. Co. has been granted a charter with a capital stock of \$5,000 to operate an electric plant in West Deer Township, Allegheny County, with office in Pittsburgh. The incorporators are J. C. Dicey, W. G. Gruenewald and R. E. Yokach, of Pittsburgh.

SALT LAKE CITY, UTAH.—The Salt Lake Lt. & Trac. Co. has been incorporated with a capital stock of \$1,000,000 to operate electric, gas and steam plants. The incorporators are O. J. Salisbury, S. A. Whitman, W. Johnson, A. H. Parsons and J. E. Salisbury.

MONTELELLO, WIS.—The Montello & Harrisville El. Lt. & Pwr. Co. has been incorporated with a capital stock of \$40,000 by D. W. McNamara, L. M. McNamara, L. G. Miller and others.

PEACE RIVER CROSSING, ALTA.—The Peace Valley Lt. & Pwr. Co. has been incorporated with a capital stock of \$50,000.

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AUG. 11, 1914.

Prepared by Robert Starr Allen, 16 Exchange Place, New York, N. Y.

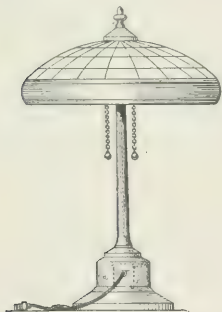
- 106,368. ELECTRICAL APPARATUS; F. Conrad, Swissvale, Pa. App. filed April 10, 1908. Current rectifier and regulator which can be readily removed from its casing.
- 106,372. AUTOMATICALLY OPERATED SWITCH; C. W. Eisenmann, Chicago, Ill. App. filed July 4, 1912. Prevents closing of switch between storage battery and dynamo at any time when voltage of dynamo is less than that of battery.
- 106,381. ELECTRODE FOR FURNACES; C. Hering, Philadelphia, Pa. App. filed Dec. 2, 1913. In form of sheet of material thin that the current flows through practically its entire section.
- 106,384. INCANDESCENT BODY FOR ELECTRIC LAMPS; W. S. Hughes, Pittsburgh, Pa. App. filed May 23, 1913. Drawn in form of filament in pure metallic state.
- 106,386. FUEL VAPORIZER FOR EXPLOSION ENGINES; H. H. and C. B. Ingersoll, Chicago, Ill. App. filed Nov. 3, 1910. Disposed of engine resistance ribbon placed in engine intake.
- 106,387. RAIL CONTACT FOR VEHICLES; E. Jenoi and J. Stevenson, Jenkins, Ky. App. filed May 15, 1913. Contact rollers mounted on a spring-pressed slide.
- 106,432. IGNITION SYSTEM; E. C. Wilcox, Meriden, Conn. App. filed May 10, 1913. Battery automatically cut out of circuit when engine stops on a contact point.
- 106,436. ELECTROLYTIC MANUFACTURE OF ALKALI METALS; C. A. Ashcroft, London, Eng. App. filed May 23, 1914. Electrolyte containing alkali hydroxide and alkali cyanide.
- 106,441. SIGNALING MECHANISM; H. C. Crumrine, Cleveland, Ohio. App. filed July 5, 1912. Auto rear signal.

- 1,106,442. ELECTRIC PLUG; F. Deiser, Chicago, Ill. App. filed Oct. 24, 1911. "Swivel" attachment plug.
- 1,106,459. LAMP SOCKET; G. C. Krauff, Chicago, Ill. App. filed Jan. 13, 1913. Bayonet-slot type for auto lamps.
- 1,106,469. AUTOMATIC MOTOR CONTROL; W. S. Mitchell, Somerville, Mass. App. filed April 17, 1912. Embodies control magnets with switch-operating and switch-holding coils.
- 1,106,476. ELECTRIC SOLDERING IRON; J. C. Royce, Toronto, Canada. App. filed May 23, 1913. Has flat heating elements clamped to a core of high heat conductivity.
- 1,106,486. ELECTRIC FURNACE; G. H. Benjamin, New York, N. Y. App. filed Dec. 19, 1913. Secondary in form of annular crucible and body of metal therein can be rotated relative to the core and primary.
- 1,106,501. CALL REGISTERING TELEPHONE; J. D. Fader, J. Tibb and J. N. Tibb, Vancouver, B. C. App. filed Sept. 19, 1913. After a certain number of calls has been made telephone is automatically disconnected.
- 1,106,510. ELECTRICAL SYSTEM OF DISTRIBUTION; A. S. Hubbard, Belleville, N. J. App. filed Aug. 7, 1909. Converting apparatus and a booster which is controlled to cause a battery discharge during lightning.
- 1,106,513. ELECTRIC MOTOR; D. C. Jackson, Madison, Wis. App. filed March 10, 1900. Produces a repulsion motor torque and an induction motor torque simultaneously in the same conductors.
- 1,106,514. DYNAMO-ELECTRIC MACHINE; D. C. Jackson, Madison, Wis. App. filed Dec. 22, 1902. Alternating-current motor with commutated armature circuit.
- 1,106,540. RENEWAL ELEMENT FOR SEMI-DRY-CELL BATTERIES; W. Broad, Beaver Falls, Pa. App. filed April 12, 1912.

- Calc. of magnesian dioxide and carbon impregnated with chemicals of oxidant nature.
- 1,106,572. INSULATING JOINT FOR PIPE SYSTEMS; A. J. Loepsinger, Providence, R. I. App. filed Aug. 28, 1911. For dry-type automatic sprinkler systems.
- 1,106,576. ELECTROMECHANICAL SWITCH; E. R. Miller, Pueblo, Col. App. filed Dec. 2, 1911. Solenoid mechanical switch-throwing connections.
- 1,106,592. TELEPHONE SYSTEM; F. E. Summers, Memphis, Mo. App. filed June 22, 1913. Subscriber can ring or talk in one direction only or in both.
- 1,106,593. ELECTRIC SWITCH; B. P. Swyers, Pittsburgh, Pa. App. filed Sept. 17, 1912. Permutation switch for auto-ignition circuits.
- 1,106,631. INVERTED LAMP; W. J. Davis, Chicago, Ill. App. filed Nov. 17, 1913. Shaded light for cleaning floors, etc.
- 1,106,639. MOTOR SWITCH; O. B. Duncan, Chicago, Ill. App. filed May 8, 1912. Has a quick throw to change from starting to running connections.
- 1,106,655. TELEPHONE CALL BELL OR RINGER; W. Ransing, Chicago, Ill. App. filed Aug. 10, 1906. A magnet yielding holds the armature in its "biased" position.
- 1,106,656. SUBSTATION SIGNAL RECEIVING DEVICE; H. O. Rugh, Sandwich, Ill. App. filed Jan. 20, 1911. Step-by-step selective signaling device.
- 1,106,683. ELECTRIC WEB-DRYING MACHINE; J. C. Sheverson, Brookline, Mass. App. filed April 23, 1911. Primary or non-rotatable core and secondary in form of rotary tubular drum.
- 1,106,710. RECORDING ELECTRIC METER; C. H. Ingrassia, Danvers, Mass. App. filed Aug. 12, 1910. Recording portion can be used with standard integrating meter.



- 1,106,719. BATTERY: S. Lake, Milford, Conn. App. filed Aug. 6, 1912. Special storage-battery construction for submarine boats.
- 1,106,750. TELEGRAPH SYSTEM: B. F. Thompson, Arlington, Md. App. filed Dec. 22, 1910. Single, duplex or duplex; balancing of line is eliminated.
- 1,106,761. SELF-LOCKING JUNCTION BOX COUPLING: A. W. Weikert and J. Pettibone, Washington, D. C. App. filed Feb. 6, 1914. Conductor clamp with spring fingers interlocking with the junction box.
- 1,106,762. TALKING MACHINE: F. H. Widgren and R. A. Widgren, Albany, Sweden. App. filed Dec. 20, 1913. Springs are interposed in the connections between the tone-producing elements and the recording pen.
- 1,106,759. ARC LAMP: H. E. Davies, West New York, N. J. App. filed April 12, 1910. Special electrode feed mechanism.
- 1,106,797. ELECTRIC INSULATOR: J. L. Fay, St. Louis, Mo., and S. E. Way, Milwaukee, Wis. App. filed Feb. 24, 1913. Induces a circulation of air to dissipate the heat produced by "flashovers."
- 1,106,799. SCALE: W. N. Gilbert, Springfield, Ohio. App. filed Dec. 19, 1910. Platform scale with two indicators.
- 1,106,819. PLAYING APPARATUS FOR MUSICAL INSTRUMENTS: J. F. Kelly, Pittsfield, Mass. App. filed Dec. 6, 1907. Player piano with special provision for accentuating desired notes.
- 1,106,821. ELECTRIC CONDUCTOR TAKE-UP: D. C. Lamb, Nappanee, Ind. App. filed Dec. 4, 1913. Cord reel mounted in the base of the lamp or other device.
- 1,106,823. TROLLEY GUARD: J. Lawton, Irvington, N. J. App. filed April 10, 1912. Freely swinging guard arms at sides of trolley wheel.



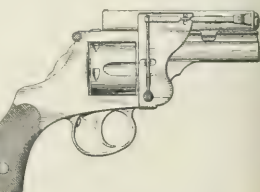
1,106,821.—Electric Conductor Take-up

- 1,106,828. PORTABLE ELECTRIC LAMP: W. J. Monaghan, Waterbury, Conn. App. filed April 6, 1914. Push-button at one end of lamp casing serves to push the battery into contact with the lamp.
- 1,106,855. WIRE CONNECTOR: G. S. Willis, Twin Buttes, Ariz. App. filed Sept. 14, 1912. Screw plug forces clamp against wire inserted in the casing.
- 1,106,874. WIRELESS APPARATUS: P. L. Jensen, San Francisco, Cal. App. filed June 4, 1912. Eliminates the effect of atmospheric electricity.
- 1,106,875. WIRELESS APPARATUS: P. L. Jensen and E. S. Pridham, Napa, Cal. App. filed April 22, 1913. Reduces disturbing effects of static electricity by surrounding the antenna with locally charged guard wires.
- 1,106,907. ELECTRIC CONTACT MAKER FOR FLOW METERS: J. Wilkinson, Schenectady, N. Y. App. filed Jan. 2, 1914. Indicating circuits made by the flowing together of two bodies of mercury.
- 1,106,911. PROTECTOR: J. Zwilling, New York, N. Y. App. filed May 8, 1914. For protection from lightning: special construction of cable-connecting springs and their mounting on the base.
- 1,106,922. SELECTOR: A. M. Bullard, New York, N. Y. App. filed May 3, 1907. The retaining and slipping pawls are both normally out of engagement with the ratchet.
- 1,106,945. ANTENNA FOR WIRELESS TELEGRAPHY: N. J. Jeffries, Atlantic City, N. J. App. filed May 8, 1913. Made up in collapsible form.
- 1,106,953. SPARK-CONTROLLING DEVICE FOR MAGNETO IGNITION: H. H. Lanning, Topeka, Kan. App. filed April 3, 1911. Differential gear set interposed in the gearing between the crank shaft and magneto armature.

- 1,106,960. ELECTRIC GLOW-LAMP: W. Nernst, Göttingen, Germany. App. filed March 29, 1898. Glow consisting of an intimate mixture of yttria and small proportion of tungstic acid.
- 1,106,961. ELECTRIC GLOW-LAMP: W. Nernst, Göttingen, Germany. App. filed March 29, 1898. Radiant body comprising intimately mixed calcium and tungsten.
- 1,106,971. FILAMENT MOUNTING: H. C. G. Remann, Berlin, Germany. App. filed Sept. 13, 1910. Anchor has an open S-shaped fork to receive the filament.
- 1,106,974. LAMP SOCKET: G. F. Rush, Chicago, Ill. App. filed June 13, 1913. Screw shell has teeth frictionally gripping the flange of the base in which it is inserted.
- 1,106,975. ELECTRIC HEATER FOR FANS: A. Schaeffer, Frankfurt-on-the-Main, Germany. App. filed April 8, 1912. Removable heater elements mounted in the fan casing.
- 1,106,982. AUTOMOBILE REAR SIGNAL: J. W. Stachnick, Baltimore, Md. App. filed June 12, 1913. Automatically indicates by semaphore arm and by lights the direction the auto is to take.
- 1,107,000. SHORT-CIRCUITING ATTACHMENT FOR GAS-ENGINE IGNITERS: C. N. Weeks and H. N. Jackson, Babylon, N. Y. App. filed Dec. 1, 1911. Pivoted spring jaws forming connection from spark-plug terminal to a ground on the engine.
- 1,107,013. CIRCUIT CLOSER: A. G. Anderson, Olney Center, Neb. App. filed Oct. 30, 1913. For lighting gas head-lights on autos.
- 1,107,024. TELEPHONE: L. S. and O. E. Boyce, Rockwell City, Ia. App. filed May 6, 1913. Subscriber's party line can listen without being heard or can push button and then be heard.
- 1,107,040. REVOLVER FLASHLIGHT: J. R. Conde, Philadelphia, Pa. App. filed March 13, 1914. Attachment which can be quickly clamped to the barrel of revolver.
- 1,107,061. ARC LAMP: C. A. B. Halvorsen, Jr., Lynn, Mass. App. filed July 21, 1910. Luminous arc: has means to break forcibly the non-conducting layer at the arcing end of the consuming electrode.
- 1,107,064. VENT AND OVERFLOW FOR BATTERIES: C. T. Mason, Sumter, S. C. App. filed Aug. 21, 1913. For storage cells.
- 1,107,099. ROTARY ELECTRIC SWITCH: M. R. Ownbey, Shawnee, Okla. App. filed April 7, 1913. Gang switch for electric signs.
- 1,107,111. INSULATOR: B. S. Purkey, Tacoma, Wash. App. filed Oct. 1, 1912. A spring clip holds the live wire in the slot receiving the same.
- 1,107,120. PLURAL SOCKET: F. E. Seeley, Bridgeport, Conn. App. filed Nov. 21, 1912. Twin socket with pull-switch control.
- 1,107,127. ELECTRIC ACTION FOR ORGANS: J. T. Austin, Hartford, Conn. App. filed Dec. 30, 1907. Flexible contacts are bent into engagement with a movable conductor.
- 1,107,133. TELEPHONE EXCHANGE SYSTEM: E. E. Clement, Washington, D. C. App. filed March 27, 1905. Semi-automatic with common battery at central office.
- 1,107,134. TELEPHONE EXCHANGE SYSTEM: E. E. Clement, Washington, D. C. App. filed March 27, 1905. Calling subscriber has control of the ringing key.
- 1,107,135. TELEPHONE EXCHANGE SYSTEM AND APPARATUS: E. E. Clement, Washington, D. C. App. filed July 11, 1905. Semi-automatic, two-wire metallic circuit, with quick-working magnets and slow-working magnets.
- 1,107,136. TELEPHONE EXCHANGE SYSTEM: E. E. Clement, Washington, D. C. App. filed Aug. 5, 1905. Simplified exchange switchboard and uniform distribution of load among the operators or connective apparatus.
- 1,107,137. TELEPHONE EXCHANGE SYSTEM: E. E. Clement, Washington, D. C. App. filed Aug. 31, 1905. Semi-automatic.
- 1,107,138. AUTOMATIC TELEPHONE EXCHANGE SYSTEM: E. E. Clement, Washington, D. C. App. filed Sept. 18, 1905. Subscriber's sender reduced to simplest form, a simple make-and-break being all that is used.
- 1,107,139. TELEPHONE EXCHANGE SYSTEM: E. E. Clement, Washington, D. C. App. filed Nov. 11, 1905. Has automatic answering and connecting devices controlled by a calling subscriber.
- 1,107,140. TELEPHONE EXCHANGE SYSTEM: E. E. Clement, Washington, D. C. App. filed Nov. 21, 1905. Subscriber can, by a "sender" at his substitution, connect his line with the line of any other subscriber.
- 1,107,141. TELEPHONE EXCHANGE SYSTEM: E. E. Clement, Washington, D. C. App. filed Nov. 21, 1905. Auxiliary switch-

board during busy hours takes care of overflow from main switchboard and during quiet hours takes entire load.

- 1,107,142. TELEPHONE EXCHANGE SYSTEM: E. E. Clement, Washington, D. C. App. filed Dec. 23, 1905. Semi-automatic.
- 1,107,143. TELEPHONE EXCHANGE SYSTEM: E. E. Clement, Washington, D. C. App. filed March 15, 1906. Operator gets wanted number from subscriber and then simply presses proper button.
- 1,107,144. TELEPHONE EXCHANGE SYSTEM: E. E. Clement, Washington, D. C. App. filed March 30, 1906. Semi-automatic with special connector switch mechanism. (Forty-nine claims.)
- 1,107,145. TELEPHONE EXCHANGE SYSTEM: E. E. Clement, Washington, D. C. App. filed June 22, 1906. By which existing manual exchange switchboards can be converted into semi-automatic.
- 1,107,146. TELEPHONE EXCHANGE SYSTEM: E. E. Clement, Washington, D. C. App. filed July 14, 1906. Connective means comprising as its essential elements relays only.
- 1,107,147. TELEPHONE EXCHANGE SYSTEM: E. E. Clement, Washington, D. C. App. filed July 14, 1906. Matron, D. C. App. filed July 14, 1906. Connecting means for answering and automatic switching apparatus consisting of all relays for connecting with wanted line.
- 1,107,148. TELEPHONE EXCHANGE SYSTEM: E. E. Clement, Washington, D. C. App. filed Aug. 1, 1906. Subscribers calls are distributed among connective terminals in an improved manner.
- 1,107,149. SELECTIVE APPARATUS FOR SYSTEMS OF COMMUNICATION: E. E. Clement, Washington, D. C. App. filed Oct. 11, 1906. Combination of relays controlling the circuits and less in number than the total number of circuits.



1,107,040.—Revolver Flashlight

- 1,107,150. TELEPHONE EXCHANGE SYSTEM: E. E. Clement, Washington, D. C. App. filed Nov. 26, 1906. Improvements in sending and receiving lines to be served and the circuit therefor.
- 1,107,151. TELEPHONE EXCHANGE SYSTEM: E. E. Clement, Washington, D. C. App. filed April 24, 1907. Has a number of groups of selector and connector switches less than the number of lines to be served.
- 1,107,152. TELEPHONE EXCHANGE SYSTEM: E. E. Clement, Washington, D. C. App. filed Dec. 26, 1907. Subscribers' lines terminate with contacts of relays, which are divided into certain groups.
- 1,107,153. ELECTRIC SWITCH: E. E. Clement, Washington, D. C. App. filed July 15, 1907. Simplified form of selective step-by-step switch having multiple arms and bank contacts arranged in the segment of a circle.
- 1,107,154. TELEPHONE EXCHANGE SYSTEM: E. E. Clement, Washington, D. C. App. filed Nov. 23, 1905. Has main and so-called "equalizing" switchboards.
- 1,107,155. TELEPHONE REGISTERING SYSTEM: E. E. Clement, Washington, D. C. App. filed April 15, 1905. Records particular operator who handled a particular volume of business, calls made and answered by the called subscriber, and elapsed time.
- 1,107,156. TELEPHONE REGISTERING SYSTEM: E. E. Clement, Washington, D. C. App. filed Feb. 23, 1905. For registering messages and their duration.
- 1,107,157. TELEPHONE EXCHANGE SYSTEM: E. E. Clement, Washington, D. C. App. filed Sept. 13, 1905. For automatically ringing a wanted subscriber and calling to ring when subscriber answers.
- 1,107,228. AGRICULTURAL TROLLEY SYSTEM: E. W. Sanderson, New York, N. Y. App. filed June 9, 1913. Tractor pulls the feeder wires laterally.
- 1,107,233. RESISTANCE ELEMENT: C. N. Moore, Schenectady, N. Y. App. filed May 11, 1914. Resistance conductor with granular insulating material incased in tube and subjected to successive swaging operations.

# Electrical World

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No. 9

## The Copper Situation

Of the American industries which have suffered a direct and serious check because of the conflict in Europe, the copper industry has been hit the hardest. Production, which had already been curtailed to some extent owing to financial depression and to labor troubles, has now been cut in two owing to the war. This is not to be wondered at when it is considered that less than half of the copper produced in this country is used for domestic consumption. To be sure, there has been a tendency in recent years toward overproduction so that the present crisis is not without compensation in that it will tend to place copper on a more stable basis. On the other hand, some producers look upon the situation with alarm because it represents an actual loss in cash. Germany consumed 145,500 tons of American copper last year, Holland took 77,100 tons, France 65,800 tons, and England 55,600 tons. The price ranged from 16 cents to 15 cents a pound, depending on the grade, and inasmuch as no less than 395,000 tons of copper were exported last year, some comprehension of the loss in dollars and cents is afforded. Shutting down mines under such conditions is both logical and wise. The market undoubtedly will still be open to the United States when conditions in Europe return to normal, but it will take some time for the copper industry to recover from the loss the present European war entails.

## Credits in South America

Many people have spoken and written about the need of granting long-time credits to South American buyers of electrical apparatus. Manufacturers have been cautioned that the South American buyer regards payment in three or four months as equivalent to cash. Carry the argument a little further, and it appears that a long-time payment, as that is known ordinarily in this country, would be postponed in South America to a month far distant on the calendar. This condition arises in part from a lack of capital, and it is strengthened by the lifetime practices of our neighbors on the south. Whatever terms are essential for our manufacturers to make they will make. In the past they have felt that they were handicapped by a lack of knowledge of South American customs, lack of banks and lack of American shipping facilities. In reality these obstacles seemed more serious than they were. Knowledge can be acquired, the National City Bank of New York is to start branches, and American shipping facilities are already in a fair way to be provided. Foreign banks have always been open in South America, and shipping facilities under flags of other nations have been plenti-

ful. Bankers and manufacturers know that the question of credit is like any other business problem. It is answered by the same reasonable rules that are applied to all business problems. If long-time credit is a factor in a sale, it is a factor in the cost. The expense of financing the account is a part of the expense of producing and financing the goods. If the buyer gets long-time credit, he is not on the same basis with the buyer who pays cash. If the credit involves undue risk of principal, that is another factor to be reckoned with in the calculation of cost. No new market can be entered easily or without advance preparation and expense. To these difficulties South American countries add the problems of different language and customs and of long-established relations with European business men. Like the question of credit these problems have a reasonable solution which it has now become the duty of manufacturers to discover.

## Attention to Export Trade

This journal has been making an effort to see how far America can do its share in preserving intact and in keeping vitalized all the vast electrical applications in countries outside the scene of warfare that must have supplies and new material. Recent issues have had a number of articles and interviews devoted to the subject. The one fact that has been made clear is that the electrical export trade was utterly unprepared for war, and that export trade in general has not yet made more than the merest beginning in securing its necessary facilities. The electrical opportunities have been fairly well indicated, but there is still a lack of some focal point or central agency to which the miscellaneous incoming demand for goods and the outward push for customers might be directed. Our present electrical export trade of about \$25,000,000 has been done by relatively few concerns and without concentrated and sustained effort beyond them and their connections abroad. They are a very small percentage numerically of the 1000 American electrical manufacturers for whose apparatus a demand may now be reasonably assumed to exist, not merely abroad but here at home, to fill the place of goods previously brought in from the Continent and England. It is not known that any such definite organized agency exists except the loosely knit National Foreign Trade Council. We are without any available electrical body, for none of the societies such as the American Institute of Electrical Engineers or the National Electric Light Association is intended or equipped for the work. Possibly the Society for Electrical Development might here discover a new oppor-



tunity, but its present basis is purely domestic. The formation of an export association, which was discussed in our issue of last week, would help manufacturers, and its possibilities merit careful consideration.

### A Large Transmission System Service by Steam Plants

The system of the Texas Power & Light Company, which we describe in this issue, is rather notable as being one of the very few large transmission plants operated by steam power. Electric transmission has been so bound up with the development of the hydro-electric station that one almost instinctively associates the two together, so that it is of no little interest to realize that we have here in the largest state of the Union a network of nearly 250 miles of 60,000-volt transmission line fed from steam plants using the relatively cheap fuel produced in neighboring territory. The system is fed in fact from two such stations, one of which, at Fort Worth, was described in our last issue, the other being at Waco at the southernmost end of the transmission district. The main transmission line is of steel-tower construction with towers spaced at intervals of about 600 ft. and carrying the conductors at an elevation of about 50 ft. above the ground. A single line operating at the same voltage on the eastern edge of the district is carried on wood poles. These are 55 ft. in height and are spaced at 300-ft. intervals. They carry, however, only a single three-phase circuit of No. 1 wire. Suspension insulators are employed throughout the system, and usually consist of four disks in series.

A particularly interesting feature of the plant is the fact that all the transformers and switching substations are of the outdoor form, and the high-tension switches themselves are mostly of the air-break type used so extensively on the Pacific Coast, although less familiar to operating men in Eastern communities. A certain number of oil switches are placed at important points, but most of the duty of transferring connections falls upon the simpler air-break apparatus. Some thirty-three separate communities are served by the system. In the cases of some of the smaller towns the outdoor substations have no regular attendants, arrangements being made with some local call man to visit the station daily as well as when specially summoned to make any changes in the connections required. On his regular visit this part-time attendant charges the aluminum-cell lightning arresters, where these are used, looks after the oil levels and transformers, reads the instruments, and sends a daily record of all the details to the superintendent of power. Indeed striking is the fact that it has proved possible to make the system so nearly automatic in its regular functioning that these daily visitations are effective from an operative standpoint. At all the substations the motor and lighting circuits are kept separate and the latter are all provided with automatic induction regulators. It will thus be seen that in so far as is possible the whole

transmission system is arranged to take care of itself without an extraordinary degree of attention. The separation of the lighting and motor circuits is a rather important feature of the general scheme, particularly since the company carries a heavy motor load, furnishing service to many cotton gins, cottonseed-oil mills, flour mills and other large consumers. The whole system is a type of that class of development which is necessary in dealing with a large load in comparatively widely separated communities scattered over a wide area, and is all the more notable as proving that a difficult problem of this kind can be economically worked out while deriving energy entirely from steam plants.

### Transatlantic Radio Service

The difficulties of securing regular and uniform wireless communication increase so rapidly as the separation of the sending and receiving stations becomes greater that at the present time few, if any, pairs of installations are working constantly across more than 2000 miles of land or sea. In the early days of long-distance radio signaling the greatest trouble seemed to be from the tremendous decrease in signal strength in daylight as compared to that of night signals. This bugbear was almost entirely removed by the adoption of wave-lengths of 4000 meters or more. Then there remained the impossibility of reading weak signals when atmospheric disturbances were intense, and it was not until after the general adoption of the high-frequency musical spark transmitter that this hardship was sufficiently reduced to permit regular transmission over even 1000 miles. The long-distance working of the Arlington naval station, of Glace Bay and Clifden, and of the Nauens and Sayville plants, has shown that by spark telegraphy distances of about 2000 miles may be covered in a fairly dependable manner, provided that use is made of long waves, high group frequencies and abundant transmitting power.

Rivaling the spark stations in transmission distance, reliability and economy are the plants utilizing sustained electromagnetic waves, as suggested by Fessenden in 1901 and practised shortly thereafter, produced by gas-discharge oscillators or by radio-frequency alternators. Representatives of the first type are the intercommunicating installations at South San Francisco and Honolulu and the new naval station at Darien Canal Zone, which it is expected will be able to exchange messages with Arlington. The only powerful example of the alternator wave-producing plant in the United States is at Tuckerton, N. J. This station is able to telegraph to, and receive from, the similar equipment at Eilwese, near Hanover, Germany, when "static" disturbances are not severe. These two installations represent in many ways the best practice of radiotelegraphy.

Another pair of transatlantic stations is about to be opened, however, and these are to be of the spark type. On page 425 of this issue Mr. John L. Hogan, Jr., describes the Marconi plants at Carnarvon and Towry

Wales, which it was expected would be placed in touch with American stations at New Brunswick and Belmar, N. J., this fall. That this can be done is now somewhat doubtful, on account of the present European complications, and preparations are being made to open communication between New Brunswick and a powerful station being erected in Norway.

A most striking fact is that even to-day, nearly thirteen years after the first experiments in transatlantic radio and more than eight years after the establishing of the first regular night-time wireless between the United States and Great Britain, no commercial day-and-night radio service has been opened in competition with the Atlantic cables. The confidence and commercial daring shown by the erectors of the New Jersey and Welsh plants make them indeed worthy of complete success.

### War and Industry

What effect will the war have on industrial activity? This is the question uppermost in the mind of every American business man. Deploping the consequences to humanity, he still is deeply concerned to know what the conflict will do to the material business of this nation. He knows that many consuming centers will inevitably turn to this country for products and that the great needs in South America which cannot be supplied by the foreign nations now commercially inactive must be met from here. In a few weeks war has caused a world-wide convulsion of business whose effects, like those of a convulsion of nature, may be lasting. In that short time the industrial development of great countries has been stopped, for the best of Europe's working population is now engaged in destructive, not productive, enterprise. That does not, however, indicate the full extent of the revolution, because those who ordinarily would be workers are not only not now engaged in production but they must be provided for at heavy cost, and this will fall, to a large extent, upon those least capable of meeting it.

Producing centers in this country are ready to meet the demands thrown upon them at short notice. The war has created markets for many classes of products in European lands and in the countries formerly supplied from Europe. Foodstuffs are wanted by nations at war, and those who produce foodstuffs or use them in canning or manufacturing will have their activities greatly increased. Goods to provision, outfit and clothe armies will also be in urgent demand. These needs will stimulate many producing industries temporarily and will mean sure markets at prices enhanced by a demand more insistent than can be supplied. Other products which this country will be asked to furnish are those that have been going from nations now at war to other lands. Studies will be made to show the extent of these. The importance of electrical exports has been pointed out in the articles published in the *Electrical World*, not because "one man's misfortune is another man's advantage," but by reason of a world-wide demand and unfilled. A situation without precedent has

arisen in our industries. Neutral countries are crippled because they relied upon European sources of capital and materials and European markets. Commercial relations cultivated during many years are swept away in the torrent of war.

No countries ever before deliberately sacrificed commercial life on the scale of the terrible exhibit in Europe. Trade between the countries directly engaged in the war is fatally hurt. Trade between each of those countries and other nations now at peace is interrupted and, except in the event of an early conclusion of hostilities, it cannot be easily restored. Too much capital and too many trained workmen will have been sacrificed to enable European nations to resume quickly their banking and commercial relationships with the countries which heretofore depended largely on their assistance. If peoples wholly innocent of part in the war are to have the burdens lightened for them, it will be because a strong nation like ours is ready and willing to do its part toward that end. Only by time and patience can the needs created by the commercial inactivity of Europe be met. Where this country has been dependent on Europe for raw materials, other materials or substitutes, so far as they can be found, will be introduced. Temporarily crippled, some manufacturers in this country will learn how to use what is at hand to take the place of that which they cannot now import. For the nations involved the terrors of war will not be lessened, but our activities will protect other peoples against the dire consequences of a strife not of their making.

### The Railroad Rate Case

It is one of the minor fortunes of war that the European news almost buries the brief announcement that Eastern roads will ask the Interstate Commerce Commission to reopen the 5 per cent rate advance case. This will give the commission an opportunity to reverse the finding in which it denied the advance. Whether or not the roads have any reason to believe that the commission will act favorably on the application, they do not have to look far afield to find proof for that body that conditions have changed. The commission has been inclined to be optimistic over earnings and traffic and to feel that the glances of the roads toward disaster were calculated merely to influence the verdict; but even the arch-enemy of the carriers, which the commission is not, would admit candidly that their financial necessities are accentuated by the war. The practical fact is that the calculations of the commission were based on the expectation of a reasonable increase in revenues and reasonable arrangements for new capital requirements. At the present time judgment on these points is suspended. It is not argued that the roads will not be able to borrow money in the future. It is argued that at this moment no one can tell what rates will be necessary to invite public investment. However, if earnings are not large enough to attract new capital the railroad development cannot possibly take place.



# The News of the Week

## Activities and Events in the Electrical Field— Reports of Meetings—Commission Findings, Etc.

### San Francisco Rates Found Confiscatory

A decision has been rendered by Mr. H. M. Wright, master in chancery of the United States Circuit Court at San Francisco, Cal., in regard to the electric rates established by the city of San Francisco for the Pacific Gas & Electric Company. The decision holds that the rates are confiscatory. It is found that the company was earning only 5.82 per cent on the value of the property as fixed by the master in chancery. The city authorities have voluntarily granted authority to the company to establish a higher schedule of electric rates. This schedule, it is stated, is satisfactory to the company.

Mr. Wright rendered a decision recently that the gas rates established by the city of San Francisco for the company were confiscatory. The earnings in that case were found to be but 5.21 per cent on the valuation established by the master in chancery.

### Trust Regulation Still in the Senate

The administration's anti-trust legislation program has made further progress in the Senate. The Clayton anti-trust bill, supplementing the Sherman law, has received attention. Several important amendments have been agreed to, and Senator Culberson, chairman of the judiciary committee, who is in charge of the bill, hopes to get a final vote on the measure very soon.

Senator Newlands, chairman of the conference committee, has attempted to get the conferees together on the federal trade commission bill. There is a strong sentiment in favor of doing nothing further with the trade commission bill until the Senate has disposed of the Clayton anti-trust bill, the reason given being that the two measures are so closely related that everything should be done to make them dovetail.

The Rayburn stock and bond issue bill, regulating the issue of securities by common carriers, has been reported to the Senate and is awaiting its turn, which is to come as soon as the Clayton bill has been passed.

### Convention of Edison Sales Managers

The fifteenth annual convention of the sales managers of the large Edison companies was held at Association Island, N. Y., Aug. 24, 25 and 26. The meeting was more successful and the discussion even more animated and profitable than those of previous years. Unfortunately, however, it is the custom of the association to withhold publication of the papers and discussions until released by the authors. The program was as follows: "Central-Station Advertising Plan," by Mr. H. K. Mohr, of the Philadelphia Electric Company; "Old Store Rates," by Mr. Douglass Burnett, of the Consolidated Gas, Electric Light & Power Company of Baltimore; "Service Inspection," by Mr. C. H. Stevens, of the Edison Electric Illuminating Company of Brooklyn; "Rates for Residence and Business Lighting," by Mr. H. A. Brooks, of the Consolidated Gas,

Electric Light & Power Company of Baltimore; "Telephone Order System," by Mr. R. H. Wright, of the Cleveland Electric Illuminating Company, and "The Present Status of Electric Furnaces."

Those in attendance included Messrs. L. R. Wallis, W. G. Stetson and R. S. Hale, of the Boston Edison company; A. A. Pope, W. H. Whitton, E. F. Tweedy and H. Robinson, of the New York Edison Company; J. F. Becker, J. V. Guilfoyle and A. F. Berry, of the United Electric Light & Power Company of New York; T. I. Jones and C. H. Stevens, of the Brooklyn Edison company; R. R. Young and H. H. Holding, of the Public Service Electric Company of Newark, N. J.; J. D. Israel, J. Meyer and H. K. Mohr, of the Philadelphia Electric Company; D. Burnett, C. E. Robertson and H. A. Brooks, of the Consolidated Gas, Electric Light & Power Company of Baltimore; J. C. McLaughlin, of the Washington Railway & Electric Company, Washington, D. C.; Miss F. M. Sheridan, Messrs. D. B. South and E. L. Crosby, of the Detroit Edison Company; Messrs. Mathias Turner and R. H. Wright, of the Cleveland Electric Illuminating Company; P. H. Kemble and L. R. McCleary, of the Union Gas & Electric Company of Cincinnati, and F. D. Beardslee, of the Union Electric Light & Power Company of St. Louis.

### Action on Conservation Bills

The House of Representatives, making slow headway on the Ferris bill for the development of water-power and the use of public lands in relation thereto, is expected to send that measure to the Senate, considerably amended, in the last days of August. Even then the Senate will not have passed the Adamson general dam act, and if the experience which the bill met in the House is to be reflected in the Senate, with its larger ideas of unending discussion, it will be late in the fall before the first of the conservation measures is sent to the White House for the signature of the President.

At present the Ferris bill is running a severe gantle on the floor of the House, as the charge is made by Eastern men, regardless of party alliances, that the measure is not carefully drawn. No doubt it will be amended before its final passage. An important amendment has already been accepted by the House, sitting in committee of the whole, which takes from the bill what some of the members called "the monopolistic features." Instead of the Secretary of the Interior being empowered to allow any one consumer to use an or all of the electrical energy generated in a plant affected by the Ferris bill, the measure has been amended so that the consent of the Secretary must be a specific matter if any consumer is to get more than 50 per cent of the product.

After the Ferris bill leaves the House, the measure providing for the leasing of coal lands in Alaska is in order. After this the bill to authorize exploration for and disposition of coal, oil, gas, potassium or sodium will be in order, and the "radium" bill is the last of the measures scheduled to be passed by the House in this session.

### Edison Illuminating Companies' Convention Program

At the convention of the Association of Edison Illuminating Companies, to be held at the Hotel Greenbrier, White Sulphur Springs, W. Va., Sept. 15, 16 and 17, the following papers and addresses will be presented:

"Accounting for Variation in Coal Economy of a Large Central Station," Messrs. Robert Dillon and Charles H. Parker; "Further Development of the Business in Case Lamp Efficiencies Continue to Improve," Mr. R. S. Hale; "Industrial Education," Dr. Charles P. Steinmetz; "Mercury Turbine Developments and Possibilities," Mr. W. L. R. Emmet; "Protection Against Effects of Grounds and Short-Circuits," Mr. Paul M. Lincoln; "Safety in the Electric Lighting Industry," Messrs. J. L. Murrie and J. C. Robinson; "Scientific Management of Public Utilities," by a representative of the Penn Central Light & Power Company; "Single-Phase Loads from Polyphase Systems," Mr. B. G. Lamme; "The Central Station in Its Relation to Dust and Cinder Problems in Cities," Mr. R. P. Bolton, Dr. J. A. Deghuee and Mr. C. B. Grady; "The Changing Attitude of Employers," Mr. Gerald Stanley Lee; "The Illumination of the Panama-Pacific Exposition," Mr. W. D'Arcy Ryan; "Workmen's Compensation and the Physical Examination of Employees," Mr. J. B. Murray.

Committee reports will also be presented by the following chairmen of committees: Electric heating and kindred uses of electricity, Mr. Joseph D. Israel; electric storage batteries, Mr. S. C. Harris; electric vehicles, Mr. George H. Jones; high potentials, Mr. L. L. Elden; incandescent lamps, Mr. J. W. Lieb; load-factor, Mr. J. W. Lieb; meters, Mr. S. G. Rhodes; national code, Mr. P. H. Bartlett; steam operation, Mr. J. D. Andrew; street lighting, Mr. J. W. Cowles.

Mr. Arthur Williams, New York City, is president of the Association of Edison Illuminating Companies, and Mr. Walter Neumuller, Irving Place and Fifteenth Street, New York, is assistant secretary.

### War Will Not Affect Panama-Pacific Exposition

We have received advices to the effect that the war in Europe will not cause a postponement of the Panama-Pacific International Exposition. President C. C. Moore states that at no time had the directors a thought of postponing the opening date. According to Lieut. G. W. Danforth, chief of machinery exhibits, the conditions now existing are that forty-four states of the Union have made appropriations and are actively engaged in building state pavilions and preparing their exhibits. The various state appropriations are made for a stated period and a delay in the Exposition would necessitate going to the legislatures for more money. The exhibit palaces are completed, the installations are already begun on a large scale, and it is the desire of the exhibitors to proceed with the arrangements as they have planned.

"Thirty-four foreign nations," Lieutenant Danforth said, "have made appropriations and are actively engaged in erecting their official buildings and preparing their exhibits regardless of war, so that any postponement in the Exposition would complicate the situation. There is nothing in the present situation that seems likely to affect the plans or success of the Exposition. Of the thirty-four foreign nations that are now preparing buildings and exhibits, only three are concerned in war, and none of these has yet indicated that its arrangements for participation will be interrupted. France and Italy have cabled that their preparations to participate are proceeding despite the war. The possi-

ble loss of exhibits from countries involved in war will be replaced by increase in other directions. The effect on the attendance will be favorable, for whatever is lost from Europe will be ten times compensated by Americans and South Americans, especially citizens of the Argentine, coming here instead of going to Europe. The Argentine government cabled Aug. 13 that it was preparing to increase its exhibits and accordingly requested the Exposition officials to assign additional space to it. Brazil also cabled that it intended to proceed with larger plans for an exhibit at this Exposition. For the first time in its history China has made application to display machinery, and space has been assigned to the Chinese Republic in Machinery Palace in addition to assignments in the other exhibit palaces.

"The forces of peace and the necessity for commercial activity are greater than the forces of war, and as soon as America recovers from the inconvenience caused by the transatlantic conflict our country will doubtless take advantage of the splendid opportunity before it.



MACHINERY PALACE, PANAMA-PACIFIC INTERNATIONAL EXPOSITION

"The operation of the new regional banks and the added number of ships flying the American flag, making quick time from coast to coast through the Panama Canal, place the United States in the most favorable position in the world, rich, self-supporting and at peace with all, and the Panama-Pacific International Exposition offers the quickest and most effective medium for bringing American manufactures to the attention of the distributors and consumers of the world."

### Nevada Electrical Association

The Nevada Electrical Association will meet at the State University, Reno, Nev., Sept. 7, in conjunction with the State first-aid and mine-rescue sessions scheduled for the same day. Among the papers to be presented are the following: "The Beowawe Locomobile Plant," by Mr. A. N. Voss, Buckhorn Mines, Beowawe, Nev.; "Electrical Control," by Mr. E. P. Cullinan, Belmont Mines, Tonopah, Nev.; "Drying Out Wet Motors," by Mr. J. K. Poe, Consolidated Mines, Goldfield, Nev.; "The Edison Storage Battery," by Mr. E. M. Cutting, Orange, N. J., and "The Nitrogen-Filled Lamp," by Mr. A. G. Jones, Harrison, N. J. Papers on the protection of meters against lightning will also be presented by superintendents of several electric power and transmission companies of the State.



### Southeastern Section, N. E. L. A.

The second annual convention of the Southeastern Section of the National Electric Light Association was held at Isle of Palms, Charleston, S. C., Aug. 19 to 21, the attendance of more than 100 being well representative of central stations in Virginia, North Carolina, South Carolina, Georgia, Alabama and Florida. A number of entertainment features marked the program, including dances, automobile rides, steamboat excursions to Fort Sumter and the Charleston Navy Yard, etc.

Following the address of the president, Mr. T. W. Peters, Columbus, Ga., on Wednesday morning, Messrs. A. L. Dixon and F. N. Carle, Long Island City, N. Y., presented a paper on "The Electric Vehicle—the Central Station's Greatest Opportunity," in which the authors discussed the future of electric transportation in the South. Mr. Norman B. Hickox, Knoxville, Tenn., followed with a paper entitled "Commercializing Electrical Advertising," in which plans for sign campaigns were outlined.

#### Technical Topics

Mr. E. S. Moorer, Atlanta, Ga., opened Thursday's session with a paper on inductive interference between telephone and transmission lines. Mr. Moorer described the causes of this class of troubles and suggested means for their correction. The paper was discussed briefly by Messrs. C. M. Young, Columbus, Ga., and G. K. Selden, Atlanta, Ga. "Feeder Voltage Regulation" was next discussed in a paper by Mr. A. D. Fishel, Pittsburgh, Pa., who described the application of automatic apparatus for single and three-phase lines.

"Recent Developments in Incandescent Lamps" was the subject of a joint paper by Messrs. T. W. Moore, Harrison, N. J., and Henry Schroeder, Atlanta, Ga. Emphasis was laid on nitrogen-filled and high-current lamps. Mr. Martin, Atlanta, Ga., and Mr. George Wygant, Tampa, Fla., took part in the discussion.

#### Public Relations and Commission Regulation

"How, When and Where—A Few Irregular Thoughts on Regulation" was the inviting title of Mr. John S. Bleecker's paper, in which the author suggested that a utility commission be ready to apply its regulative function whenever the standard of service is departed from, as well as at times when the rate of return on investment is improper. Mr. J. E. Bigham, Tampa, Fla., called attention to the changing conditions which affect the problems of fixing rates and returns. He closed with a strong plea against government ownership of telephone and telegraph lines. The convention also adopted a resolution indorsing the expression of the Railroad Commission of Georgia to the effect that competition can never be "a consistent and proper regulator of rates and other conditions in the public utility field."

The report of the public policy committee, prepared by Mr. Bleecker, declared that the policy of regulation should prevent undue returns on investments in public utilities, but at the same time it should insure reasonable return. Efficient regulation, therefore, implies both prohibition of competition and prohibition of discrimination. And if this principle of regulation is correct, asserted the committee, the regulating body should have as much authority over municipally owned plants, both before and after their establishment, as it has over privately owned plants.

At the Friday morning session Mr. S. A. Sewall, New York City, spoke of the national activities of the N. E. L. A., of which he is assistant secretary. Mr. MacDougal Dexter followed with a description of a new method of indicating and recording river stages. The scheme employs compressed air and has been used with

success at the plant of the Columbus Power Company. An experience meeting and informal discussion of electrical topics followed.

Following is the list of officers elected for 1914:

President, Mr. J. E. Bigham, Tampa, Fla.; first vice-president, Mr. W. A. Belcher, Cordele, Ga.; second vice-president, Mr. C. M. Benedict, Charleston, S. C. Executive committee, Messrs. C. D. Flanagan, Athens, Ga.; W. E. Mitchell, Birmingham, Ala.; C. I. Day, Jacksonville, Fla.; H. W. Plummer, Asheville, N. C.; Alfred Wallace, Columbia, S. C. Rate committee—Mr. W. R. Collier, Atlanta, Ga. Membership and finance committee—Mr. W. A. Belcher, Cordele, Ga. Public policy committee—Messrs. P. S. Awkright, Atlanta, Ga.; John S. Bleecker, Columbus, Ga., and Z. V. Taylor, Charlotte, N. C.

Mr. George H. Wygant, Tampa Electric Company, Tampa, Fla., was appointed secretary-treasurer.

### The Electrolytes

Within the last few months a new society—a sort of "jolly good fellows" society in one branch of the electrical industry—has made its appearance in Chicago. It bears the name of The Electrolytes, and its existence was hinted at in a note printed in the N. E. L. A. *Convention Daily* at Philadelphia on June 3. The new association is a secret society and is, in fact, an organization to promote good-fellowship in the electric-vehicle industry and its allied lines. It has weird ceremonies and an elaborate initiation, never neglects the "eats" and is not averse to song and story. Membership is by invitation. Only those connected in some way with the electric-vehicle industry are invited to join, but nevertheless the organization is in no sense a technical or industrial organization—it is purely social. It is at present confined to Chicago, but possibly may spread out and become a national society. The officers have curious titles, as may be judged by the following list: Grand hi lite, Mr. L. E. Wagner, Baker Electric Sales Company; imperial rectifier, Mr. Otto A. Suttmueller, Hyde Park Hotel Garage; grand circuit breaker, Mr. Paul Frank; recording wattmeter, Mr. M. E. Davis; grand high frequency, Mr. C. B. Frayer, Edison Storage Battery Company. For Aug. 29 the organization planned to give a clambake and "field night."

### Meter Tax Law Invalid in Salt Lake City

By a decision of the Utah Supreme Court the ordinance passed by the City Council of Salt Lake City four years ago levying an annual license tax of \$1 against each meter in use by the Utah Light & Railway Company is held to be invalid on the ground that it is not uniform in its application.

The right of the city to pass an ordinance requiring such a license fee is upheld by the court, and it is announced that the matter of passing an amended ordinance to meet the requirements of the decision will be laid before the city commission in the near future.

The court says that a company selling by flat rate would be exempt from the license tax under the present ordinance, and for that reason it is class legislation in violation of the fourteenth amendment of the federal constitution.

The company contended that the city had not the right to impose an "additional burden," declaring that under its franchise an "additional burden" is prohibited. The court rules against this contention, holding that the right to levy the tax is inherent with the city and cannot be bartered away.

# The War's Effect on the Electrical Industry

Entire Art in Europe Suffers Technical and Commercial Setback Opportunities Afforded  
American Manufacturers to Supply the Markets of the World Now Barred from  
Regular Sources Statistics Bearing on European Electrical Exports  
and Advice from Experienced Observers on Ways and  
Means of Meeting South American Needs

## WRECKAGE OF THE INDUSTRY ABROAD

How It Affects the American Market and What It Means  
to the Art, Technically and Commercially

BY DR. LOUIS BELL

The present war of giants seems like the terrific visions of a nightmare, too horrible to outlast, save as vague memories, the hour of waking. It is well-nigh impossible to realize that the Pan-European war dreaded for a generation past is actually in progress, breaking out without warning like an eruption from the bottomless pit itself, and sparing nothing human or of human contrivance. Whatever the issue, it means the setting back of our vaunted civilization for many a long year and the wrecking over half the world of the finest achievements of man's industry.

We in this country are fortunate indeed in being free from entanglements and able to extend a helping hand to the war-stricken in so far as equity permits. And it would seem that our first duty lies in keeping from utter ruin the arts of peace and lessening as best we may the frightful results of the strife upon the industries of mankind. In the special field of electrical engineering and manufacturing we can be of peculiar service as the only nation upon which war has not laid the hand that strangles. The effect of the struggle upon technical industry of every kind is hard to overestimate. Its first withering touch removes from the ranks of labor every workman of active years who is not absolutely needed to provide material of war in every country having compulsory military service. Imagine if you can the paralyzing effect of a universal lock-out in every occupation of all men between, say, twenty and forty, quickly followed by the expulsion of most of those in the next decade of life. Imagine further a pestilence breaking out among the unemployed, destined to decimate them and to leave a large share of the survivors broken in health and spirit, and you have some feeble notion of the wreckage of this demonic fight.

### European Production Wholly Shut Down

In electrical manufacturing, France, Belgium, Austria-Hungary, and pre-eminently Germany, have had a large share in the world's markets. Their factories are known everywhere, and now the supply from them is practically cut off by the cessation of demand, the loss of labor and the lack of transportation. Some work must be done even to supply military necessities, but it must be accomplished by those beyond military age and by women and children. So far as active commercial work goes, one may as well reckon every door as closed in all the warring Continental countries. Nor in this dreadful exigency would much be done even if there were no dearth of labor, since money must be hoarded for actual necessities. Hence central stations will feel the pinch almost from the first, and their business will in a way measure the extent to which electrical service has put down the stage of being a luxury. Under existing conditions the swift increase in the cost of food will overshadow every other economical consideration.

There is besides the possibility that many plants, both manufacturing and operating, will be destroyed in

the progress of hostilities. Even now the factories in and about Liège are deserted, if not actually wrecked by the German shells. Even if the fortunes of war spare Paris, Berlin and Vienna, the big works near the eastern and western fighting zones, to whomsoever belonging, are in no small danger of destruction. For the manufacture of heavy machinery there are left thus far uninvolved the small groups of important Swiss works, some of lesser note in Italy, and such residuum of the British works as may be able to keep up activity. Probably they will hold up with fair success since England will call relatively few men to the colors and, above all, holds substantial control of the seas, with the resulting freedom of transportation which means so much to industry. It is to be hoped that brave little Switzerland will not be embroiled as was Belgium by the violation of her boundaries, but if she should be, her greatest plants lie dangerously near the frontier. The Scandinavian countries, like Italy, have not yet drawn sword, but occupy a somewhat precarious position. Of all the electrical branches the manufacture of incandescent lamps will perhaps suffer least owing to the small proportion of male labor involved and the steady demand for necessary replacements. But there is a strong likelihood that the tungsten supply will quickly run short in some of the countries affected and drive the users back to carbon.

### Resumption of Manufacture Waits on Peace

The manufacture of supplies is certain to fall off enormously from lessened demand and facilities, and instruments must suffer for the same cause, so that, all in all, electrical production will in great measure cease on the Continent until peace is in sight, and even then it may take a long time before conditions are settled enough for resumption of business on any large scale. And when peace comes the toll that Death has taken from the world's workmen will be heavily felt.

Here in the United States we must suffer somewhat from the feeling of financial insecurity that disturbs that normal condition of credits on which business depends. Fortunately, we are not vitally dependent upon the interior of Europe for electrical materials, and to the coasts we have access. The most serious single item of import is that of electrodes for flame-arc lamps and for the remaining inclosed lamps. These come from Germany and no very large stock is carried on this side of the water, so that if the war is prolonged our American makers will have to supply the demand and can subsequently hold the market permanently if they will but exert themselves. As England and France are fellows in this deprivation, the effect of the war on lighting technique may be considerable. A few years ago the check on the imports of glassware would have been serious, but our manufacturers have made rapid progress and the present situation is good. There may be temporary inconveniences in minor matters, such as getting some necessary materials, but, with the sea practically clear for commerce, only Germany and Austria-Hungary are virtually blockaded by hostilities, and save for some delays in transportation things are likely to go along well enough.

The gravest menace to our electrical industries is the



stringency in the money market that checks enterprise. There are signs already of some relief, and when the war enters its second stage in which the rapidity of action is less and the struggle turns to one of organized endurance conditions are likely to improve in this particular. After all, cash under lock and key is unproductive and its owners soon tire of holding it tight. Meanwhile, the markets of this hemisphere are open to us as they have not been before in the memory of this generation. All the great manufacturing producers are in the fight, and the world's needs must be supplied from all sources still available. The electrical trade of South America will now turn to the United States as the only large source of supplies left, and reasonable care in encouraging it will perhaps make up in the export trade all that timidity may lose us at home. It is a somewhat grim notion, this gaining the trade lost by the fighting hordes, but it looks like a straightforward matter of necessity, as it is in the matter of selling foodstuffs—the world needs what we have to offer and buys it in the best available market. For, whether the war be brief or long-drawn-out, the struggling nations are commercially seriously crippled now and for some time to come will be staggering under burdens of debt that will hinder the resumption of industry. Capital spent in war is a terrible loss to the world in that it destroys not only the means of production but the producers themselves, and our country can hardly serve humanity better than by refusing to allow loans for the promotion of bloodshed while reserving its resources for the promotion of the world's industry when peace comes at last.

## HOW TO ENTER SOUTH AMERICA

**Mr. E. F. Colyer Gives Practical Advice, Based on Long Experience, in Regard to Necessary Knowledge and Practices**

Mr. E. F. Colyer, in charge of the Latin-American section of the foreign department of the General Electric Company, has had much experience in Central America and South America. In discussing export trade matters with a representative of the *Electrical World* he said that no commercial traveler who went to either Central America or South America could do much if he did not know the language spoken in the country he visited. In all the countries excepting Brazil, where Portuguese is spoken, and British, French and Dutch Guiana, it is necessary to talk Spanish. Although some of the plants are owned by English or Americans, the miscellaneous trade, excepting in the large cities, is principally in the hands of native firms, and with these Mr. Colyer believes that a foreigner who had to talk through an interpreter could make very little progress. This, of course, applies to travelers who are trying to make actual sales. If a representative of an American manufacturer goes to the country merely in order to get information concerning the outlook for his goods it is not so imperative that he speak the language. It will be found that many of the plants and stores in Central American countries have connections with commission houses in New York and New Orleans.

### Advantage of Proper Credentials

In offering goods to residents of the Central and South American countries it is most desirable, Mr. Colyer stated, to have letters of introduction in order that a friendly relation may be established before actual business is attempted. As the banks of this country do not often have correspondents there, they are not likely to be of much assistance to commercial travelers. If

it is possible to get a letter of introduction to a resident banker or to establish a business connection with him, that is an advantage. In all cases the first man to be seen is the consul. American consuls are always glad to assist any man who is on a business trip, and frequently they are able to give much information that is of service. A representative of a large well-known corporation is in a somewhat different position from one who represents an unknown concern. Correspondence between a company and a possible consumer is, of course, a step toward a personal introduction that will be found to be a help.

### Large Territory, Scant Sales

Mr. Colyer emphasized the fact that much of the business with the greater part of Central and South America is apt to be small in amount, and that some time is required to develop the market. He figures the traveling expense of a salesman in Central or South American countries at pretty close to \$5,000 a year. If a salesman were to attempt to cover the entire field, he would find the territory so large that he might easily become discouraged. Business is not transacted in accordance with the practices that prevail here. There is little prospect that several orders a day may be taken. Often a salesman will not receive a single order until he has been on the ground for weeks.

Mr. Colyer said that, with the possible exception of Guatemala, which is more nearly a market for European countries, the Central American countries patronize mainly the manufacturers of this country. Between the commission and jobbing houses and local representatives of American firms, Central America is now pretty well covered by manufacturers of this country.

### When and How to Travel

Mr. Colyer was asked about the time of the year when trips should be made by representatives of manufacturers. He said that it varied with the section visited, but that it was desirable to avoid the rainy season. Clothes suitable for the tropics should be taken, with a light overcoat for the altitudes. On account of the condition of the rivers in Colombia it is possible to get into the interior of that country readily only during two seasons of the year.

### Misinformation About Credits.

The question of granting credit, Mr. Colyer believes, is not radically different in Central and South America from other countries. A good deal of misinformation has been published about the general necessity of very long credits, which are not the invariable rule. In some lines extended credits must be given, while in other lines it would be poor business policy. The practice in different markets and in different lines varies very widely.

### Brazil, Argentina and Chile Offer Best Markets

Since the foreign trade in Brazil, the Argentine Republic and Chile is several times as great as that of the rest of Latin America, these countries naturally offer the most attractive market for American manufacturers. They have in the past been supplied principally from Europe. They have large modern cities, are well provided with railways, and business methods will be found to differ less widely from ours than is the case in other sections.

### Care in Packing Essential

The question of the form of package and method of packing has been discussed often in connection with Central and South American trade. Mr. Colyer said that the important point in packing for export is to make the package so carefully that goods will not be

broken. In some countries buyers stipulate packing for mule-back transportation. If this is mentioned, it is absolutely imperative that the instructions be followed. On the west coast the conditions necessary to meet in landing freight are very bad, and stout packing is required. In other countries, where duties are assessed in accordance with the weight, buyers stipulate that the package be as light as possible.

## STUDY OF FOREIGN TRADE NECESSARY

### Mr. W. J. Clark Calls Attention to the Banking and Credit Facilities Which Have Helped Foreign Nations

Mr. W. J. Clark, manager of the traction department of the General Electric Company, takes an optimistic view of the ultimate effect of the war upon industrial conditions in this country, but he feels that it will take time to adapt our financial machinery to the new conditions. European financiers have made a diligent study of foreign business for so long a time that Americans cannot expect to learn the art of dealing with South American countries, especially, in a few months.

#### Study of Credits

In the opinion of Mr. Clark a vital feature in the European industrial achievements abroad has been the attention given to the financial standing of individual foreign customers. The status of each as a creditor is studied carefully and suitable terms are made for him. Credits up to two years are sometimes allowed with a reasonable interest rate which can be discounted at home, making a profitable transaction for seller as well as purchaser. Belgium has played an important part in the financing of foreign undertakings. Owing to favorable laws, to the supposedly neutral character of the country and to the excellent Belgium consular service, it has been to a considerable extent a clearing house for them. Capitalists in other countries invested through Belgium corporations somewhat as though they were holding companies. The capital thus placed outside of Belgium in public utilities of various kinds is at least \$1,000,000,000. There are also vast sums invested directly by French, German and other financiers. In South America the public utilities, with the exception of the Pearson, Grace and minor interests, are financed in Europe principally, directly or indirectly, from Germany.

#### Quality of Our Products

To offset the conditions outlined, Mr. Clark believes that, aside from the temporary and possibly permanent conditions produced by the present war, the principal advantages possessed by American manufacturers lie in the quality of their products and the ability of their selling forces. That our manufacturers are beginning to appreciate their opportunity is shown by the activity of the United States Steel Corporation and a few other enterprising organizations.

The General Electric Company does much of its South American business through its London office, opened fourteen years or more ago, largely to handle foreign business. A very large business is done here because London is the natural center for South American trading. The company also controls the South American General Electric Company with headquarters at Buenos Aires, and it has regular office headquarters at Rio de Janeiro. In addition, a large business is handled by W. R. Grace & Company in the west and southwest, and by Amsinck & Company in the north.

In discussing the probable effects of the war upon financial and industrial conditions, Mr. Clark stated that

he expects some small immediate benefits and larger ultimate benefits. At first there should be an increase in the demand for small supplies for which the purchaser can pay directly. The present plants must be kept up and supplies will be required at once. Ultimately foreign projects will have to be partially, and possibly largely, financed from America. Europe up to this time has largely financed all foreign undertakings, but America must shoulder part of the burden because European money will be needed at home. As foreign ownership influences trade to a large extent, it follows that as fast as American money is invested abroad American trade will follow it. South America has little money of its own and hence must depend upon the outside world for capital. The conditions for investment, however, are favorable, and they are constantly becoming less so in this country, at least so far as public utilities are concerned.

#### Influx of Immigrants After the War

In Mr. Clark's opinion the close of the war will be followed by an influx of very desirable immigrants, who will flee from the burdens which inevitably follow a great war. South America will share in this benefit as it did fifty years ago, when some of the present prosperous Irish and other families settled there, particularly in the River Platte country. The reaction of the war will probably also be seen in the increased costs of manufacturing in Europe, both in labor and supplies, through high taxes and shortages due to destruction and non-production. These will act as a protection to American industries, enabling them to offset the results of tariff reductions.

## ENGLISH AND GERMAN ELECTRIC EXPORTS

### Statistics of Exports from Electrical Industries of Germany to Neutral Countries, Nations at War and Colonies

In our issue of Aug. 15 and 22 an account, with tables, was given of the American and British electrical export trade. The electrical exports from the United States for 1912 were shown to have been somewhat in excess of \$26,000,000 and the British electrical exports for the same period were shown to have been over \$34,000,000, or 30 per cent more than the American trade. Germany for 1912 exported electrical goods having a value of over \$55,000,000. This figure is almost the sum of the American and British combined exports. It is over 110 per cent more than the American electrical export trade and almost 62 per cent greater than Great Britain's export trade.

#### Germany's Electrical Exports and Imports

Germany annually took from Great Britain electrical goods valued at over \$570,000 and from the United States electrical goods to the value of \$215,000. At the same time Germany exported to Great Britain electrical goods valued at over \$4,000,000 and to the United States electrical goods valued at over \$450,000, as against the combined imports from the two countries of \$785,000. In other words, Germany's electrical exports to United States and Great Britain amounted to six times her exports from those two countries. Her exports to the United States alone were 100 per cent more than her imports from this country.

#### Austria's Electrical Foreign Trade

In the case of Austria-Hungary Great Britain's exports were negligible, America's trade amounted to but \$24,000, while Germany's trade had a value of almost \$5,000,000. In other words, Germany had a monopoly



of the Austro-Hungarian electrical import trade. Servia imported practically no electrical goods from either England or America. From Germany, however, she imported electrical goods valued at \$80,000.

#### French Imports and Exports

France imported approximately \$400,000 of electrical goods from America, \$1,000,000 from Great Britain, and \$2,280,000 from Germany. Such totals make

TABLE I—VALUE OF GERMAN ELECTRICAL EXPORTS DURING 1912 TO NEUTRAL COUNTRIES

Countries	Machinery	Lamps	Miscellaneous (Including Remainder)
Denmark	\$139,100	\$291,400	\$1,057,000
Italy	1,057,000	590,000	2,193,000
Netherlands	640,500	16,770	1,963,000
Norway	424,000	286,000	879,000
Portugal	80,800	64,750	117,500
Spain	771,000	723,000	987,500
Sweden	132,000	472,000	1,530,000
Turkey	19,170	14,630	134,700
Ukraine	142,600	157,000	179,400
Cuba		71,700	15,350
United States		279,000	223,400
Argentina	1,139,000	466,000	2,582,000
Brazil	604,000	446,000	613,000
Chile	280,800	201,200	718,000
Bolivia		17,260	
Colombia		17,980	
Peru	14,180	25,430	5,030
Uruguay	110,700	84,600	338,000
China	60,650	198,300	193,800
Siam	2,639	11,520	22,520
Portuguese Africa	9,350		13,430
Egypt		16,300	74,300
Other neutral countries*	633,500	750,000	3,120,000

\*Includes Costa Rica, Guatemala, Honduras, Nicaragua, Panama, Salvador, Santo Domingo, Ecuador, Dutch Guiana, Paraguay, Venezuela, Dutch East Indies, Greece, Roumania, Switzerland and Dutch India.

America's electrical export trade to France seem extremely small. Russia took less than \$60,000 worth of electrical goods from the United States, approximately \$450,000 worth from Great Britain and over \$6,660,000 worth from Germany. This can mean but one thing, that Germany practically controlled the Russian electrical import trade.

#### German Control of Electrical Trade in Europe

Belgium took somewhat over \$150,000 in electrical goods from the United States, almost \$350,000 from England and more than \$4,000,000 from Germany. Japan imported electrical goods to the value of \$2,350,000 from America, more than \$1,500,000 from Great Britain and over \$2,600,000 from Germany.

Germany, in other words, easily controlled the electrical import trade of Europe. England was ahead of

TABLE II—VALUE OF GERMAN ELECTRICAL EXPORTS DURING 1912 TO COLONIES OF COUNTRIES NOW AT WAR

Countries	Machinery	Lamps	Miscellaneous (Including Remainder)
UNITED STATES			
Canada	\$718	\$156,500	\$102,800
Australia and New Zealand	124,800	116,400	214,400
Others	433,800	240,700	183,600
GERMANY	5,088		96,700

America, principally in the electrical machinery trade, but Germany with one or two minor exceptions was ahead of both countries in practically every branch of the trade.

Considering next the colonies of those countries now at war, Germany did practically the entire export trade with her own colonies, although the amounts involved

were rather small, being approximately \$150,000. America's exports to German colonies were less than \$1,000, and England's trade with them was so small that it was not separately listed. Neither Germany nor England appears to have sent any electrical goods to French possessions. America sent to them roughly \$13,000 worth of electrical goods.

It was in the trade with English colonies that Germany made a poor showing. As was natural, England

TABLE III—VALUE OF GERMAN ELECTRICAL EXPORTS WITH COUNTRIES NOW AT WAR

Country	Machinery	Lamps	Miscellaneous (Including Remainder)
Great Britain	\$614,000	\$1,664,000	\$1,730,000
Austria-Hungary	1,080,000	1,093,700	2,707,000
Spain	21,580	12,950	44,800
France	560,000	702,000	1,020,000
Russia	1,203,650	2,590,500	2,869,000
Belgium	867,000	546,000	2,588,000
Japan	823,500	215,900	1,670,000

led, with exports to the value of \$20,000,000. America came next, with \$11,000,000, and Germany was last, with \$1,500,000. The great difference was in the trade with Canada. Canada's imports from America were roughly \$9,000,000; from England they were \$1,700,000, and from Germany they were \$250,000.

#### Trade with Central and South American Republics

The Central and South American republics for which we have comparative figures are Mexico, Argentina, Brazil and Chile. Mexico's electrical imports from Germany were approximately \$500,000; from England they were but \$50,000, while from America they were \$3,000,000. America led Germany and England in every item of any importance.

Argentina has been importing \$4,000,000 worth of electrical goods from Germany, \$3,000,000 from England, and a paltry \$600,000 from the United States. In

TABLE IV—COMPARATIVE FIGURES FOR GERMAN ELECTRICAL EXPORTS

First Half of	Values
1910	\$24,680,000
1911	23,800,000
1912	24,860,000
1913	30,300,000
1914	35,500,000

other words, Argentina has been importing from the three countries \$7,600,000 of electrical goods and America has been supplying less than one-twelfth of that amount. In the machinery trade England and Germany practically broke even; but in the lamp trade and the miscellaneous trade Germany had the lead by far. America was third in every case.

In Brazil, however, America was more fortunate. The American electrical exports to Brazil were \$1,750,000, and the German exports were \$1,660,000. Germany led in the machinery trade, with England next and America last. Germany led in the lamp trade, with America second and England third. In the miscellaneous trade, however, which includes among other items telephone and telegraph apparatus, America was foremost.

In Chile Germany's trade was more than the combined trade of England and America. Germany's trade

amounted to \$1,200,000, England's amounted to \$530,000, and America's amounted to \$420,000. The principal differences were in the lamp and miscellaneous trade.

To sum up for the four southern republics mentioned, Germany's trade was \$7,300,000, England's was \$5,300,000, and America's was \$6,020,000. With the war threatening to be a drawn-out affair, it is seen that there is in these countries an annual electrical business of approximately \$12,000,000 awaiting the American electrical manufacturer.

## LONDON ELECTRICAL PAPERS ON THE WAR

They Speak Calmly and Hopefully About the Effect on English Trade, and Discuss the End of Business with the Continent

Issues of the London electrical papers speak calmly and not without confidence about the condition of electrical activity.

The *Electrical Review* of London said in part on Aug. 7: "The calm and steady way in which London—speaking principally for the City and its financial organizations—has withstood the shock of the crisis is rational ground for assuming that no new alarm is likely further to unsettle it. . . . Out of the evil good will come. Canada and the United States, for example, may find their financial salvation by reason of the present grave condition of affairs. Afterward there will arise such activity in trade, in metals, in stocks and shares, as few can remember. These, however, are for the future. The immediate outlook is too serious to be illumined by more than hope, but that hope is fortified and cheered by the steadfast way in which the financial institutions of London and the people whom they affect have met a situation that might have precipitated a panic which nobody could have called surprising."

### Effect on Electrical Trade

Under the title "The Electrical Trade and War," *The Electrician* of London said in part in its issue of Aug. 7: "The outlook for trade, and especially the electrical trade, will, it is confidently hoped, become brighter as the first operations of the war are concluded. Unfortunately for all concerned, those firms which are now and have been for many years trading in electric plant, apparatus and material from the Continent, and particularly Central Europe, will find themselves faced with no alternative but to close their doors.

"The blow which statesmen have dreaded, and which commercial men were hopeful that trade ties would avert, has fallen with appalling swiftness upon business firms engaged in the re-export of Continental products and material of an electrical and kindred character. It is improbable that there will be a resumption of the same commercial relations between this country and Germany for many a long day, not merely in electrical but in other products. In fact, our inter-trade with the continent in electrical material, both raw and finished, will have already completely ceased. The minds of British manufacturers are compelled to turn to those outlets for trade which the distant parts of the empire and other unaffected countries offer. It is to be hoped that shipping facilities may be such as to maintain the flow of trade to our colonies and insure some market for our productions. Many electrical firms do big business with the colonies and will have in hand contracts and orders which they should be able to complete. Where they have used raw material or semi-finished parts from the Continent they may now turn to the home producer, who will be only too glad of the business.

"There must be many electrical firms who will be kept going with existing and new government contracts. In addition, the recent records of tenders accepted by municipalities for Continental plans prove that these orders will have to be replaced in this country, for it is inconceivable that electricity supply can come to a standstill. Again, there will be a great opportunity for the makers of electric vehicles in this country, for all means of transportation will inevitably be at a premium owing to the hostilities."

### Business as Usual

In *The Electrician* of London on Aug. 14, under the title "Business as Usual," the following appears: "From inquiries which we have made of the principal electrical manufacturing firms and supply houses there is no occasion for uneasiness, nor has there been any unwonted falling off in trade.

"According to accounts from London and provincial electricity undertakings, company and municipal, many of the staff, both electrical and mechanical, are called out, and not a few of the stations may, for a period, be under-manned. Whether or not there will be any serious loss in load through the closing of factories will not be ascertained for some weeks yet, but the probabilities are that loss of a customer in one district will be followed by a gain from factories on overtime or new industries created by the war."

## MR. SUNNY ON THE BUSINESS OUTLOOK

Chicago Telephone Official Sees Obstacles to Development Unless the Government Is More Tolerant

Mr. B. E. Sunny is president of the Chicago Telephone Company, the Wisconsin Telephone Company, the Cleveland Telephone Company and the Michigan State Telephone Company. He is also a director of the General Electric Company and of some of the transportation companies and banks of Chicago. To a representative of the *Electrical World* who asked him, on Aug. 19, for his opinion of the present business situation, Mr. Sunny said that the telephone business is holding up pretty well under the present abnormal conditions due to the business uncertainty in this country resulting from the European war. The telephone toll traffic has been affected more than the local traffic, and it is not apprehended that the latter will be seriously curtailed. However, utility companies of all classes are making very few extensions at the present time. There will be difficulties, perhaps, in financing new issues of securities by public service companies while the present unsettled conditions exist in the financial centers of the world.

In relation to the movement having for its object the encouragement of foreign trade in the South American countries, Mr. Sunny said that, while the idea is of course a splendid one, it will be difficult, if not impossible, to accomplish anything along that line unless there is an immediate and radical change in the views of the public in respect to subsidizing a merchant marine service, as is done by England, Germany and France, and, furthermore, unless there is a more tolerant attitude by the government toward the men who have had the courage in the past to embark in big enterprises.

"Congress cannot mercilessly hammer the so-called 'captains of industry,'" said Mr. Sunny, "and expect them to come up smiling and ask for more. My observation is that they have quit and that we shall miss their help for many a long day."



## PUBLIC SERVICE COMMISSION NEWS

## Ohio Commission

Mr. J. Walter Wright, city solicitor of Bucyrus, filed a brief with the commission last week in the rate case of the Bucyrus Light, Heat & Power Company. He asserts that a public service corporation is not entitled to a fixed or definite return on its investment. The interests of the consumers are to be considered first, he argues, and a utility company has not the right to plead to the commission that it is entitled to any certain return until the rates are actually reduced.

Mr. Wright also argues that in fixing the rate the commission should take into consideration the probable increase in business which the reduced rate would naturally bring to the company. If depreciation is greater than it should have been because of the selection of poor apparatus, Mr. Wright argues that the bill should not be paid by the people through the maintenance of high rates. The commission, he says, should investigate the company's business in order to determine the earnings after the ordinance goes into effect.

## Missouri Commission

The Missouri Public Service Commission denied the request of the Kirksville Light, Power & Ice Company for a re-hearing of the decision in the electrical rate case which was mentioned in these columns on July 4, 1914. In compliance with the law of Missouri the company was required to put the new rates into effect on the date fixed by the commission. The company, however, had time to take action through the court and to protect itself in that way if the new rate should be lower than will provide a return. It is expected that the company will file a motion with the Circuit Court which will allow it to take up the matter later.

## Nevada Commission

The third annual report of the Public Service Commission of Nevada, covering the year 1913, says that the case against the Nevada-California Power Company is by far the most important with which the commission was called upon to deal during the year. The value of the power company's property used in the service of furnishing light and power, according to the company's own evidence, is something more than \$5,000,000, while, apart from the testimony, the company itself gives to its property an estimated valuation of approximately \$8,000,000.

The commission was divided upon the subject of water-right valuation; Commissioner Shaughnessy adopting the view that no value whatever should be attached to the company's water rights. With this view the majority of the commission could not agree. But in the conclusions reached as to what would be just and reasonable rates under all the circumstances and conditions connected with the operations of this company in the district which it served there was no material difference of opinion, and the order as made met the approval of the entire commission.

The report says, in reference to the work of the commission, that, in order to justify the permanent maintenance of the commission, it is not necessary to anticipate a continued and heavy cutting of rates. There is a line of reduction that cannot and ought not be crossed if the commission has the principles of justice and the best interests of Nevada at heart. If it crosses the line of confiscation, any court in which the orders are contested will hold them to be void. But it should not be the policy of the commission to go anywhere near the line of confiscation, because if it does it will very seriously check the investment of capital in public utilities and greatly retard the progress and prosperity of

the State. What in business and social life are regarded and spoken of as "modern improvements" result almost, if not quite, in their entirety from the operations of public utilities. While at all times endeavoring to bring about proper readjustments both of rates and service rendered by these utilities, the commission must also be careful not to become so drastic as to alarm capital, and thus seriously check, if not entirely stop, the investment of money in those enterprises that are so essential to the progressive commercial development of the State.

If it should so happen that the commission never makes another reduction in rates, which is not at all likely, it would still be the height of unwisdom to dispense with the commission. The correctness of this statement will be clearly apparent when it is considered that if the commission were to go out of existence to-morrow there would be nothing to prevent public utilities over which it has jurisdiction from immediately restoring the old rates or even making them higher in order to recoup the losses they have sustained by the reductions to which they have been subjected. The courts are powerless to establish reasonable rates. The Legislature has power to prescribe rates to be charged by all public utilities, but experience has shown that it is neither wise nor effective to attempt to regulate utilities through arbitrary, non-elastic statutes which may be held valid with respect to some utilities and void with reference to others, or void *in toto*. Regulation through commissions, which are administrative boards armed with certain judicial powers, has been found to be the only just and effective method of regulating those individuals, companies and corporations that are engaged in rendering service to the public.

## Wisconsin Commission

In our issue of July 18 there was abstracted that portion of the annual report of the Wisconsin Railroad Commission giving statistical information regarding the number of cases and complaints and the amount of authorized securities. The following paragraphs present an abstract of the corporate and financial part of the report:

A portion of the report contains a summary of the principal facts relating to the statistical work of the commission and includes a résumé of the development of railroad and utility business during the period covered by the report. The detailed statistical tables and the unit cost tabulations are to constitute a separate section of the annual report and will be completed later. During the year a total of 1136 utilities made reports to the commission as against 1043 for the preceding year. The report of the statistical department shows that at the beginning of the fiscal year ended June 30 last the value of the property and plant of all electric utilities was \$36,438,900, or a decrease of 8.75 per cent over the year preceding. The construction during the year increased 15.46 per cent over 1912. The total assets show a decrease of 13.31 per cent. The total operating revenues show an increase of 17.58 per cent, the gross income an increase of 21.98 per cent, and the net income an increase amounting to 30.72 per cent.

The total property of the gas companies at the beginning of the year showed an increase of 8.99 per cent over the year preceding, the total operating revenues an increase of 8.99 per cent, and the net income an increase of 13.89 per cent.

In the case of the telephone companies the construction during the year showed a decrease of 10.46 per cent over 1912. The total operating revenues increased 9.53 per cent and the net income 14.36 per cent.

## Current News Notes

**INDUSTRIAL EXPOSITION AT NEWARK, N. J.**—The annual exposition of Newark's arts and industries will be held in the First Regiment Armory at Newark, Sept. 12 to 16.

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**ACCOMMODATING THE WOMEN-FOLKS.**—Although most of the customers of the municipal electric-lighting plant at Huron, Ohio, receive service at a flat rate, the management of the plant keeps the station running each Wednesday morning until 11 o'clock. This is done solely for the accommodation of the 125 women of Huron who own electric flatirons.

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**DETROIT'S G. A. R. ILLUMINATION.**—The Detroit (Mich.) Edison Company will furnish gratis the electricity for lighting the elaborate decorations of the court of honor, the street illuminations and the outlining of public buildings in connection with the forthcoming G. A. R. celebration at Detroit. As a formality the company has taken a contract to supply the energy, the consideration being \$1.

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**PENALTIES FOR OFFENDING RADIO OPERATORS.**—The Department of Commerce is penalizing commercial radio operators whom it discovers to be violating the regulations governing the service. The Secretary of Commerce has, for example, just suspended for six months the commercial first-grade license held by a ship operator as a penalty for his sleeping on duty at sea and subsequently denying that he was asleep.

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**THE PUNKAH-WALLAHS OF IND.**—In the electrified cities of India the electric fan is fast displacing the immemorial punkah, and the punkah-wallahs—Hindoo servants who tirelessly work the huge native fans for a monthly wage of \$2.60—have been forced to seek other, even if less lucrative, employment. Thousands of electric fans are already in use by both British residents and well-to-do natives to palliate the fierce heat of the tropics.

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**UNDERGROUND CONSTRUCTION "RUNS INTO MONEY."**—A recent computation puts the total of the conduit owned by the Commonwealth Edison Company of Chicago at 18,961,333 duct-feet. The company's investment in conduit (including tunnels), cable, services, etc., is about \$19,000,000, or about 22 per cent of the total assets of the company. The amount of conduit installed by the company in 1913 was about 1,500,000 duct-feet.

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**ELECTRICALLY HEATED AIR SPRAY FOR APPLYING VARNISH.**—The application of varnish by means of an air spray has been made practicable recently by inserting an electric heater in the compressed-air supply line to prevent the varnish stiffening and turning white when it strikes the surface being coated. By heating the air the varnish is caused to flow more freely through the orifices of the "air brush" and the varnished surface dries more quickly and smoothly than in the presence of cold air. An electric exhaust fan may be employed to remove fumes from the varnishing cabinet.

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**THE VEHICLE INVESTMENT IN PARCEL DELIVERY.**—In the list of investments of the express companies reporting to the Interstate Commerce Commission horses

make up the largest single item of classified cost next to real estate and buildings. For the year 1911 the thirteen express companies reporting had invested in horses \$2,938,009, compared with \$2,772,330 in vehicles. This was an increase of \$217,000 over the investment in horseflesh for the preceding year, despite the fact that the electric automobile was then just coming into use as a means of conveyance for parcel delivery.

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**ISTHMIAN TRANSMISSION LINE NEARING COMPLETION.** The foundations for the last of the standard track-span bridges to support the 44,000-volt transmission line across the Isthmus of Panama Canal Zone were completed during July, and the steel towers are now being erected. There will be 327 of these standard bridges, besides several special crossing towers of extra height which will support the conductors 78 ft. above the ground, in contrast with the standard height, 30 ft. Each of the special bridges will weigh about 17 tons and cost \$1,500.

\* \* \*

**A MESSAGE TO MOY KEE.**—The Society for Electrical Development has under preparation a post card in Chinese, which members may mail to Chinese laundrymen within their territories, setting forth the uses of electrical devices in laundries. Names and addresses received in reply will be forwarded to central stations, manufacturers and dealers. The society is also sending its central-station members printed matter and suggestions for rendering assistance to real-estate agents in the renting of wired houses. Following its booklet "Vacation Comforts," other literature will be issued on the subject of dry-goods-store window dressing and electrical home conveniences and toilet accessories.

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**ELECTRICAL SAFETY RULES.**—The Bureau of Standards, Washington, D. C., has issued an important compilation of "Safety Rules" to be observed in the operation and maintenance of electrical equipment and lines. General suggestions are addressed to both employers and employees, and plans of safety organization for corporations are outlined. Protective devices and methods are described and recommended, and detailed instructions are offered for the operation of power plants, overhead lines, switchboards, arc-lighting systems, signal lines, etc. Another set of rules covering the requirements of construction, installation and maintenance work will be issued later. Copies of the newly published book of "Safety Rules" may be obtained from the Government Printing Office, Washington, at 15 cents per copy.

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**A MILLION AND A HALF AUTOMOBILES.**—Figures compiled by *Automobile* show a total of 1,548,350 automobiles, gasoline and electric, in use in the United States on July 1, an increase of about 250,000 since the first of the year. New York State leads with 140,635 cars, and Illinois comes next with 115,000. Among the states whose registration lists permit the separation of the statistics for gasoline and electric vehicles, Pennsylvania is reported to have 7455 electric passenger cars and 2461 electric trucks, New York 7000 electric cars and 2992 trucks, Indiana 1000 passenger cars and 500 trucks, Massachusetts 823 cars and 695 trucks, the District of Columbia 710 cars and 90 trucks, and Connecticut 400 cars and 200 trucks. In the sixteen states thus reporting separate gasoline-car and electric-car statistics the electric passenger cars numbered 18,055 against 508,673 gasoline machines, and the electric trucks 7086 against 31,556 gasoline trucks.



**FOUR-HUNDRED-MILE TRANSMISSION COMPLETED.**—With the closure of the tie-line switch at San Bernardino, Cal., on Aug. 13, energy was transmitted from Bishop Creek to El Centro, Cal., a distance of 400 miles, completing the longest transmission circuit in the world. The new line brings electric service into the Imperial and Coachella valleys.

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**DAY SERVICE FOR VENEZUELA'S CAPITAL.**—After many false reports it now seems certain that Caracas, Venezuela, is at last to receive daytime service. Energy is furnished by the Venezuela Electric Light Company, which has no competition in supplying lighting service in Caracas. A field for the use of electric fans and household appliances is thus opened up in the Venezuelan capital.

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**LIGHTING THE WAY TO SALES.**—Saturday afternoons and Sundays are notably "real-estate days," for most home-seekers are employed during the rest of the week. To reduce the extraordinary activity of the week-end daylight hours and to encourage prospective customers to call during the evenings, a Los Angeles real-estate firm has mounted a searchlamp on a platform overlooking its suburban development so that any plot in the tract under discussion with a customer can be flooded with light, making inspection as easy as in full daylight.

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#### SOCIETY MEETINGS.

**BOILER MANUFACTURERS' ASSOCIATION.**—The annual convention of the American Boiler Manufacturers' Association will be held at the Waldorf-Astoria, New York City, Sept. 1 to 4.

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**COLORADO ELECTRIC ASSOCIATION.**—The annual convention of the Colorado Electric Light, Power and Railway Association will be held at Glenwood Springs, Col., Sept. 3 to 5, as recently announced in these pages.

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**NEW ENGLAND SECTION, N. E. L. A.**—As already noted in these columns, the New England Section of the National Electric Light Association will meet at the Hotel Mathewson, Narragansett Pier, R. I., Sept. 2 to 4.

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**TELEPHONE PIONEERS OF AMERICA.**—The fourth annual meeting of the Telephone Pioneers of America will be held at the Hotel Jefferson, Richmond, Va., Oct. 29 and 30. Mr. Theodore N. Vail is president, and Mr. H. W. Pope is secretary.

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**INDIANA ELECTRIC LIGHT ASSOCIATION.**—The Indiana Electric Light Association will hold its annual convention at Terre Haute, Ind., Sept. 24 and 25. Mr. Thomas Donahue, General Service Company, Lafayette, Ind., is secretary of the association.

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**ELECTRIC-VEHICLE MEN AT PLAY.**—The second annual outing of the Chicago Section of the Electric Vehicle Association of America and the Chicago Garage Owners' Association was held at Cedar Lake, Ind., on Aug. 12. There were many athletic contests, the garage men winning the two principal events—the baseball game and the tug-of-war.

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**MOTOR TRUCK CLUB OF AMERICA.**—The annual convention of the Motor Truck Club of America will be held at Detroit, Mich., Oct. 7, 8, 9 and 10. Mr. W. D.

Anderson, of the Anderson Electric Car Company, Detroit, heads the electric-vehicle committee for the meeting. The co-operation of interested electric-vehicle organizations has been invited.

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**INSTITUTE OF RADIO ENGINEERS.**—At a meeting of the Institute of Radio Engineers to be held at Columbia University, New York City, Wednesday evening, Sept. 2, Mr. David Sarnoff, contract manager of the Marconi Wireless Telegraph Company of America, will present a paper entitled "Radio Traffic." Among the topics to be discussed will be methods of handling radio traffic and the regulations of the London convention, particularly with reference to present commercial wave-length limitations.

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**ELECTRICAL TOPICS BEFORE MINING ENGINEERS.**—The American Institute of Mining Engineers held its annual convention at Salt Lake City, Utah, Aug. 10 to 14. Several papers dealing with applications of electricity to the mining and ore-treating industries were read and discussed. Among the number was that on "Electrical Fume Precipitation at Garfield," recording experiments made by the Garfield Smelter Company at its smelter at Garfield, Utah. The paper was discussed by Messrs. F. G. Cottrell, E. M. Dunn and Lyman Bradley.

\* \* \*

**NEW YORK SECTION, E. V. A.**—At a meeting held Aug. 20 a New York Section of the Electric Vehicle Association of America was organized. Following are the officers elected: President, Mr. Harvey Robinson; vice-president, Mr. D. C. Fenner, and secretary, Mr. D. F. Tobias, United Electric Light & Power Company, Irving Place and Fifteenth Street, New York. Executive committee—Messrs. W. C. Andrews, T. C. Martin, S. W. Menefee, F. W. Smith, Nathaniel Platt, C. A. Ward, F. F. Sampson, C. G. Kenworthy and S. G. Thompson.

\* \* \*

**DETROIT SECTION, E. V. A.**—The Detroit (Mich.) Section of the Electrical Vehicle Association of America has been organized with the following officers: President, Mr. J. W. Brennan, Detroit Edison Company; vice-president, Mr. W. J. Gordon, Century Electric Car Company; secretary and treasurer, Mr. Hal C. Smith, secretary Carl M. Green Company. The officers with the following members comprise the executive committee: Mr. C. M. Torry, Philadelphia Storage Battery Company; Miss Sarah M. Sheridan, sales manager Detroit Edison Company; Mr. A. C. Downing, assistant sales manager Anderson Electric Car Company; Mr. W. H. Conant, manager Gould Storage Battery Company, and Mr. J. C. Aywrs, district manager General Motors Truck Company.

\* \* \*

**ELECTRIC CLUB-JOVIAN OUTING NEAR CHICAGO.**—A party of about 500, men, women and children, enjoyed the very successful joint outing of the Electric Club of Chicago and the Chicago Jovian League at Ravinia Park, Ill., Aug. 20. There were all sorts of athletic events and guessing contests, with valuable prizes. A motion-picture photographer made about 2000 ft. of film, which will be reproduced at fall meetings of the club. The tug-of-war was won by the Electric Club. The ladies' needle-threading race aroused much interest, there being sixty-five entries. The swimming contests were particularly successful. Prizes were awarded, among other things, to the ladies wearing the most attractive bathing costumes. Bowling on the green was another attractive feature. Mr. H. A. Mott was chairman of the general committee.

## High-Tension Distribution in Central Texas—I

**The 60,000-volt system of the Texas Power & Light Company, linking twenty-three communities and supplying energy for lighting, motors, electric railways, cotton gins, oil mills, cotton mills, water pumping, etc.**

**B**RINGING the benefits of economical centralized generation and the diversity advantages of long-distance transmission and distribution to a large proportion of its 23,000 customers in Texas, the Texas Power & Light Company is now operating 247 miles of 60,000-volt transmission lines in the north central section of the Lone Star State. Standard steel-tower construction, with suspension insulators, characterizes the company's transmission circuits, and all switching, transformer and lightning-arrester equipment is of the outdoor type.

At the present time the Texas Power & Light Company operates in thirty-three Texas communities having an aggregate population of 212,000. Its connected load in lighting aggregates 14,000 kw and in motors 12,401 kw. In addition, it operates 3200 street lamps and sells energy to several interurban railways. This railway load alone amounts to 2300 kw and consumes

about 1,300,000 kw-hr. each month. Cotton gins, oil mills, cotton mills, city water pumping and railroad shops make up the principal classes of its industrial customers, while the company has one user, a cement plant, which, with a connected load of 3500 kw in motors, consumes 2,500,000 kw-hr. per month.

### The Transmission District

The majority of the thirty-three communities now served by the Texas Power & Light Company lie quite close together geographically, and already some twenty-three of them have been linked by the high-tension lines of the company and compose what is known as its "transmission district." This entire central system is fed with energy from two steam plants at opposite ends of one of the main transmission circuits. The communities outside the present transmission district are now served by individual steam or Diesel-engine plants.

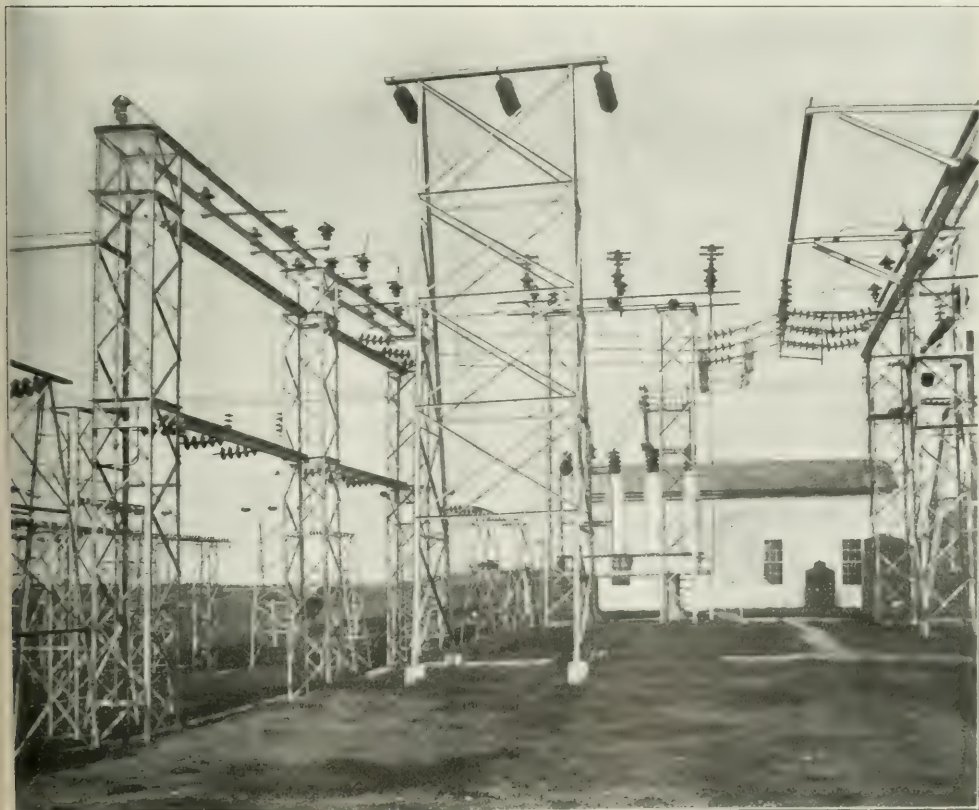


FIG. 1—OUTDOOR TRANSFORMER AND SWITCHING SUBSTATION AT HILLSBORO, TEX.



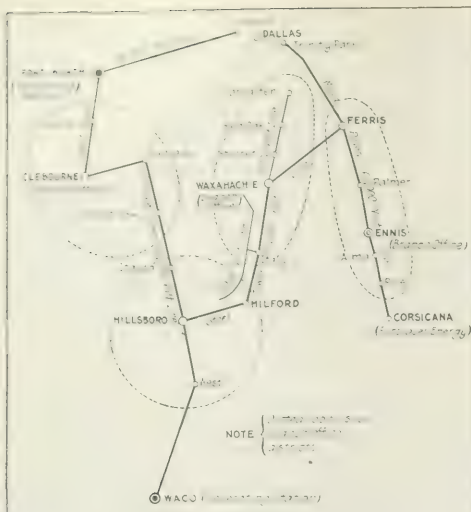


FIG. 2—MAP OF TRANSMISSION DISTRICT, TEXAS POWER & LIGHT COMPANY

but will later doubtless be reached by the high-tension network as this is extended from its present nucleus.

A glance at the accompanying map of the system will afford the reader perhaps a better understanding of the conditions of operation. The company has a steam plant at Waco, the present southernmost extremity of the transmission district. This plant is now being replaced by a modern turbo-alternator station containing two 7500-kva units. The Texas Power & Light Company also purchases a large amount of its energy from the modern turbine station of the Fort Worth Power & Light Company, a description of which appeared in the *Electrical World* of Aug. 22.

From the two stations above mentioned the towns shown on the accompanying map now obtain their electric service, the division of demand upon the two stations for a typical day being illustrated by the accompanying load curves, which indicate the relative inputs into the transmission district.

#### 60,000-Volt Tower-Line Construction

The standard 60,000-volt transmission-line construction of the Texas Power & Light Company utilizes



FIG. 4—INSERTING AMMETER TO READ ARRESTER CHARGING CURRENT

3000-lb. four-legged steel towers measuring 67 ft. 6 in. above the ground line. These towers are set at intervals of 600 ft., an average of eight or nine being installed per mile. At all turns greater than 5 deg. in the case of the No. 1 conductor lines, and greater than 3 deg. for the No. 0 lines, anchor towers similar to those used for dead-ending at switching structures, etc., are employed. These anchor towers weigh 7500 lb. each. Where the line is carried within the corporate limits of cities or towns the special towers used are of the same height and cross-arm dimensions as the line towers, but are compactly built so that at the base these 3000-lb. structures measure only 3 ft. on a side. All towers are set directly in the ground on steel foundation stubs extending 7 ft. below the surface. The towers for the system were furnished by the American Bridge Company, the Millikan Company and M. H. Treadwell.

The line from Hillsboro to Waco employs No. 0 six-strand conductors; for the remainder of the present transmission system No. 1 three-strand conductors have been used. These conductors are carried on four-disk suspension-type insulators. On the outdoor-substation structures five-disk insulators are used. On the double

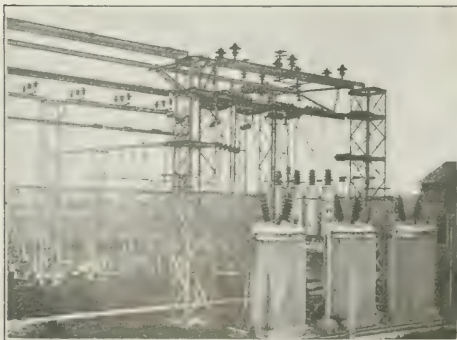


FIG. 3—TRANSFORMERS AND LIGHTNING ARRESTERS AT HILLSBORO

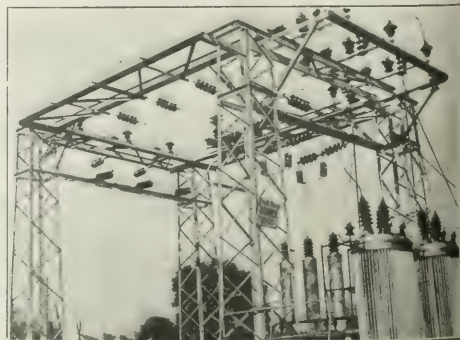


FIG. 5—OUTDOOR TRANSFORMER SUBSTATION AT CORSCANA

circuit transmission towers the wires of each circuit are arranged at 8-ft. intervals in a vertical plane and at a horizontal distance of 12 ft. from the conductors of the

Month    Day    Hour    A M    P M.

	Meters			
	Total	Lighting	Power	Area
Today				
Yesterday				
Difference				

Note All Interruptions

	Transformers		
	No. 1	No. 2	No. 3
Oil Level			
Temperature			
H T Fuse on Hand			
Condition of H T Fuse and Switches			

Signed \_\_\_\_\_

FIG. 6—STATION RECORD ON BACK OF VOLTMETER CHART

other circuit. At railroad crossings the towers on each side have the customary single insulators replaced by pairs of insulators hung from equalizer yokes, thus increasing the margin of protection against falling conductors. On turns the jumpers connecting the dead-ended line conductors are tied firmly in place with extra

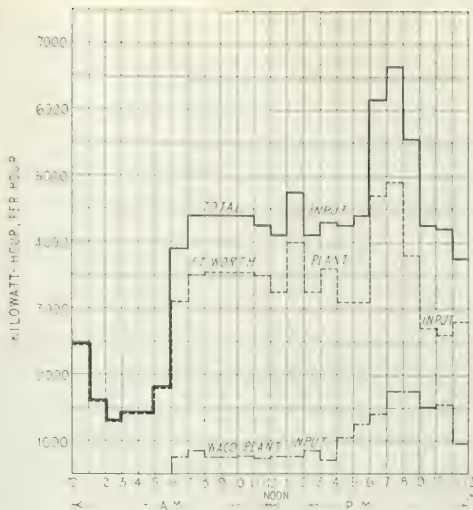


FIG. 10—INPUT TO TRANSMISSION SYSTEM, JAN. 3, 1914

suspension insulators where any likelihood exists of the jumpers being pulled in toward the tower. Arcing hooks are also being added at strain insulators.

Transpositions are made at special anchor towers, all lines being dead-ended at such transposition towers with strain insulators. Jumpers are then used to cross-

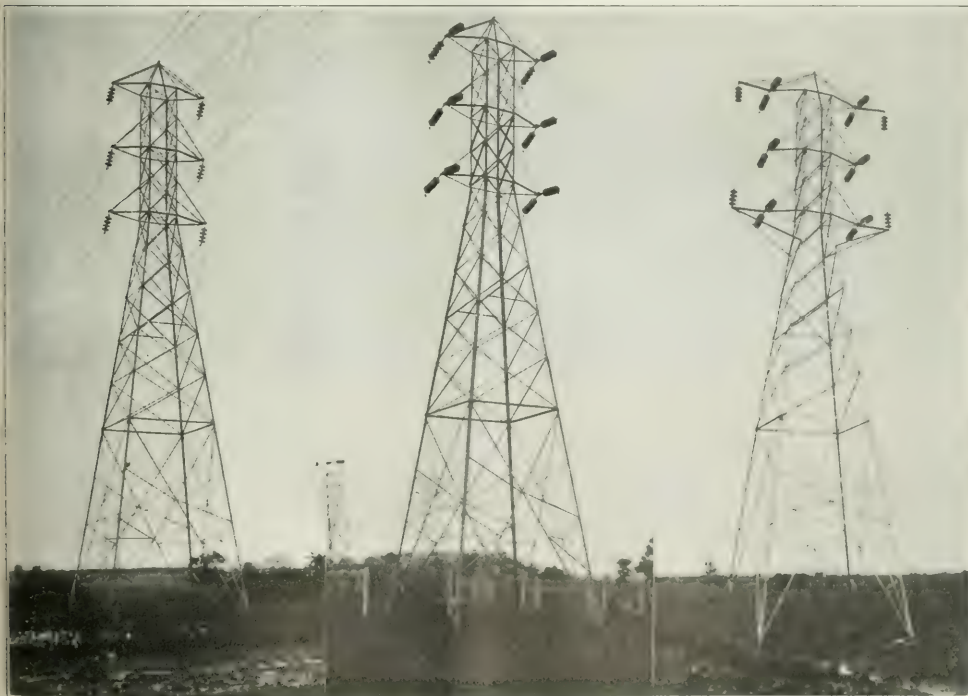


FIG. 7—STANDARD TOWER WITH SUSPENSION INSULATORS

FIG. 8—ANCHOR TOWER WITH STRAIN INSULATORS

FIG. 9—TRANSPPOSITION TOWER, SHOWING JUMPERS



connect each incoming conductor to the outgoing wire on the cross-arm above it. The remaining top and bottom conductors are linked by a vertical connection carried between two strings of insulators mounted on special extensions which overhang the regular cross-arms. The circuits are given a complete rotation approximately once in every 30 miles. Locke, Thomas and Ohio Brass insulators are used.

For protection against lightning the line conductors are surmounted by a ground-wire of  $\frac{3}{8}$ -in. Siemens-Martin seven-strand cable, which is carried on the peaks of the steel towers. Throughout most of their length the transmission lines of the company parallel the tracks of the Southern Traction Company, which purchases from the power company the energy supply for

55-ft. creosoted wooden poles, set at intervals of 300 ft. These poles also carry the trolley brackets for the traction line which connects Dallas with Corsicana, additional trolley poles being set midway between the combination transmission poles first mentioned.

#### Outdoor Construction and Tap Stations

All transformer and switching substations on the transmission system are of the outdoor type as regards the high-tension equipment, switches, transformers and lightning arresters being all exposed to the weather. The low-tension switchboard controlling the local feeders is in each case mounted in a galvanized-iron house adjoining the open-air high-tension structure.

For the substations serving the larger communities

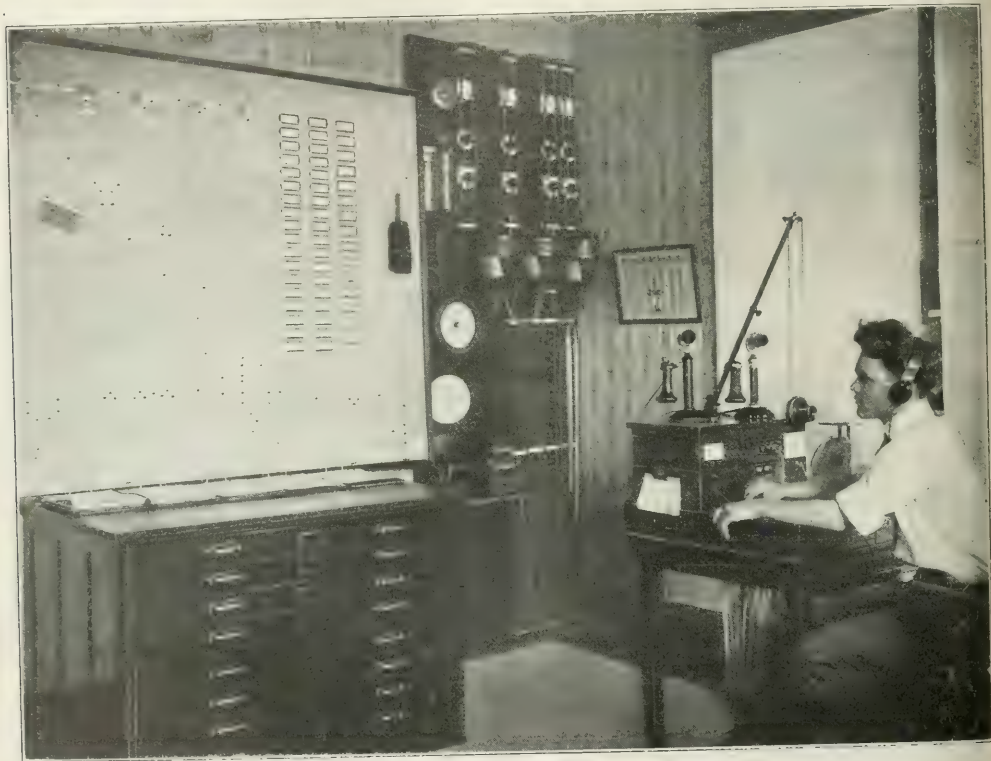


FIG. 11—LOAD DISPATCHER'S OFFICE, HILLSBORO, TEXAS POWER & LIGHT COMPANY TRANSMISSION SYSTEM

its 1200-volt trolley. The towers are usually erected 30 ft. from the center line of the interurban railway tracks, except where detours are made to pass around cities and towns through which the railway runs.

The towers were shipped to Texas in bundles of parts, and all erection work was done on the job. One erecting crew was able to average setting ten towers a day, although under particularly favorable conditions this gang erected twenty-three towers in a single day. Three assembling gangs were required to put the towers together as rapidly as one field crew could erect them in place. Wire was strung at the rate of a mile a day. Sag allowances were corrected for temperature and checked with dynamometer readings.

The 60,000-volt line from Dallas to Corsicana consists of a single circuit of No. 1 conductor carried on

special attendants are employed, but in most cases these are combination railway substations containing motor-generator sets and the single operator handles both sets of equipment.

The "tap stations" for the smaller towers have no regular attendants, but in each such community the company has a man "on call," usually a local electrician or wireman, who is paid \$5 or \$10 a month to visit the station for a few minutes each day and to make any switch movements requested by the load dispatcher at Hillsboro. All switches are numbered, making it an easy matter for the dispatcher to give instructions over the telephone for any switching connection desired.

As already noted, the local man is required to visit the tap station at a given hour each day, and while there he charges the aluminum-cell lightning arresters

notes the temperature and level of the oil in the transformers and regulators, reads the various station kilowatt-hour meters and enters the numerical results in blanks provided on the back of the circular chart which he removes from the curve-drawing voltmeter. This



FIG. 12—SMALL-TOWN TAP STATION

record, which is promptly mailed in to the superintendent of power, thus presents a complete report of the preceding day's operation at that tap station.

In the smaller stations the low-tension switchboard panel comprises a totalizing or transformer panel, a lighting panel and a motor-service panel. The motor and lighting circuits are kept entirely separate, and all lighting circuits are provided with automatic induction regulators. The 2300-volt oil switches are mounted on a separate structure several feet behind the switchboard, an arrangement of pull-rods and bell-cranks serving to connect the switches with their lever arms, at the same time affording free passage between the board and switch structure. The switches are equipped with inverse-time-limit relays.

To facilitate instrument readings, all switchboard-type ammeters on the Texas Power & Light Company's system have cases finished in black, all voltmeters are nickeled, and all wattmeters have coverings of polished copper. As this practice is standard throughout the system the men learn to be guided by it and can locate and read the desired instruments easily, even in unfamiliar stations.

Each switchhouse is also equipped with a metal-enclosed lighting cabinet which contains the switches for the station and yard lighting, the alarm-bell circuits, the regulator motors, etc.

#### Use of Air-Break Switches

Air-break switches of the Pacific Electric type are provided at all high-tension switching points, includ-

clips, giving a double break on opening. The current-carrying contact blade is the first to leave its clips, and an instant later the movable member of the horn-gap (which in its closed position is swung clear past its mate) effects the final rupture of the circuit. This



FIG. 14 INTERIOR OF WAXAHACHIE SUBSTATION

improved arrangement does away with the former spring mounting of the horn-gap member. The switches are hand-operated with removable wooden lever handles. Each switch is plainly numbered at its operating position, and at night the yard is well lighted by tungsten lamps mounted on the steel bus structure. Each substation yard is of course inclosed by a strong wire fence with substantial concrete or iron posts.

The lightning arresters are of the General Electric aluminum-cell type and are mounted on concrete platforms which bring their bases 4 ft. above the ground. They are connected in series with resistances which limit the flow of charging current. Every arrester cell on the system is charged at least once a day, as already noted. Each Monday morning the attendant is required to insert the long-handled ammeter provided (see Fig. 4) into the ground-clips of the arrester group and to read the flow to ground. If the charging current taken exceeds 4 amp per cell, he immediately telephones the load dispatcher for instructions relating to the more frequent charging of the cell.

The transformers are of the outdoor, oil-insulated, self-cooling type. The three 400-kw General Electric units at Hillsboro are well shown in Fig. 3. They are provided with disconnecting switches, and in their main leads are inserted both fuses and choke coils, the latter formed by linking the ends of two open helices dropped from the conductor dead-ends to a strain insulator. The transformers are mounted on a low concrete platform and the 2300-volt leads are carried in underground conduit to the switch house.



FIG. 13—OPENING A 60,000-VOLT AIR-BREAK SWITCH

ing the small tap stations, although the larger switching stations are also now being equipped with 60,000-volt oil switches in series with the air-break switches. The air switches have centrally pivoted horizontal blades which swing into contact with the terminal



FIG. 15—OUTDOOR STRUCTURE, HILLSBORO SUBSTATION

Pipes are in place so that the oil can be withdrawn from any transformer tank or lightning-arrester cell to be delivered to storage tanks at one side of the yard, or passed through the filter. The oil in each transformer is tested regularly every three months and is



required to show ability to withstand a breakdown pressure of at least 45,000 volts.

All steel structures on which station high-tension buses are carried are foundationed in concrete. The construction is substantial, 0.25-in. by 2.5-in. angles being employed for all main members and 0.1875-in.

The power company has its own private telephone lines communicating with every station on the system. These telephone circuits are not carried on the tower-line structures but on separate wooden poles, in order that possible transmission-line troubles may not affect also the means of communication. All telephone in-

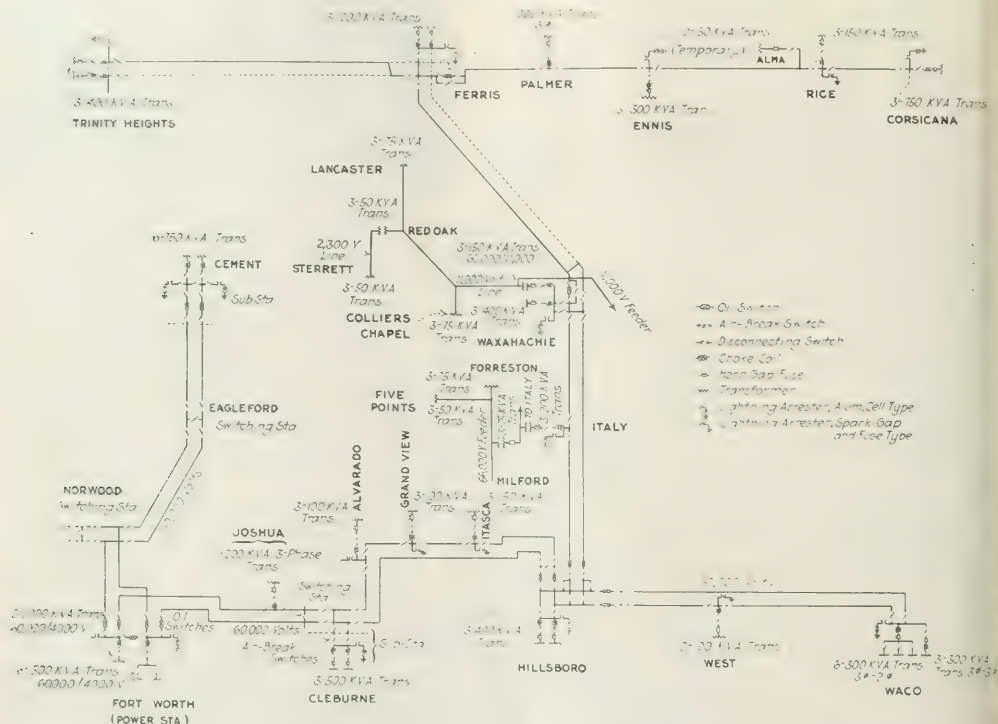


FIG. 16—MAP OF THE 60,000-VOLT TRANSMISSION SYSTEM, TEXAS POWER & LIGHT COMPANY

by 1.25-in. angles being utilized for cross-bracing members.

The load dispatcher of the transmission system is stationed at Hillsboro, where he is provided with telephone connections to all stations and to the Bell and independent exchanges. Before him is a large map showing the lines and the condition of every switch on the transmission system, red tacks being used to mark "live" circuits. The dispatcher issues orders for all switching operations, and also instructs the operators of the steam plants at Fort Worth and Waco concerning the proportion of the system's load each is to pull, depending upon local conditions.

With the scheme of numbered switches employed, the dispatcher's instructions become easy for even the part-time small-town attendant to carry out. All even numbers relate to air-break or oil switches; odd numbers refer to disconnect blade-type switches. The substation operator is required to send in a written report of all switching operations or switch changes made by him on order of the dispatcher.

He must also fill out daily a blank showing the position of each switch in his station. The supplementary report is useful for "checking" and for making sure that the dispatcher's record shall show at all times the exact position of every switch connected with the entire system.

struments are protected by means of insulating transformers.

The second and concluding section of this article will describe the commercial organization of the company and the sale of energy for operating electric rail ways, cement mills, cotton gins, oil mills, cotton mills, water-pumping plants, etc.

### Municipal Meter Testing in Chicago

Last year a new section was added to the Bureau of Electrical Inspection of the city of Chicago. It is charged with the duty of testing electric meters, particularly watt-hour meters. Tests are made in compliance with a city ordinance which provides, among other things, for an adjustment in the case of overcharge or undercharge where meters are more than per cent fast or slow. In the last six months of the year 1913 262 electricity meters were tested, but only eleven of these tests were on complaint, perhaps because the service has not become well known to the public. Results of the tests showed twelve meters slow and twelve fast, or 4.8 per cent in each case, 90.4 per cent of the meters tested being found accurate. Of the ones tested on complaint, none was slow, two were fast and nine were accurate.

# A New Marconi Transatlantic Service

**Radiotelegraphic transmission between the coasts of Wales and New Jersey soon to be undertaken—Brief history of the progress of "wireless." By John L. Hogan, Jr.**

FOR many years it has been possible to signal between America and Europe by wireless telegraphy at night in cool weather. Marconi's experiments in this direction first gave encouragement late in 1901, when the transmission of repetitions of the letter "S" was announced. Ever since that time skeptics have insisted that only atmospherics in groups of three dots were heard, but in view of the use of high balloon-supported aerials and the delicate iron-mercury-carbon microphone there would appear no good reason to disbelieve that in December, when conditions were especially favorable, occasional "S's" might have been received at St. John's, Newfoundland, from Poldhu. It was easily recognized that regular transmission was a forlorn hope with the small-powered senders and the receivers then used, so the transmitter at Poldhu was enlarged and, in December, 1903, another attempt was made to signal over the 1800 miles to Nova Scotia. This time it was stated that complete messages were transmitted. Meantime a sending station was erected on this side of the Atlantic, in Cape Breton, and in 1903 the two plants were able to exchange messages at night under favorable conditions. Commercial service could not be instituted, however, because daylight transmission was still impossible and even the night working could not be relied upon in times of atmospheric disturbance. This condition held for the four years following, until 1907, for the Marconi stations in Canada and Great Britain.

In 1905 Fessenden erected 400-ft. towers and installed apparatus at Brant Rock, Mass., and at Machrihanish, on the west coast of Scotland, 3000 miles away. By using musical sparks of a clear, definitely pitched note he was able to overcome much of the difficulty caused by atmospherics or "static," and almost at once succeeded in transmitting complete messages in both directions. This marked the first continuous radio communication between the United States and Europe, and it is worthy of note that to this date, some eight

years later, no regular daylight service has been established between that continent and the United States. Fessenden's early experiments were on a commercial scale and were successful as regards night transmission, but telegraphing by day was found impossible with the powers available. Enlargement and further increases in efficiency, including the adoption of longer wave-lengths (in accordance with Fessenden's discovery that low wave frequencies were less affected by the change from darkness to daylight), were in progress when a storm blew down the Machrihanish tower. Thus a defect in a guy joint put to an end the most promising long-distance wireless transmission of the time, for thereafter it proved impossible to secure government concessions on terms which would warrant the investment required. The Massachusetts tower is still standing and the plant there has been increased in power. At the present time its installation is practically a duplicate of that at the Arlington high-powered station of the Navy Department, and in 1910 it was used as the shore station, with the United States cruisers *Salem* and *Birmingham*, in the long-distance tests of which the results are well known to radio engineers.

## Radiotelegraphy Enters Commercial Field

In October, 1907, Marconi completed the erection and experimental work upon powerful installations at Glace Bay, Nova Scotia, and Clifden, Ireland, and a limited transatlantic service between these points was opened to the public. This was the first time that radiotelegraphy entered into direct commercial competition with the Atlantic cables. The radio service was made reasonably reliable even in daylight by the use of long waves (from 5000 m to 7000 m) and musical sparks, and, although the effective rate of sending was kept below twenty words per minute because of the necessity of repetitions, continuous transmission was maintained. About 1910 a number of changes were made, including the installation of horizontal "directive" antennas at both stations, and the speed of the service was somewhat increased. Within the last year it has been announced that the plants have been duplexed by the erection of receiving stations to operate simultaneously in conjunction with each transmitter, and thus the

message-handling ability of the system has been doubled.

The present condition of the Nova Scotia-Ireland link defines the greatest advance in commercial transatlantic radio at this time. With the "duplex" in operation messages may be transmitted by



FIG. 1—CARNATION STATION BUILDING. SHOWING AERIAL AND GROUND LEADS

*Elec. World*, Jan. 18, 1913, and April 5, 1913.

*Bulletin*, Bureau of Standards, Vol. VII, No. 3, pp. 315 to 363.



wire from New York or elsewhere to Glace Bay, and then repeated by radio to the receiving station near Clifden. From there they are distributed by wire to the cities to which they are destined. When in duplex operation, the Clifden station simultaneously collects messages for America on its line connections and relays them by radio to the receiving station near Glace Bay, whence

and Townyn, and thence by way of the transmitters at New Brunswick and Carnavon by radio across the Atlantic.

At Carnavon station a horizontal "directive" aerial runs east from the plant for nearly 4000 ft.<sup>3</sup> The wires are supported by ten 400-ft. guyed steel masts, arranged three at each extreme and two at each third-

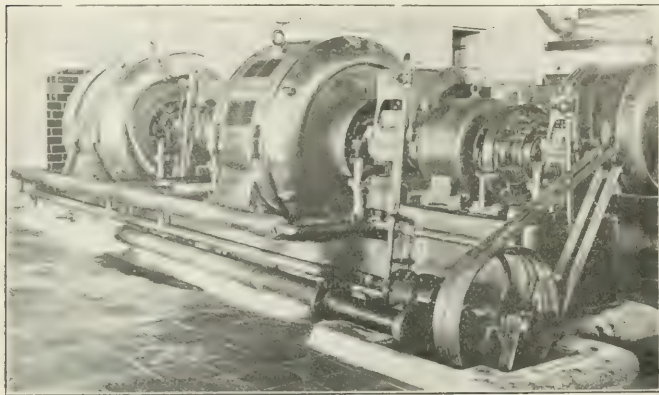


FIG. 2—300-KW, 150-CYCLE MOTOR-GENERATORS



FIG. 4—GEARED MOTOR-DRIVEN BLOWER

they are distributed by wire. In each case the transmitting station is operated over a short wire line from the receiver near by, so it is evident that the method of traffic handling is closely analogous to that used on the indirect cables.

#### Additional Link Soon to Be Ready

The Marconi company is now preparing to provide an additional link of radio service between Great Britain and America. A powerful transmitting station has been erected near Carnavon, Wales, and a receiving and operating plant for duplex working at Townyn, 62 miles away. The corresponding American installations are at New Brunswick and Belmar, N. J., making the communicating distance something over 3000 miles. It is proposed to begin service in the autumn of the current year, at rates less than those charged by the cable companies. Automatic high-speed duplex working is pro-

way point of the antenna system, so as to make the average width of the group of wires about 500 ft. The earth connection is made through a large number of buried wires running under the aerial to its far end and two concentric circles of sunken earth plates connected by radial wires and surrounding the station. The central connections by which both aerial and earth wires are led into the station building may be seen in Fig. 1.

The upper floor of the station contains the loading inductances, radio-frequency transformers and oil-insulated condensers. These instruments are combined in the usual way, but are of special construction so as to carry high-frequency currents of 150 amp or more without undue heating. The spark-gaps are of the synchronous rotary type and are installed in sound-proof blower-ventilated chambers on the floor below. Insulated shaft extensions pass through the walls of these

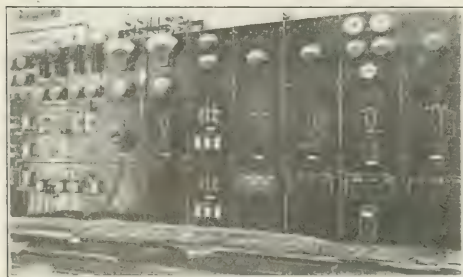


FIG. 3—DISTRIBUTING AND CONTROL PANELS

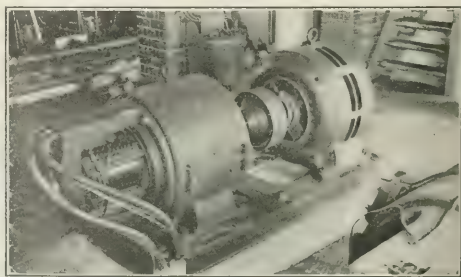


FIG. 5—50-KW A.C. TO D.C. MOTOR-GENERATOR

vided for, so that if all expectations are realized it should be possible to transmit fifty words per minute in each direction simultaneously. Since wave-lengths as great as 16,000 m are to be used, there should be no interference with the Glace Bay-Clifden service. Messages collected at New York and London are to be sent by private wire to the controlling stations at Belmar

rooms from the main motor-generators, as shown in Fig. 2. It will be noted that the entire power plant is installed in duplicate to reduce liability of service interruption.

Electric energy used at the Carnavon plant is gener-

<sup>3</sup>Marconi's Wireless Telegraph Company has furnished many of the technical data relating to the Carnavon and Townyn stations.

ated by hydraulic turbine-driven machinery at Cwn Dyli, and from the public service station there brought 11.5 miles at 10,000 volts, fifty cycles, three-phase, the emf being stepped down to 400 volts. This energy is used for operating the large motor-generators as well as auxiliary machines for ventilation, generation of direct current, etc. Each of the main units, shown in

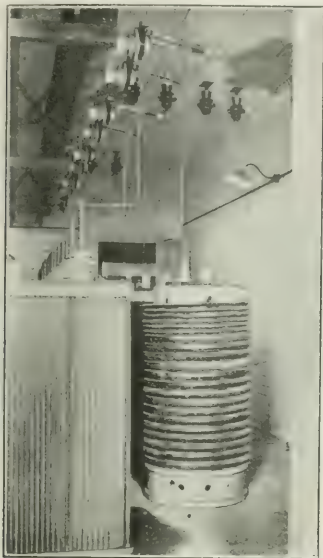


FIG. 6—BANK OF 150-CYCLE POWER TRANSFORMERS

Fig. 2, consists of a 500-hp motor directly connected to a 300-kva, 150-cycle, 1750-volt single-phase alternator and a 12-kw, 40-volt exciter. The synchronous gap is provided with one electrode for each pole of the generator and thus produces normally 300 sparks per second. Should other spark frequencies be required, however, they may be secured by driving the gap from an independent 50-hp, 110-volt motor which is so placed that the rotary disk may easily be connected to it after uncoupling from the shaft of the main motor-generator.

The large switchboard shown in Fig. 3 carries the circuit-breakers, starters, meters and distributing switches for the power apparatus of the entire station. The 50-kw motor-generator of Fig. 5 produces direct current at 110 volts for various uses, such as driving the motors provided for non-synchronous operation of the rotary gaps. Fig. 4 shows one of the geared rotary blowers which is driven by a 440-volt, three-phase motor and supplies air for the relays, etc.

The 150-cycle current produced by the main machines at Carnavon is not of sufficiently high voltage to use in charging the condensers, and hence, after passing through the Morse signaling relays and low-frequency inductances for resonance adjustment, it is led to the power transformers of Fig. 6. These are in five units of 75 kva each and may be connected in as desired by means of the high-potential switches overhead. The secondary terminals of the transformers are led directly to the condensers and rotary gaps. The signaling relays, which make and break the full power of the main transmitter in accordance with dots and dashes of the Morse code, are operated in conjunction with the small triple motor-generators of Fig. 7, and may be controlled either by a hand sending key or, through tele-

graph relays, by means of an automatic transmitter.

At Carnavon there is also installed a complete receiving station which may be used for simplex operation with the United States in case of damage to the Towyn receiving plant or to the lines connecting it. This necessitates a somewhat elaborate system of remotely controlled and interlocked switches for transfer of aerial connections, grounding of wires not in use, protecting receiving instruments, closing power circuits, signaling to the engineer in charge of the transmitter, etc. All these functions may be performed by the closing of a switch at either the regular duplex receiver at Towyn or the emergency receiving outfit at Carnavon.

In addition to the telegraph and power plants the transmitting station building contains offices, store-rooms, a laboratory equipped for such experimental work as may be carried on in a place of this kind, and a machine shop for the repair work which arises from time to time.

#### System of Duplex Operation

In duplex operation according to the plan to be used in these stations the transmitter remains connected to its own aerial wire system and is kept in continuous operation at some determined wave-length. Simultaneously the receiving apparatus on the same side of the ocean is kept in operation, listening to messages received upon its own antenna at some other wave-length from across the Atlantic. Obviously, means to prevent interference by the local sender must be employed at the receiving station, and nothing will be likely to remove such interference difficulties unless the two local stations are separated by 30 miles or more. The Welsh receiver at Towyn is stationed about 60 miles from the sending plant and has a long receiving antenna supported on a line of five 300-ft. poles which extends from the operating house directly away from the distant American station. This is the position which is best suited to receiving from New Brunswick, and it makes the Towyn aerial wires parallel to those at Carnavon, which relation (taken in connection with the angle formed by the Carnavon wires and a line between the stations) causes the energy picked up from Carnavon by the Towyn aerial to be nearly a minimum. Even by taking advantage of this directional property of horizontal aerials, in addition to the wave-length difference and the 60 or more miles between the stations, it is believed that the signals received from the

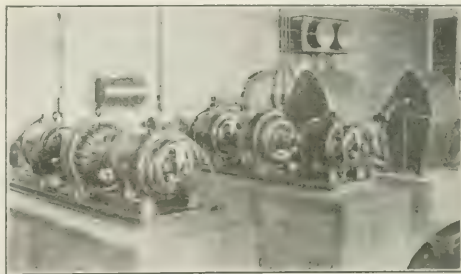


FIG. 7—TRIPLE MOTOR-GENERATORS FOR SIGNALING

Welsh transmitter will be too strong to permit reading messages from America while Carnavon is sending. To overcome this, and so to permit duplex working, a "balancing aerial" 80 ft. high and extending away from Carnavon has been erected at Towyn, and the energy from this (which is directed favorably for collecting signals from Carnavon and unfavorably as regards the



messages from New Brunswick) is reversed in phase by an opposing primary coil in the receiving tuner and used to cancel the interference set up in the main receiving aerial by the operation of Carnavon.

The apparatus at Towyn includes the usual tuning inductors and condensers, with arrangement for use of either the modern crystal or gaseous detectors and amplifiers. Provision is made for automatic receiving at high speeds, up to, say, fifty words per minute, by amplifying the responses to the incoming signals with either microphonic or vacuum relays and using the resulting larger pulsating currents to operate the recorder on a phonograph carrying a rapidly revolving wax cylinder. The cylinders thus filled with signal records at high speeds are to be distributed among a group of deciphering operators who will run them through upon their reproducing phonographs at lower speed and copy off the messages for transmission over the land lines. From Towyn it is proposed to send London messages through by the Creed automatic wire system, in which the London instrument will print in Roman letters upon a tape the telegrams put on the line by the wireless deciphering operator.

All telegraphing, whether for the sender or receiver, will be done at the Towyn operating station. The receiving process has been outlined. Transmitting from London is to be even simpler, for messages received at that place will be perforated on the sending tape and passed through a Creed transmitter. At Towyn a Creed reperforator will produce the identical signals on a second transmitting tape, which is then to be run through a Wheatstone sender connected by wire with Carnavon. Thus by a single handling, as regards Morse, a message will be run through from London and launched into the ether on its way to Belmar. If instead of receiving by ear or recording upon a phonograph it were only possible to utilize incoming wireless signals to operate a perforator, there would be needed no Morse operators to run the entire transatlantic service, for the original transmitting tape might be prepared by a typist upon a keyboard perforator. However, such receivers have been little more than dreamed of as yet, and in fact we have still to see a single radio message exchanged between the United States and Europe under conditions which would warrant confidence in continuation of communication for months or even for days. It is greatly to be hoped that the opening of the New Jersey-Wales installations will inaugurate a transatlantic radio service of permanent commercial value.

### Automatic Sidewalk Alarm for Garage Entrance

An element of danger to the pedestrian is introduced by garages and driveways which open directly onto the sidewalk, for whereas in earlier days the clatter of horses' hoofs gave warning of the approach of a team, the silent, powerful travel of an automobile or motor truck affords scant notice of the danger besetting the passer-by.

To protect pedestrians on the sidewalk in front of its establishment at Louisville, Ky., the Southern Motors Company has a combined lamp and bell warning signal mounted over the doorway from which cars are likely to emerge. The lamp labeled "Danger," as shown in the illustration, burns all night long, and by contacts mounted in the floor of the driveway leading to the door a powerful 10-in. bell is rung at the approach of a car. Both the lamp and the alarm bell are carried on a frame which overhangs the sidewalk.

The contact device by means of which the bell is automatically operated consists of a sheet-steel plate, slightly curved so as to spring upward and break the

circuit when pressure is removed from its top. This plate, hinged at one side to admit being lifted when necessary, is laid in the concrete floor of the passageway. Measuring 18 in. by 24 in., it is so placed that the wheels of an automobile leaving the garage cannot avoid passing over it. The contact is formed both when



SIDEWALK ALARM SIGNAL AT GARAGE ENTRANCE

the front wheel passes over any part of the plate and again when the rear wheel passes over it. Thus with a long wheelbase two distinct rings of the gong are given. A copper spring beneath the steel plate is pressed against an insulated stationary contact when the weight of a car deflects the plate. This completes the circuit and the gong sounds.

It is interesting to note that at the first tap of the bell every person passing the building invariably halts perceptibly and looks around. Anyone who has not stepped from the sidewalk level to the alley paving checks his progress until he makes sure whether or not a car is coming.

The globe with its warning legend burns all night long, the man at the head of the night shift being held responsible for turning this lamp on when he comes or duty and extinguishing it at daylight.

### Typhoons and Philippine Transmission Lines

From June to October of each year the Philippine Islands are subject to typhoons which occasionally interrupt electric service by blowing debris against transmission lines and poles. These whirlwinds are usually very violent and occur without warning, uprooting trees, demolishing houses, sucking up large quantities of water, and sometimes even swamping ships. Because of their vertical, gyratory movement, however they are not so destructive to transmission lines as equivalent horizontal gusts or gales of wind would be except when they drop entrained debris on the lines or trail loose branches of trees through the conductors. The Manila Electric Railroad & Light Company report that these disturbances do little damage to its trolley wires unless loose branches are flying through the air. Ordinarily the typhoons cause about the same interference with operation as would a fairly bad snow and sleet storm in the States.

# Central Station Management

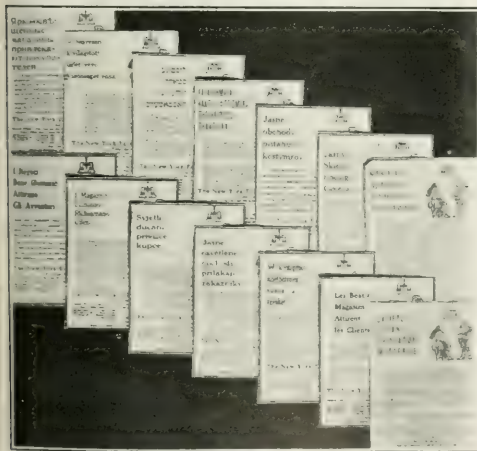
Devoted to Discussion of Administrative Policies, Commercial Methods and Current Practice Among Successful Utilities

## Labor-Saving Electric Flatirons at Boston

Under the caption "Light Versus Heavy Housekeeping," the Edison Electric Illuminating Company of Boston, Mass., points out the fact that at least 15,000 6-lb. electric laundry flatirons are in use in the company's territory, and that as each of these irons replaces at least three 6-lb. sadirons, the use of the electrical equipment means that 270,000 lb. of old irons have been relegated to cellars, attics and junkheaps. The use of these old irons required on ironing days the expenditure of some 2400 mechanical horse-power in human strength, and on the basis that each electric iron saves its user yearly 200 miles of walking in the beaten path between the ironing board and the range, the irons now in use on the Boston Edison system save the women of Greater Boston a total of 3,000,000 miles of walking annually. The company allows a credit of \$1 for any old iron, regardless of its type, toward the cost of a new 6-lb. electric iron, making the latter \$2.50 net to the purchaser during the present campaign.

## Advertising to New York's Polyglot Population

In the campaign for new business constantly being waged by the New York Edison Company the foreign residents of the metropolis are not overlooked. Besides the many English and the three German dailies, the company advertises in twenty-seven newspapers



"EDISON SERVICE" IN A FEW OF NEW YORK'S MANY TONGUES

printed in foreign languages. These papers reach nearly 1,000,000 readers—Bohemians, Croats, Frenchmen, Greeks, Hungarians, Italians, Jews, Poles, Russians, Servians, Slovaks, Slovenes and Syrians. In addition the German dailies reach 227,000 readers of the language of the Vaterland.

## Milwaukee System of Compensating Electric-Service Salesmen

A new and comprehensive system of compensating salesmen, worked out for the Milwaukee Electric Railway & Light Company more than a year ago, has now been in successful operation for a number of months with results satisfactory to both the salesmen and the company. The object and purpose of the system is to provide a basis by which salesmen will be compensated in proportion to the value of business they produce, and at the same time to differentiate properly between the several classes of business available. In drawing up the plan here described it was recognized that the duties of a salesman are not confined to the mere taking of orders for new and additional service, but that the salesman must, in addition to his regular work of soliciting new business, look after customers' complaints and protect old business.

TABLE I—CREDIT POINTS FOR BUSINESS SECURED

Classification	Business Signed by Salesmen	Business Signed in Office
New customers on existing lines	5	1
New business on extended lines	2	1
Additional business with present customers, lighting	7	1
Additional business with present customers, motor service	3	1
Successor customer	2	1
Renewal of contract	2	0
New commercial customer converted from gas or gasoline	7	1
Old houses wired	11	1
Flat-rate or street-lighting contract	7	0
For each additional dollar of estimated annual revenue on three-year contracts or longer	1	

One of the objections frequently urged against any commission system for compensating salesmen is that such a system invites carelessness on the part of the men in matters wherein the satisfaction derived by old customers is at stake. To compensate the salesman for his work in connection with old customers the plan is accordingly arranged to pay the salesman a fixed salary plus a commission. Payment of such a fixed salary gives the company the first call upon the salesman's time in taking care of the company's existing business. In the practical application of the system the company's territory is divided into districts and each salesman is held strictly accountable for the condition of the business in his district. The business available has been classified, and values, per kilowatt connected, in dollars of estimated annual revenue have been assigned, based upon the company's past experience as to the revenue which the several classes of business may be expected to produce.

The salesman's compensation paid as commission is computed upon the basis of so much per thousand "points," and the value of each class of business, in



points per dollar of estimated annual revenue, is set forth in Table I.

In the application of any system of compensating salesmen wherein a commission is involved, it is necessary to devise some plan for requiring the salesmen automatically to take care of existing business and to be keen against loss of business to competitors, whether gas or electric. The system of compensating salesmen here described has taken this feature into consideration by arranging for debit points to cover losses of business. The application of these debit points is shown in Table II.

The estimated annual revenue upon which the points in Tables I and II apply is based upon the actual number of watts connected, or disconnected, and the productiveness of the various classes of business secured as determined by the company's experience. The salesman has no part in fixing these values.

#### Appliance-Sale Commissions

As the Milwaukee company, like many other public-service companies, handles motors, rectifiers and other kinds of energy-consuming devices, its plan of compensating salesmen provides for the payment of a commission on the sales of such equipment. The industrious salesman has, therefore, another opportunity to add to his earnings, and the company receives an opportunity to push any particular device by making the

TABLE II—DEBIT POINTS CHARGED SALESMEN FOR LOSS OF BUSINESS

Disconnection	1
Actual customer lost to competitor	7
Prospective customer lost to gas or gasolene competitor	2
Decreased business	1
Complaint not reported upon by salesman within six days of filing	50
Misrepresenting facts to customers, or failure to report loss of business accurately	100
Misleading customers	

commission attractive. Motor-service salesmen, for instance, find but little trouble in securing the customer's order for motors at the time they take the customer's contract for motor service, and lighting salesmen, likewise, frequently are able to sell flatirons, washing machines and other household devices to customers as a mere incident to securing the customer's service contract. In its commercial-engineering work the Milwaukee company frequently has occasion to trade in various types of electrical equipment which are displaced by central-station service. By placing an attractive commission on this traded-in equipment opportunity is often found to sell it to customers of the company. Salesmen, as a rule, much prefer to sell new equipment, but the opportunity afforded to attach an attractive commission to the sale of used apparatus offsets the former tendency.

#### Rules Governing Application of the System

Any system of compensation designed to hold the salesman strictly accountable for business gained and lost in his territory must provide for the establishment of a well-defined district in which the salesman is to operate, and, furthermore, his operations must be confined strictly to his own district. By the Milwaukee plan salesmen are credited or charged, as the case may be, with all business developed or lost within their respective districts, with the exception of certain special business which is handled directly by the sales manager or by the commercial-engineering department. It occasionally develops, however, that a certain salesman

is particularly fitted to handle a piece of business in another territory, and in case the salesman is so detailed he is compensated for such service under the personal direction of the sales manager. Motor-service salesmen are entitled to assistance to the extent of one call by a commercial engineer, without penalty, and lighting-service salesmen are similarly entitled to advice from the illumination engineers and the district sales agents without penalty. If the business under consideration appears to demand the preparation of an engineering report or to require the assistance of special engineers, the salesman is penalized to the extent of 50 per cent of his normal commission on account of his inability to close the business without such assistance. This arrangement tends to minimize the work which the special engineers or the commercial-engineering department is called upon to do, and is productive in developing self-reliance and resourcefulness on the part of the salesman.

#### The Value of District Sales Agents

Motor-service salesmen are not credited with lighting business and lighting-service salesmen are not credited with motor-service business except as such business may be incidental to the regular business of the salesmen. This provision is necessary, inasmuch as the districts of the motor-service and lighting-service salesmen must overlap. The territory in which electric service is supplied by the Milwaukee company is divided into several principal divisions, each division being in charge of a district sales agent. For the purpose of keeping the district sales agents keenly alive to every possibility that exists within their districts, and at the same time giving them a contingent interest in the prosperity of the salesmen, a bonus plan has been developed under which the district sales agent participates in the results produced by the salesmen reporting to him, provided that such results are above a predetermined value. The district sales agents are paid a bonus depending upon the ratio of amount paid as commission to the amount of fixed salary plus commission paid within the district sales agent's division. This bonus is in addition to a reasonable fixed salary, and makes the district sales agent thoroughly alive to the importance of eliminating all unproductive salesmen.

#### Results After Nine Months' Operation

As originally worked out, the system was designed to give the average salesman approximately the same wages he had been receiving. That the plan is beneficial to every one concerned is demonstrated by the fact that no salesman is earning less than his former salary, while the increases in some cases have ranged as high as 90 per cent of the former salary. The increased earnings by salesmen therefore indicate increased efficiency and lower cost of securing business. The system so far has shown good results. It was devised by Mr. James D. Mortimer, president of the North American Company as well as of the Milwaukee company.

#### Prospective Load in a Town of 250

Uniondale, Ind., 3.5 miles off the right-of-way of the Fort Wayne & Northern Indiana Traction Company, is soon to receive electric service from the 33,000-volt transmission line paralleling the electric railway. A preliminary canvass of the town, which has a population of 250, has produced forty-six lighting contracts as well as motor-service contracts aggregating 100 hp. Among the latter are four comparatively large customers—namely, two grain elevators, one sawmill and one cement mill.

# Illumination and Wiring

## Modern Illumination for Historic Structure

The grounds about the county court house at Springfield, Ill., were formerly among the darkest spots in the city's business district. Recently, however, ten 20-amp high-efficiency tungsten lamps with compensators have been suspended from brackets at intervals around the building, with the result shown in the illustration



HISTORIC STATE HOUSE AT SPRINGFIELD, ILL., LIGHTED WITH HIGH-EFFICIENCY LAMPS

herewith. The building itself is of historic interest, having served as the Illinois State House in the days when Abraham Lincoln was a practising attorney at Springfield. Since that time, however, the building has been raised and another story added beneath the original structure.

## The Meter Basis for Street-Lighting Contracts

At Bessemer, Mich., an unusual form of street-lighting contract has been entered into, which, while providing for the ownership of the street lamps by the city, arranges for the purchase of the necessary electrical energy upon a meter basis from the local central station, the Gogebic & Iron Counties Railway & Light Company, which supplies service to a number of communities in the vicinity. The form of contract is one recommended to the city by its consulting engineer, Mr. J. R. Cravath, of Chicago.

In order to understand the reasons for drawing up the contract in its present form it will be of interest to review briefly the recent history of Bessemer's street lighting. In 1910 a contract was made between the city of Bessemer and the company which then owned the central station providing for the operation of 7.5-amp alternating-current inclosed arc lamps, all night every night, at \$87 per lamp per year. Later the electric-lighting property at Bessemer was purchased by the present owners. Early in 1914 dissatisfaction with the street lighting developed locally, much of this being doubtless due to the fact that the neighboring city of Ironwood, which was supplied by the same company, was obtaining 4-amp magnetite arc lamps at a cost of \$60 per lamp-year. The Bessemer contract contained the antiquated and much litigated specifications calling for "1200 candle-power." The city called upon Mr. Cravath to make candle-power tests and to advise as to the best course to be pursued.

Mr. Cravath's tests showed that the lamps were

hardly up to the candle-power performance which lamps of this kind should average on the streets. The sixteen lamps tested on the street averaged 156 cp as measured at angles between 2 deg. and 10 deg. below the horizontal. Although Mr. Cravath expressed the opinion that the city might have grounds for cancellation of its street-lighting contract because of failure on the part of the company to fulfil its terms, he did not recommend that such radical action be taken. He proposed that instead of starting wasteful litigation a new form of contract be made which would be much more advantageous to the city and which would give Bessemer an up-to-date street-lighting equipment in place of the antiquated inclosed carbon arcs. The company realized the justice of the city's request for better street lighting in return for the money expended, and after some negotiations the new form of contract was put into effect.

## Terms of the New Bessemer Street-Lighting Contract

The principal terms of the new street-lighting contract are as follows:

The city agrees to use not less than 98,000 kw-hr. of electrical energy per year for street-lighting purposes, this energy to be delivered at the lamp terminals. This service is to be in the form of sixty-cycle alternating current, maintained constant at 7.5 amp. As a result, the company will not have to change its regulating apparatus, and very few and unimportant changes are necessitated in its series street-lighting circuits. The company is to furnish all poles, wires and other appliances necessary to deliver the electrical energy at the city's lamp terminals. The city is to furnish the lamp fixtures and lamps. The company is to thoroughly clean all lamp globes and reflectors once each month. The city is to furnish the lamps for renewals, but all the labor of maintenance and renewal is to be performed by the company. Electrical energy is to be metered at the company's power plant or substation. Provisions are made for checking the accuracy of the meters by representatives of both the city and company. The city is to pay the company for the service and electrical energy used for street lighting at the rate of 4 cents per kw-hr.

Electrical energy lost in the series street-lighting circuits is to be deducted from the kilowatt-hours for which the city is billed, and for this purpose periodical tests for line loss are provided. With the lamp terminals short-circuited a test will be made to determine the electrical power taken by the circuit with 7.5 amp flowing. The company is to perform the labor of hanging the city's street-lamp brackets and fixtures. The company is to advance or loan to the city sufficient money to purchase new lamps and fixtures in place of the present lamps. Specifications have been drawn up by the city's engineer under which these lamps are to be purchased.

In place of the present seventy-four inclosed carbon-arc lamps, nitrogen-filled tungsten units will be provided as follows: Forty-three 80-cp lamps and thirty-six 250-cp on the business streets; eleven 250-cp lamps for white-way lighting and forty-five 600-cp lamps for other places. The last-named are to be 20-amp lamps with compensators for operation on the 7.5-amp circuit.

## Advantages Secured by Both Municipality and Company

The engineer estimates that the cost of electrical energy and lamp renewals for the first two years plus the cost of the fixtures (which are to be paid for in twenty-four equal monthly instalments) will just about equal the city's present street-lighting bill. This form of contract, it is pointed out, is one which is decidedly advantageous both to the city and to the company. It



makes easy for the city a change of street lamps at any time that advancing improvements seem to justify such a change. This can, moreover, be done without the controversy which sometimes accompanies the drawing up of a new contract for street lighting. At the same time the company is relieved of the uncertainties of providing for changes in the street-lighting art on a lamp-year contract basis. On a lamp-year basis the company is obliged either to charge enough to provide for very rapid depreciation of the street-lighting equipment or to insist on a long-time contract, both of which are undesirable from the city's standpoint. The city is exchanging an antiquated street-lighting system for one which gives much more light for the money at a reduced ultimate cost to the city, and according to the engineer's estimate the company's net earnings from street lighting will not be reduced under the new contract. In fact, the old contract was taken as a basis of calculating the kilowatt-hour rate under the new contract because the old contract was in full force and could not be set aside except by the consent of both parties or through a lawsuit.

#### Another Metered-Basis Contract

The town of Garner, Ia., has recently made a street-lighting contract with the Enterprise Electric Light, Heating & Power Company which seems to be working out well for all concerned and is creating less dissatisfaction from outages than did the old lamp-year contract. Under the Garner contract the city pays 10 cents per kw-hr. and turns the street lamps on and off as it sees fit. The company owns the entire equipment except the lamp bulbs. The police look after lamp renewals. The new system has stopped controversies as to lamp outages and operation on cloudy moonlight nights. Garner's population is about 1000. The cost of street-lighting energy averages about \$35 per month for moonlight, midnight service.

#### Causes of Electrical Fires

Something may be learned, perhaps, by a perusal of typical cases mentioned in the reports of Chicago electrical inspectors for 1913 relating to electrical fires. Here are a few:

"Jan. 5, 5 p. m., one-story brick garage, 3454 Evans-ton Avenue. Fire caused by the breaking of a portable incandescent lamp. The lamp was unguarded and a piece of hot filament caused a gasoline explosion. Loss \$4,500."

"Jan. 18, 6:47 p. m., one-story frame, Fifty-second Street and Hermitage Avenue. Fire caused by the heating of a motor main which was over-fused, setting fire to the insulation. Loss \$1,500."

"Feb. 3, 11:49 p. m., eighteen-story brick, 29 East Madison Street. Fire caused by an electric sadiron left connected to a live circuit, igniting the table and wood-work. Loss \$1,200."

"April 21, three-story brick, 4641-42 Michigan Avenue. Fire caused by grounded and crossed wires in service conduit near service switch located in center of basement. Loss \$3,750."

"June 13, 8:35 a. m., 4621 Michigan Avenue. Water pump out of order, causing driving motor to stop. Current remained on motor, causing it to burn out. Loss \$35."

"Aug. 4, 2:43 p. m., four-story and basement brick, 162 West Adams Street. A short-circuit near a gas meter burned hole in same and ignited the gas. Short-circuit was made accidentally by a meter tester while removing a jumper which was used to shunt the load around the customer's meter. Loss \$25."

"Sept. 9, 10:07 a. m., 5535 Ellis Avenue. Fire caused by a short-circuit in the winding of a motor attached to a dish-washing machine. The lye in the water broke down the insulation of the winding, causing the short-circuit. Loss \$10."

"Sept. 25, 5:18 p. m., 139-41 South Fifth Avenue. Fire was caused by short-circuit in drop cord. Portions

#### STATISTICS OF ELECTRICAL FIRES

Causes of Fire	Number	Total Loss from Each Kind of Fire
Low-tension wires grounded	1	\$5
Low-tension wires short-circuited	5	287
Short-circuit in fixture outlet	1	50
Short-circuit in lamp cord	5	10,503
Short-circuit in fixture	2	2
Short-circuit in conduit	2	205
Short-circuit on gas pipe	5	105
Short-circuit in piano wiring	1	1,935
Short-circuit in broken fixture	2	302
Ground of service wires	4	4,270
Loose connections	1	200
Arc to conduit from low-tension wires	1	10
Sparks from motor	2	155
Motor armature burned out	5	1,600
Motor overheated	1	None
Defective insulation on wire	1	10
Lightning	2	40
Ignition of moving-picture film	1	100
Inflammable material about an electric lamp	2	1,147
Flatiron left in circuit	20	1,586
Heating coil becoming overheated	3	72
Sparks from switch	4	1,013
Gasoline or benzine ignited by electric sparks	6	10,805
Total	80	\$34,402

of the burning cord dropped into a quantity of celluloid articles. Loss \$10,000."

"Oct. 21, 10:23 a. m., 4823 Kimbark Avenue. Fire caused by a hot filament of an incandescent lamp falling on a gasoline-saturated floor, the lamp being used as a portable one in a garage. Loss \$6,000."

However, the total loss from electrical fires is slight, considering the loss from all fires. The accompanying table gives the causes of electrical fires in Chicago by months during 1913.

#### High-Efficiency Lighting in Huron, Ohio

The little city of Huron, situated on the southern shore of Lake Erie, claims the distinction, through its recent installation, of being the first Ohio town to put in operation high-efficiency nitrogen-filled tungsten lamps



NITROGEN-FILLED TUNGSTEN LAMPS ON HURON STREET

for street lighting. The business district, shown in the accompanying illustration, is lighted by thirty-six 250-cp units placed 100 ft. apart, while in the residential section 132 100-cp lamps placed about 200 ft. apart are

used, being installed on but one side of the street. Each lamp is mounted on a 4-ft. wrought-iron bracket, the large lamps being 14 ft. above the street and the smaller ones 1 ft. lower. Wheeler reflectors of the 18-in. radial-wave type are employed throughout the entire system. The energy for operating the lamps is derived from the municipal electric-light plant. The lamps are all connected on a single series circuit in which the current is maintained constant at 6.6 amp by means of a Packard regulator. According to Mr. John C. Britton, superintendent of the municipal station, the new lamps have been giving satisfactory service, and local residents declare the illumination to be a decided improvement over the former system.

### Lighting a Club-House Entrance

The entrance lighting of the Hunnewell Club, of Newton, Mass., has recently been greatly improved by the installation of a 150-watt tungsten lamp in an alabaster-type fixture in each of the two main porches



ENTRANCE LIGHTING OF CLUB HOUSE

of the building. The lighting plan typifies hospitality to the visitor, the spacious porch being particularly well illuminated. The fixture is hung about 9 ft. above the floor of the piazza, and the porch in front of the door is about 10 ft. square. The cream-colored, Colonial entrance is well brought out by the lamp selected. Service is furnished by the Boston Edison Company.

## Letters to the Editors

### Absorption of Electromagnetic Waves

To the Editors of the *Electrical World*:

SIRS:—Prof. A. H. Taylor's article on "Wireless and Weather," which appeared in the *Electrical World* of Aug. 30, 1913, might lead one to expect to find some relation between audibility of received signals and cloudiness of the country intervening between such places as Arlington, San Francisco and Key West. Last year the University of California, on the Bay of San Francisco, carried on a series of observations of Arlington time signals every night for over a month. The signals were observed for the astronomy department to get the longitude from Washington, D. C., by wireless. We have on file the records of approximate intensities and weather maps for the period of time covered.

The writer had great expectations of being able to tell what weather would aid and what would hinder observations on the time signals from Arlington. The daily weather maps were inspected carefully to find

some relation between "Wireless and Weather." The results were all negative.

Perhaps the coincidences which Professor Taylor observed between cloudiness and good signals were accidental, mostly due to other causes.

The university stations are both equipped with first-class audion detectors and amplifiers and are able to receive readable signals from the Atlantic Coast stations any night of the year. We are situated uniquely for observing changes in the intensity of received signals over either land or water.

The data we have on file are very interesting to study, but seem to be more of a Chinese puzzle than anything else. So far we have been unable to ascribe any change in the audibility of signals to any special kind of weather.

The Weather Bureau's reports would help more in this respect if it could obtain information in regard to the ionization of the atmosphere as well as the regular weather data.

Berkeley, Cal.

RAYMOND B. ABBOTT.

### Payment and Responsibility of Directors

To the Editors of the *Electrical World*:

SIRS:—I was much interested in an editorial appearing in a recent issue of the *Electrical World* as to the responsibility of directors of public service corporations. In that editorial you stated: "It is idle to say that directors cannot do more in the future to safeguard properties, . . . but they will have to give time and thought far beyond their past ideas."

In this connection it may be of interest to note the annual compensation of directors of certain public lighting companies of Massachusetts. The Edison Electric Illuminating Company of Boston has a gross income of about \$6,500,000 a year and serves a population of 1,000,000 people living in thirty-nine cities and towns, yet a director of this corporation receives as compensation for his services only \$74.17 a year.

An inspection of the following table suggests the thought that neither the stockholders nor the public can expect to have their interests properly looked after by directors who are paid for "time and thought" the very modest compensation indicated:

Headquarters of Company	ANNUAL PAY OF A DIRECTOR	
	Amount	Cents, for Each Dollar of Gross Income
Boston	\$74.17	0.0012
Brockton	12.00	0.0028
Lowell	22.14	0.0051
New Bedford	58.85	0.0080
Lawrence	65.71	0.0081
Charlestown	15.71	0.0114
Worcester	100.00	0.0150
North Adams	62.00	0.0264
Cambridge	443.33	0.0988

Directors of public service corporations are trustees of the money of the investors and of the interests of the public. Their duties as trustees are of a peculiarly responsible and complicated nature and their compensation should certainly be more than 12 cents for each \$10,000 of income before they can reasonably be expected to give more "time and thought."

Lynn, Mass.

EDWIN F. DWELLEY.



# Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

## Different Transformer Types Gave Reversed Polarity

When the Fort Wayne & Northern Indiana Traction Company recently changed its lighting distribution system in the city of Fort Wayne, Ind., from a two-phase, four-wire system to a three-phase, four-wire system, the transfer crew met with one unforeseen difficulty. Practically all the transformers on large motor-service installations were changed early one Sunday morning, the fourth wire, which was to have been used as the neutral, having been previously traced out and "spotted" with brass tags at all necessary points. On the third large set of transformers a unit of the old type and one of more modern manufacture were operating in the same bank. These units when reconnected immediately gave evidence of the fact that they were operating under excess voltage. Investigation showed that the pressure on one phase ranged from 345 volts to 360 volts, while between another pair of wires there existed a potential difference of only 115 volts. Investigation also showed that the taps on the older type transformers were brought out of the case in reversed arrangement with respect to the newer type transformer, although the transformers were all of the same manufacture. Reversing the connections relieved the abnormal voltage strain and at once corrected the difficulty.

All transformer installations changed from that time on were first fused with a fuse wire large enough to carry only the exciting current of the transformers until a voltage test could be obtained. As soon as the polarities were found correct the bank of transformers was fused to its full rating. Later it was learned that the numbers borne by the transformer units would have informed the workmen which way the leads were brought out had application been made to the manufacturing company for this information.

In changing over the system from two-phase to three-phase approximately 425 motors were rewound, the expense of these changes being borne by the Fort Wayne & Northern Indiana Traction Company. In addition to the expense involved for the company by the change-over, great difficulty was experienced by Mr. E. S. Myers, chief engineer, and Mr. Stagg, of the contract department, in convincing customers that any other troubles they might happen to have were not due to changes in the motors. However, with the change completed it is expected that operation will become much more economical.

## Coal Waste in Center-Dump Cars

Greater plant economy—that goal toward which every engineer is striving—was the subject discussed by Mr. F. M. Wilkes, Poplar Bluff, Mo., in a paper read before the Missouri Public Utilities Association. Describing a trip through his generating station accompanied by the president of the organization, the speaker said: "As luck would have it, just as we started to the plant two 'hoboes' whom I had employed to unload coal came into the office with a slip from the plant engineer stating that they had finished unloading their car of coal and desired their money. I paid them and we proceeded to the plant.

"The car which they had just been unloading, supposedly empty, was standing on the side track next to the coal bin. It was a center-dump car with pockets in the bottom, and the sight of these must have suggested something to my companion. He proposed that we go over and look at the car and see if it was thoroughly cleaned out. We found that the 'hoboes' had done a fairly good job of emptying the car, but each of the pockets still contained about one-quarter of a ton of coal which had not been removed because it was too difficult to shovel out. This coal had probably been in the car ever since it hauled its first load and I have no doubt that our company had already paid for that same coal more than twice. And not only had we paid for the coal, but also the freight on it and the 'hoboes' to unload it—which they failed to do. Since then I have had every lump removed from the bottom of each car, for I did not relish the idea of sending about a ton of coal back to the mines for reshipment to me and perhaps to be again returned to them, and so on—until the car and the coal got worn out and the railroad had to get a new car and new coal and start all over again!"

## Water-Cooled Rheostat for 7500 Kw at 6600 Volts

BY C. EDWARD MAGNUSSON

When arranging for a test on a 5000-kw, 6600-volt, three-phase generator in a hydroelectric plant it developed, first, that no commercial load was available for testing purposes, and, second, that no permanent load rheostat would be required as the generators were designed for runaway speed. It therefore became necessary to provide a temporary load satisfying the following requirements: (a) Terminal emf on load, 6600

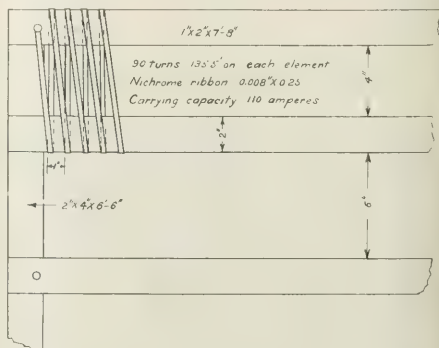


FIG. 1—DETAILS OF WATER-COOLED RHEOSTAT

volts; (b) maximum load, 7500 kw; (c) subdivisions for taking suitable points on the load-efficiency curve; (d) unity power-factor and steady load at all points, and (e) minimum cost.

All the conditions were complied with in a satisfactory manner by a water-cooled, nichrome-ribbon rheostat. A series of tests had been made by Messrs. Mul-

len and Fukagawa in the laboratory of the University of Washington on the carrying capacity of nichrome ribbon. These tests were made at low voltages.

Since the water must provide the insulation between the several strands of the rheostat, a sample of the water was tested for its specific resistance. This was found to be 8200 ohms per cu. cm at 20 deg. C.

The test was made in February, and while the water is of glacial origin, the abundant rains in the winter swelled the river and thus reduced the percentage of fine silt held in suspension. The only available place for submerging the rheostat, without building special tanks, was in the tailrace. This provided excellent circulation, but trouble was experienced in anchoring so as to keep all parts under water at all loads.

The rheostat was made from nichrome ribbon 0.25 in. by 0.008 in., having a resistance of 0.26 ohm per foot. In the description of the rheostat the dimensions differ slightly from those used on the test so as to give one-fourth load per element, the points required on the load-efficiency curve. Moreover, the spacing between the elements has been increased to provide a larger factor of safety.

In Fig. 1 are shown the dimensions of an element of the rheostat. The ribbon was wound spirally on two strips of fir wood and kept in position by means of double-pointed tacks. Six elements were placed in parallel with a 6-in. spacing, making a unit for one phase. The three units were star-connected, thus giving a maximum of 3800 volts to produce leakage between the closed and open elements of each unit, and

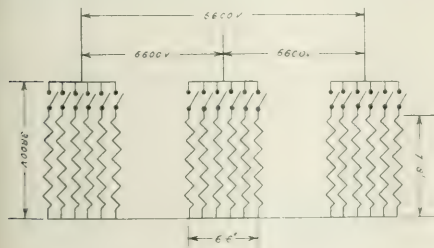


FIG. 2.—CONNECTIONS TO RHEOSTAT

a total of 6600 volts between the terminals of the three phases.

In the test the units for the three phases were arranged as shown in Fig. 2, as this made a simple float which could be handled to best advantage in the swift current of the tailrace.

Some difficulty was experienced in providing a satisfactory contact between the end of the nichrome ribbon and the copper leads. With care, double brass washers will serve the purpose, but a solder, suitable for both nichrome and copper, would be preferable.

Necessarily a rheostat of this type will give unity power-factor and also the much desired steady load at all points. Whether the last, but not least, factor—that is, minimum cost—was met may be a question of opinion, the cost data being as follows:

16.5 lb. nichrome ribbon, at \$4	\$66.00
Lumber, etc.	4.00
Labor	10.00
Total	\$80.00

The nichrome ribbon was not damaged. As the elements are light, this type of rheostat can readily be crated and shipped and hence used on several tests, or the ribbon may be removed and used for other purposes.

## How to Prevent Accidents Shown by Means of Pictures

The Rochester (N. Y.) Railway & Light Company, which was among the first central-station organizations to adopt systematic methods for preventing accidents, makes a practice of displaying pictures showing its employees "the right and the wrong way" when working about electrical apparatus. The accompany-

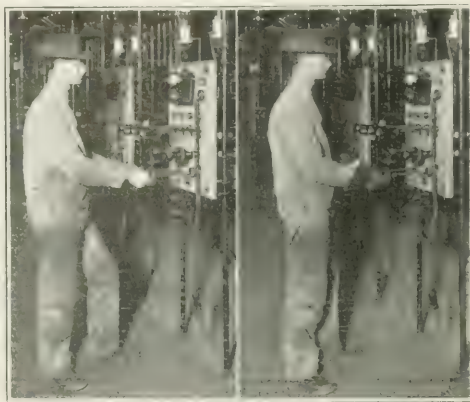


FIG. 1 — THE CARELESS WAY HANDS UNPROTECTED

FIG. 2—THE SAFE WAY —HANDS PROTECTED BY GLOVES

ing illustrations depict a switchboard attendant inserting arc-lamp-circuit plugs. Fig. 1 represents the wrong way (hands bare) of performing this operation, while Fig. 2 shows the right way, that is, with the hands protected by rubber gloves. The necessity of wearing rubber gloves on such occasions should be apparent to anyone who has stopped to consider that the insulated handles of arc-circuit plugs may contain minute cracks and that the potential between the positive and negative plugs is several thousands of volts. Photographs such as these are effective in educating electrical workmen to safety-first principles, especially if their attention is attracted thereto by their personal interest in the individual workman who has posed as both the careful and the careless operative in the particular pictures under notice.

## Effect of Altitude on Operating Temperature

Please state the effect of high altitude on the operating temperature of electrical machinery.

H. L. N.

With increased altitude a higher temperature rise is noted in some classes of electrical apparatus, due doubtless to the attenuation of the air at high levels. High altitudes, however, are usually also accompanied by low humidities, and this absence of water vapor doubtless contributes to reducing the heat convection away from the radiating surfaces of the machine, thus making its temperature rise more rapidly. Most electrical apparatus is manufactured and tested within a few hundred feet of sea level, and it is commonly assumed that no machinery will ordinarily be called upon to operate at altitudes much exceeding 3000 ft., although there are a number of plants in the West more than a mile high. Probably the highest commercial stations are those supplying energy to the cities of Leadville and Cripple Creek, Col., each at an elevation of about 11,000 ft.



# Digest of Current Electrical Literature

## Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

### Generators, Motors and Transformers

**Determination of Polarity.**—E. ROSENBERG.—In order to determine whether the successive poles in a multipolar magnet system are correctly connected, a magnet needle is often used, but its use is uncertain. If it is used near the armature, the magnetic field is so strong that the polarity of the needle may be easily reversed. If it is used on the outside of the yoke, it fails at places where there are attachments, for instance at the feet. Exact results may be obtained with the following method which can also be applied on machines in operation: The author uses a coil attached to a handle and connected in series with a millivoltmeter. The coil has a light iron core, but is completely insulated on the outside so that nowhere is there danger of metallic contact. The coil is brought near the magnet pole to be tested until it makes contact with the magnet coil and is then drawn away quickly. According to the polarity of the magnet pole the needle of the millivoltmeter is deflected in one or the other direction. The apparatus is so sensitive that the remanent magnetism of the machine at rest can be investigated by this method. Quite interesting results are occasionally obtained with machines with interpoles. With a loaded six-pole motor each interpole showed correctly the polarity of the preceding main pole (preceding in the sense of direction of rotation), but when the motor was running unloaded one interpole showed reversed polarity. This indicates a lack of accuracy in the mechanical construction of the machine. By investigating the remanent magnetism by means of such testing coils it is possible to determine with interpole machines whether the machine has been operating as a motor or generator, if its last direction of rotation is known. This may be of importance, for instance in case of a tramway accident, if the motorman makes a statement that he tried to brake dynamically but did not succeed. For in such a case, the last direction of rotation of the machine being known, the magnetic test will indicate whether the machine has finally been excited as a generator or not. The author uses a coil of the following dimensions: Outside diameter, 44 mm (1¾ in.); inside diameter, 19 mm (¾ in.); length of winding, 50 mm (2 in.); iron core diameter, 10 mm (25/64 in.); length, 63 mm (2½ in.). The coil has 580 turns of copper wire of 0.8-mm (1/32-in.) diameter. The total resistance is about 1.5 ohms; that is, it is approximately equal to that of the millivoltmeter.—*Elek. Zeit.*, July 23, 1914.

### Lamps and Lighting

**Instantaneous Values of Illumination.**—JOHANN SAHULKA.—An illustrated English translation in abstract of his German article on instantaneous values of the illumination from alternating-current arcs which has already been noticed in the Digest.—*London Electrician*, July 31, 1914.

**"Cathode-Type" Incandescent Lamp.**—H. GREINACHER.—An illustrated English translation in abstract of his recent German article which has already been abstracted in the Digest.—*London Electrician*, Aug. 7, 1914.

### Generation, Transmission and Distribution

**High-Tension Engineering at the Swiss Exhibition in Berne.**—KARL KUHLMANN.—The recently opened Swiss exhibition in Berne has a large electrical department in which high-tension apparatus is particularly well represented. Brown, Boveri & Company exhibit a high-tension transformer for 500,000 volts, 200 kva and 100 cycles, also measuring transformers for voltages from 3000 to 35,000. They are all designed according to the standardization rules of the German Association of Electrical Engineers. The same is true for oil switches, which are now being made in standard types for 3000, 6000, 12,000, 24,000 and 35,000 volts respectively. In a special design of a three-pole oil switch for 1500 volts and 6 amp the main contacts are in air while the final contacts are in oil. The Oerlikon Company also exhibits various special designs, among them a 500,000-volt, 500-kva, fifty-cycle transformer. It has a round oil receptacle with a content of 16,000 kg of oil, pertinax being used for insulation. The same company exhibits high-tension switchboards and oil switches.—*Elek. Zeit.*, July 23, 1914.

### Traction

**Electrification of Indian Railways.**—MERZ AND MCELLELLAN.—An abstract of a long report to the railway department of the government of India on the possibilities of employing electric traction on certain sections of the Eastern Bengal State Railway in the neighborhood of Calcutta. The report is divided into four parts, in the first of which the general question of electric traction is dealt with at some length, suburban, terminal, heavy gradient and main-line electrification being all considered. As a result the conclusion is reached that both in capacity and efficiency the electric is superior to the steam locomotive. Part II deals with the suburban system of the Eastern Bengal Railway in detail. Part III deals with the possible policy of the neighboring railway bodies with regard to electrification, and Part IV deals with the relative cost of different systems of electric traction. It is possible that the electrification may be carried to a distance of 150 miles from Calcutta. As might be expected, the choice of system resolves itself into a choice between single-phase and high-tension continuous current, and Merz and McLellan have decided in favor of the latter. The pressure of the line has been provisionally fixed at 1500 volts, though it is possible that 3000 volts may ultimately be decided upon. The advantage in favor of continuous current is shown to be over \$4,000,000 in capital cost on a scheme costing about \$20,000,000, and the annual costs are shown to be about \$150,000 less than with single-phase.—*London Electrician*, July 31, and Aug. 7, 1914.

### Installations, Systems and Appliances

**Newport Station.**—An illustrated article on recent developments in connection with the Newport (Monmouthshire, England) generating station, comprising an addition to the generating plant at the East power station and an addition to the converting plant at the Llanarth Street station. The lowering of the frequency of the single-phase supply is also planned. At

the present time there is a single-phase supply at 2000 volts and a frequency of 87.5, while the three-phase supply is at 6000 volts and a frequency of 50. The extension comprises essentially a 3000-kw turbo-alternator running at 3000 r.p.m. and generating three-phase currents at 6000 volts and a frequency of 50.—*London Electrician*, July 31, 1914.

**St. Owen Plant, Paris.**—T. PAUSERT.—An illustrated article giving some details of the equipment of the new Saint-Ouen generating station in Paris.—*La Revue Elec.*, June 5, 1914.

**Moravia.**—KARL SUWALD.—At the close of 1913 there were in Moravia eighty-nine electric stations, with an aggregate rating of 50,000 kw. The two largest plants are those of the Northern Railroad at Hruschan with 7,000 kw and the Rossitz central station in Oslawan with 11,500 kw. The latter supplies electricity to an industrial district and to the city of Brünn. At present districts with about 1,000,000 inhabitants are reached, while other regions with 1,620,000 inhabitants are still to be developed for service. The author discusses this possibility with special reference to the coal deposits and water-powers available in Moravia.—*Elek. u. Masch.* (Vienna), July 5, 1914.

### Wires, Wiring and Conduits

**Rating of Switch-Gear Conductors.**—B. E. G. MITCHELL.—The author enumerates a number of disadvantages of including in specifications clauses relating to current density in the connections. It is urged that this is unscientific, and that instead makers should be required to guarantee maximum and average values of temperature rise. The temperature rise of connections depends not only on the heat generated in them but equally on the area of surface available for dissipating this heat. Hence to specify one only is, at the very best, a rough method. The shape of the section is more important in the case of alternating current owing to skin effect. Heavy busbars, consisting of a number

very moderate and can safely be exceeded where there is normal circulation of air. The influence of the area for radiation is clearly shown by the difference between curves D and E. Curve E is plotted as an average between the points obtained in practice. It is very undesirable to stock a large number of different sizes of copper, and hence a curve plotted accurately would show a number of peaks. The significance of this lies in the obvious difficulty of keeping every part of the connections below the rated density or temperature rise without unnecessary waste, and in the desirability of permitting a reasonable amount of variation. Curve B shows the increased area required for fifty-cycle alternating current where plain solid circular copper conductors are used. In practice methods are adopted for straightening out this curve. For twenty-five cycles the curve is of similar shape, but rises more slowly. For average rectangular conductors the curve lies only very slightly above that for continuous current for the range of current values given.—*London Electrician*, Aug. 7, 1914.

**Overload Time Relays.**—P. BENDMANN.—The author discusses the use of adjustable overload time relays for the regulation of a supply network and shows how to determine the proper adjustment.—*Elek. Zeit.*, July 23, 1914.

### Electrophysics and Magnetism

**Emission of Electricity from Substances at High Temperatures.**—A brief note on a paper presented by G. W. C. Kaye and W. F. Higgins at a recent meeting of the (British) Royal Society in which they described experiments conducted at temperatures from 2000 deg. C. to 2500 deg. C. within a carbon-tube furnace at atmospheric pressure. Under these conditions the electrical emissions, in the absence of any applied potential, were measured for a number of substances (including the alkaline earths and the metals, tin, aluminum, iron and copper) on their introduction into the furnace. During their rapid volatilization the substances gave out large amounts of electricity which, with one exception, were negative in sign. For example, barium oxide and alumina generated negative currents of the order of 4 amp per sq. cm, boiling tin about 2 amp per sq. cm, and boiling iron about 1 amp per sq. cm. Boiling brass, on the contrary, produced a positive current of about 0.5 amp per sq. cm. The results have interest in connection with the problems of solar magnetism.—*London Electrician*, July 3, 1914.

**Passage of Cathode Particles Through Gases.**—L. W. MCKEEHAN.—An account of an investigation the object of which was to determine whether a very narrow pencil of cathode rays is scattered by traversing a high vacuum. There was no scattering in the high vacuum, but on raising the pressure in the test chamber the scattering became apparent.—*Phys. Rev.*, August, 1914.

### Electrochemistry and Batteries

**Silver and Iodine Voltmeter.**—G. W. VINAL AND S. J. BATES.—A paper giving the results of a comparison of the silver and iodine voltmeters and a determination of the value of the faraday. The authors made a careful comparison of the silver and iodine voltmeters, using them in series so that the deposits of silver and iodine should be strictly comparable. The chief results are as follows: Ratio of silver to iodine, 0.85017; electrochemical equivalent of iodine, 1.31502; value of the faraday, 96,515 ( $F = 126.92$ ); value of the faraday, 96,494 ( $Ag = 107.88$ ); value recommended for general use, 96,500. The second, third and fourth of these values were calculated on the basis of the international ampere, using 1.11800 mg per coulomb as the electrochemical equivalent of silver.—*Bulletin*, Bureau of Standards, Vol. 10, No. 3, 1914.

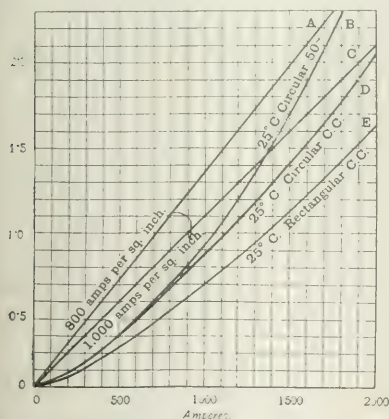


FIG. 1—VARIOUS RATINGS OF CONDUCTORS IN AIR

f strips in parallel mounted on edge, are more efficient than heavier bars having less surface. In the case of aluminum the larger surface allows a considerably higher density to be used than is given by a comparison of specific resistance with copper. Fig. 1 shows area of conductor plotted against current, the values being approximate and for continuous current. Curve for circular conductors—is seen to approach the 800-amp-per-sq.-in. rating as the size is increased. For smaller currents a considerably higher rating can be used. The temperature rise taken—25 deg. C.—is



## Units, Measurements and Instruments

*Measuring of High-Frequency Alternating Currents.*

—A note on a paper read by A. Campbell and D. W. Dye before the Royal Society in London on some investigations carried out at the National Physical Laboratory. As the accurate measurement of currents larger than 1 amp at high frequencies has presented considerable difficulty, the authors investigated the accuracy obtainable in the use of air-core current transformers (suggested by T. L. Eckersley). It was found that, with proper design, such transformers allowed of the measurement of currents up to 50 amp or higher, at frequencies from 50,000 up to 2,000,000 per second, with an accuracy of one or two parts in 1000. Over the same range of frequency it was also found that iron-cored transformers could easily be designed so as to give very accurate results. As an auxiliary standard for measuring high-frequency currents of about 1 amp to 5 amp a thermal ammeter was used, consisting of a heated wire and thermopile both immersed in oil, the pile being connected to a low-resistance galvanometer. With this instrument a scale almost exactly proportional to the current (and not to its square as might be expected) could be obtained.—*London Electrician*, Aug. 7, 1914.

*Electrometer.*—B. SZILARD.—An illustrated description of a direct-reading electrometer for the measuring of very small currents. This has already been described in the Digest.—*Journal de Physique*, March 10, 1914. An English translation in abstract in *London Electrician*, July 31, 1914.

## Telegraphy, Telephony and Signals

*Simplification of Telephone Theory.*—J. A. FLEMING.

—The author describes methods for the easy determination of the current and voltage at the receiving end of a telephone line. These methods are partly graphical and partly mechanical in their nature and are intended for practical use.—*London Electrician*, July 31, 1914.

*Wireless Telephony.*—An illustrated article on the Colin-Jeance system of radiotelephony. The continuous waves employed in this system are produced by three arcs connected in series, each arc having a carbon and

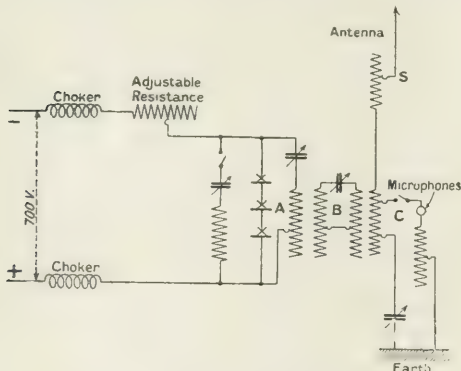


FIG. 2—DIAGRAM OF CONNECTIONS

copper electrode. The carbon electrode is of about 1.5 mm in diameter and is attached to the negative pole. The copper positive electrode is in the form of a disk. This disk is very easily replaced and forms part of the base of a cylinder filled with paraffin and cooled by water circulation. The arcs are "struck" in an atmosphere of carburated hydrogen gas, which may, for example, be produced by mixing in correct proportions acetylene gas generated from calcium carbide and hydrogen generated from calcium hydride. The princi-

pal oscillatory circuit consists of an inductance and variable condenser A connected in parallel with the arcs. (Fig. 2). An intermediate oscillatory circuit B, consisting of an inductance and variable condenser, is utilized to couple the principal circuit with the antenna and insures that multiple waves generated in the main circuit are not transmitted to the antenna, the result being that only a single wave is emitted. The antenna circuit consists of an inductance coupled with the circuit B and a variable condenser. A variable self-induction is also used in the aerial. The microphone circuit consists of nine carbon microphones connected in series and so arranged that they are all acted upon by the voice simultaneously by means of a megaphone. The microphones are connected between the variable inductance of the oscillation transformer and the earth as shown at C. With this system conversations have been carried on between Paris and Mettray, a distance of 200 km (120 miles).—*London Electrician*, July 24, 1914.

*Wireless Telegraphy and Aeronautics.*—H. THURN.—An illustrated article on the relations between wireless telegraphy and aeronautics with special reference to the Telefunken system and the systems of Huth and Lorenz. The author discusses typical equipments for wireless stations on balloons and arrangements of the antenna and finally discusses the use of wireless telegraphy for determination of the position of an airship.—*Elek. Zeit.*, July 9, 16 and 23, 1914.

## Book Review

THE MECHANICAL DESIGN AND CONSTRUCTION OF GENERATORS. By R. Livingstone. London: The Electrician Printing & Publishing Company. 222 pages, 123 illus. Price, 9 shillings.

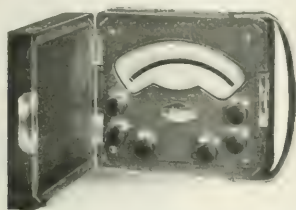
Many good books on the design of electric generators and motors are now available, and some of these devote a chapter or two to the discussion and calculation of mechanical features such as stiffness of shafts, centrifugal forces in high-speed machines, and similar subjects of great importance to the man who has to design modern electrical machinery in all its details. Mr. Livingstone has given us a book from which the purely electrical problems are excluded; the point of view is that of the mechanical engineer, and the strength, stiffness and durability of the various parts of rotating electrical machinery are clearly presented and adequately discussed. The opening chapters deal with such matters as pulleys, belt and rope drive, toothed gearing as applied to motors, shafts and bearings for low-speed machines, couplings and rotor hubs. Methods of keeping armature stampings in position are explained and the author's method of calculating the stresses in the end plates or clamping rings is thoroughly discussed. A careful study of his methods may lead to a saving of material, as the admitted difficulty of calculating the stresses in these clamping plates sometimes results in too great a factor of safety being used. Other chapters discuss the stresses in the stator frame resulting from unbalanced magnetic pull and the effects of high velocities on the rotor. The mechanical design of high-speed steam-turbine-driven machines is especially well treated; there are drawings showing different types of rotors, and rules for proportioning the shafts and bearings of these high-speed machines. The book is not highly mathematical and it is written with the practical end in view. In the opinion of the reviewer, this is the best book dealing with the mechanical design of electrical machinery that he has seen.

# New Apparatus and Appliances

An Illustrated Descriptive Record of Recently Developed  
Manufactured Products of Interest to Electrical Readers

## Direct-Current Portable Meter

The portable meter shown herewith is of the dead-beat, moving-coil type, with a permanent magnet and movement designed to secure compactness and light weight. The scale measures 4.5 in. long and has 100,

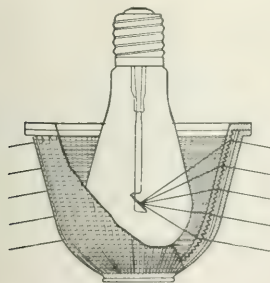


PORTABLE METER

125 or 150 divisions according to the range. The instrument is equipped with a zero adjuster and a mirror to avoid parallax errors. The accuracy of these instruments, the manufacturer claims, is 0.05 per cent for the voltmeters and 1 per cent for the ammeters. Ammeters with ratings up to 62.5 amp are self-contained. The instrument is inclosed in a dull-finished black-walnut case with a leather handle. The dimensions are 6 in. by 5.25 in. by 3.125 in., and the weight is less than 3 lb. This meter is being placed on the market by Mr. Louis M. Pignolet, 78 Cortlandt Street, New York.

## Refractor for Street Lighting

Double-bowl refractors which distribute light from concentrated-filament lamps in a manner especially desirable for street illumination are being manufactured by the Holophane Works of the General Electric Com-



CROSS-SECTION OF REFRACTOR, SHOWING ACTION OF  
HORIZONTAL PRISMS

pany, Newark, Ohio. These refractors provide uniform horizontal distribution with the principal flux at 80 deg. from the vertical. The construction of one of these refractors is shown by the accompanying cross-sectional view. It consists of a bowl within a bowl, the sur-

face where the two join being air-tight and dust-proof. The inner and outer surfaces of the assembled refractor are smooth so that they may be easily cleaned. Refraction takes place at the two adjacent surfaces which contain prismatic grooves. The grooves extend horizontally around the outer surface of the inner bowl, concentrating the light flux at 80 deg. from the vertical axis.

## Self-Starting Single-Phase Induction Motor

Self-starting single-phase induction motors which will operate in either an upright or an inverted position are being manufactured by the Bodine Electric Company, 564 West Randolph Street, Chicago, Ill., in sizes from 0.125 hp to 0.25 hp. The rotor and stator



SINGLE-PHASE INDUCTION MOTOR

laminations of these motors are made of annealed electric steel, both surfaces of which are treated with varnish to reduce eddy currents. The laminations in the stator are held together by four bars riveted on the ends, while the rotor laminations are clamped between copper end-disks held together by the copper rotor bars, which are riveted and soldered. Fastening the rotor core to the shaft is a spider, one end of which is shaped like a blower fan to force air through the machine when it is operating. The stator winding is of the split-phase type wound on forms which can be removed from the slots. Insulating varnish is used to impregnate the coils when they are in place.

The motor shaft, which is removable from the rotor spider, is supported on long bronze bearings. These are lubricated by wick oilers which can be reversed in position when it is desirable to operate the motor in an inverted position. Mounted on the shaft is a centrifugal switch which disconnects the starting winding when the rotor has attained full-load speed. The motors are self-starting even under full load.



### Separable Attachment Plug of Molded Insulation

Separable attachment plugs of molded insulation are being manufactured by the Metropolitan Electrical Supply Company, 17 Park Place, New York City. The cap and screw plug are both very compact, the former



SEPARABLE ATTACHMENT PLUG MADE OF MOLDED INSULATION

projecting only a short distance beyond the receptacle when the plug is screwed therein. The molded insulation, which is made to resemble black rubber, is extremely tough and will withstand hard usage. These plugs are particularly useful with portable appliances as they will pull out if the apparatus is dropped or the cord is jerked, thus preventing the breakage of cords and plug connectors.

### Electric Dental Sterilizer

The electric device for sterilizing dental instruments shown in the accompanying illustration consists of a glass water receptacle in the bottom of which is a disk-shaped heater supplied with energy through an insulated tube extending up one side of the jar. Resting on the heating element is a metal basket having a perforated bottom for holding the instruments in a vertical position while they are being sterilized. As the receptacle holds only one pint of fluid, it requires but a short time to bring water placed therein to a boiling temperature. Moreover, the entire heater is immersed as long as there is any water in the jar, so there is little chance of the temper being drawn out of the steel instruments placed therein and the glass is not likely to be cracked. The cover, base, tray, and even the heating element, are



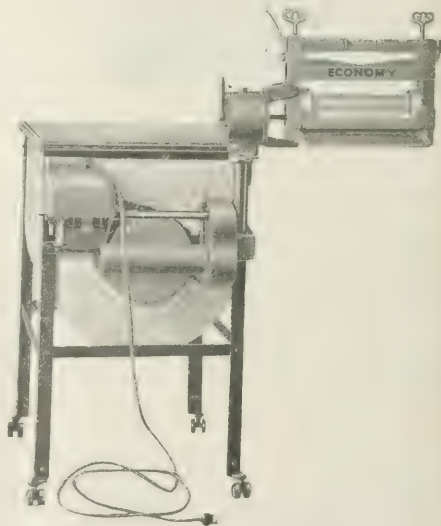
RECEPTACLE FOR STERILIZING DENTAL INSTRUMENTS

made of solid aluminum which will not rust or corrode, therefore the outfit is perfectly sanitary. Each sterilizer is provided with 6 ft. of green-silk-insulated conducting cord and a separable plug. By having one of these devices near the operating chair the dentist is saved considerable time in sterilizing his instruments,

and the evidence of cleanliness and care invariably pleases the patient. The manufacturer is the Quick Electric Heater Company, Cincinnati, Ohio.

### Washing Machine with Reversible Wringer

An electric washing and wringing machine consisting of an all-metal tub, inclosed operating mechanism and reversible, swinging wringer is being manufactured by the Pittsburgh Gage & Supply Company, Pittsburgh, Pa. The tub, which is made of copper or galvanized iron, as desired, is supported on a frame constructed entirely of angle irons and provided with universal double-wheeled casters. Attached to one side of the frame are the motor, the cylinder-reversing mechanism and the transmission to the wringer, all of which are inclosed to prevent injury and to protect the apparatus from water. Just above the motor is a two-button switch for starting and stopping the machine. A lever for disengaging the washer cylinder when only



ALL-METAL WASHER AND WRINGER

the wringer is to be operated is attached to the cylinder-reversing-mechanism case.

The wringer is supported on a bracket pivoted to swing about the vertical wringer-transmission shaft as an axis. The casing shown at the top of the vertical shaft contains the reversing mechanism for the wringer. A safety release is also provided for separating the wringer rolls in an emergency. By arranging the rinsing tubs in the proper relation around the washer it is possible to use the swinging wringer between each pair of tubs without the inconvenience usually attending the operation of changing ordinary wringers from tub to tub. When the machine is not in use the wringer and reversing mechanism can be lifted off the vertical shaft, leaving a plain-topped stand which may be covered and used for a table.

An ordinary-sized family washing can be completed in about two hours with this machine, at a cost of from 1.5 cents to 2 cents for energy, depending on the rate charged for electric service. This apparatus is made in two sizes, capable of washing eight and fourteen sheets respectively.

### Series Incandescent-Lamp Street Fixtures

Street fixtures with porcelain receptacle heads designated as 1914 models are being made by the Wheeler Reflector Company, Boston, Mass. These units are interchangeable and are made up in hooded, unhooded, suspension and bracket types. The porcelain receptacle head, the manufacturers declare, is of high-grade porcelain, and the spring-clip series receptacle is molded in one piece with it. A cast crown supporting the head is threaded for brackets of 0.75-in. or 1.25-in. pipe, or



FIG. 1—FIXTURE WITH HOODED REFLECTOR



FIG. 2—FIXTURE WITH CENTER-SPAN SUSPENSION AND 23-IN. HOODED REFLECTOR

suspension and bracket types. The porcelain receptacle head, the manufacturers declare, is of high-grade porcelain, and the spring-clip series receptacle is molded in one piece with it. A cast crown supporting the head is threaded for brackets of 0.75-in. or 1.25-in. pipe, or



FIG. 3—FIXTURE WITH ORNAMENTAL BRACKET AND FLAT-FLUTED UNHOODED REFLECTOR

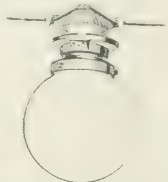


FIG. 4—FIXTURE WITH CENTER-SPAN SUSPENSION AND LARGE GLOBE

may be equipped with lugs cast integral with it for center-span suspension. A cast skirt bolted to the head is provided with screws to support the different types of reflectors and globes.

### Combined Flush Switches and Receptacles

Flush push-button switches equipped to receive plug connectors are being manufactured by the Metropolitan Electric Manufacturing Company, Long Island

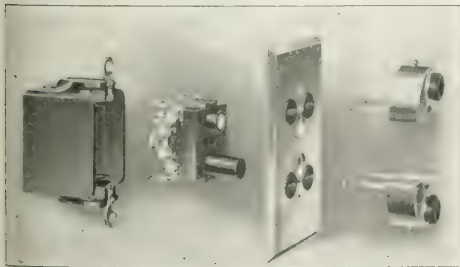


FIG. 1—FLUSH SWITCH WITH PLUG RECEPTACLES

City, N. Y. The internal construction of the combined switch receptacles is similar to that of the standard flush switch which this company is producing except that brass clips for receiving the plug tangs are attached to the mechanism support as shown in Fig. 1. In some of the switches one pair of clips is connected

to the supply terminals and the other to the controlled circuit. When connected in this manner the first plug circuit is energized at all times while the other is controlled by the switch. In other switches both pairs of clips are connected to either the controlled or supply circuits. When only one plug attachment is desired



FIG. 2 THREE-CIRCUIT PLUG RECEPTACLES

the face plate is furnished with one set of receptacles. By changing the face plate both pairs of clips may be utilized.

This company is also manufacturing flush receptacles without the switch mechanism. These are made for two sets of two-wire plugs or one three-circuit plug. A receptacle designed for the latter is illustrated in Fig. 2. Three-wire receptacles may be employed where it is desirable to supply energy to pedestal or table fixtures having two circuits which must be controlled separately.

### Ventilator for Telephone Booths

Motor-driven multi-blade blowers for ventilating telephone booths are being placed on the market by the Western Electric Company, 463 West Street, New York City. The sound-proof quality of a booth equipped therewith is not destroyed nor is conversation interfered with, as the blower operates practically without noise. By connecting the motor with an automatic door



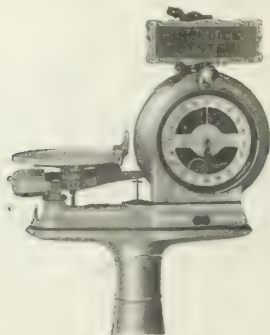
TELEPHONE BOOTH WITH VENTILATOR

switch the ventilator may be made to operate only when the door is closed. The blower is designed to be installed on top of the booth with its outlet and diffuser extending through a hole into the booth. Exhaust air may be permitted to escape through wall slots insulated with felt pads to exclude noise.



### Weighing Apparatus with Illuminated Scales

Weighing machines with advertising panels and weight and price-indicating scales which are electrically illuminated when anything is placed on the weighing platforms are being manufactured by the Angdile Computing Scale Company, Elkhart, Ind. The lamp is



ELECTRICALLY LIGHTED WEIGHING MACHINE

controlled by contact springs which close the circuit the instant the weighing beam is deflected. With this arrangement the scale mechanism carries no current and its sensitivity is not affected as the springs do not touch the balance beam after it has moved from its zero position. The advertising panel, which is lighted from the interior, may be used to feature any special article being sold or the name of the merchant. The weight-indicating scale is illuminated by a bracket lamp concealed by a reflector, while the price-indicating scale is lighted by a long tubular shade having a lamp in each end.

### Lamp with Dimming Device

A lamp equipped with a dimming device by means of which 5 deg. of light intensity can be obtained is shown in Fig. 1. The dimming device is fastened to the fixture stem with thread and set-screw and is designed particularly for use in hotels and other public places where the lamp is liable to be stolen. The dimming is effected by means of helically wound resistance coils connected to contact bars. The resistor drum shown in Fig. 2 is 1.5 in. in diameter and 1 in. long. No key or chain is used with this fixture. The various degrees of light are obtained by turning the shade, which is so connected to the dimming device that as the shade is moved the resistor drum is rotated and the point of contact is moved from one commutator bar to the next. This device is made by the Wirt Company, Philadelphia, Pa.



FIGS. 1 AND 2--LAMP WITH DIMMING DEVICE ATTACHED

### Tool-Handle Switch

A push-button snap switch which can be attached to the handles of portable tools and electric devices such as vacuum cleaners is being manufactured by the Cutler



FIG. 1—TOOL-HANDLE SNAP SWITCH

Hammer Manufacturing Company, Milwaukee, Wis. The switch has two push-buttons placed diametrical opposite each other with the switch mechanism inclose

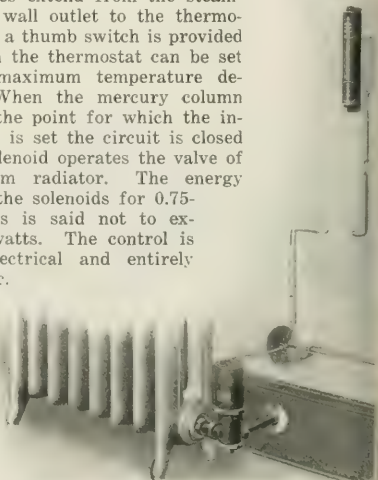


FIG. 2—SWITCH ATTACHED TO HANDLE

in a fiber cylinder 1 in. in diameter. One of the push buttons is made of light material and the other is colored dark to designate the make-and-break buttons.

### Electric Temperature Regulation

The electric temperature-control system illustrated herewith is made by the Railway Utility Company, 2 South LaSalle Street, Chicago. The thermostat consists of a mercury thermometer with a glass tube mounted in a metal case. It is fastened to a flush wall outlet box. Platinum contact points are fused into the glass, one near the bulb and other at specified temperature points in the tube. These terminals make contact with the mercury column without obstructing the bore of the tube. Two wires extend from the steam-radiator wall outlet to the thermostat, and a thumb switch is provided by which the thermostat can be set for the maximum temperature desired. When the mercury column reaches the point for which the instrument is set the circuit is closed and a solenoid operates the valve of the steam radiator. The energy used in the solenoids for 0.75-in. valves is said not to exceed 6 watts. The control is solely electrical and entirely automatic.



ELECTRIC TEMPERATURE-CONTROL SYSTEM

Mr. W. I. Savidge, president of the Home Electric Construction Company, declares that with these cards filed alphabetically under customers' names many mistakes in estimating can be avoided by reference to a card describing a similar job.



# Industrial and Financial News

## Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

**Change in Westinghouse Directorate.**—Mr. J. J. Hanauer, of Kuhn, Loeb & Company, has been elected a director of the Westinghouse Electric & Manufacturing Company to take the place of Mr. Paul M. Warburg, who has resigned because of his recent appointment to the Federal Reserve Board. Mr. T. P. Gaylord has also been appointed acting vice-president of the company to take the place of Mr. H. D. Schute, who has been made treasurer.

**Brilliant Sign Company's Factory Damaged by Fire.**—The Brilliant Sign Company, of 420 North Eighth Street, St. Louis, recently suffered a considerable loss by fire. One estimate placed the loss on building and contents at \$20,000. The factory was almost entirely destroyed, but the office was not seriously damaged. The factory will be rebuilt, and the company is continuing its sign service without interruption. Mr. Frederic A. Kehl, president of the company, was away on vacation at the time of the fire and was forced to make a hurried return to St. Louis.

**Link Belt Company Buys Property.**—The Link Belt Company, of Chicago, has purchased the block of land in that city bounded by Thirty-eighth Place, Princeton Avenue, West Thirty-ninth Street and Stewart Avenue, the reported consideration being \$95,000. The company makes elevating and conveying machinery, and its present plant is at West Thirty-ninth Street and Stewart Avenue, opposite the property just acquired. The land purchased offers the only contiguous site for an extension of the business. It is said that the property has been purchased more for future needs than for immediate use by the new owner.

**Electric Company's Exhibit at Foundrymen's Convention.**—The General Electric Company will have on display at the Foundrymen's Convention in the International Amphitheater, Chicago, Sept. 5-11, an arc-welding outfit designed for use in the foundry and machine shop. The apparatus is of the portable type and consists of a 10.5-kw motor-generator set and a panel mounted on a truck. A centrifugal compressor operated by a 30-hp induction motor will also be shown. This compressor has a capacity of 4,500 cu. ft. per minute and is designed to deliver air at a constant pressure, making it suitable for blowing air in cupolas.

**Ball-Bearing Company Unhindered by War Conditions.**—Although until recently the major portion of the product of the Hess-Bright Manufacturing Company, Philadelphia, Pa., was imported from Germany, the sudden cessation of shipping on account of the war in Europe has not materially affected the company's business. Fortunately, when the war started a good half million bearings were on hand. This supply, in addition to the output of the Hess-Bright plant in Philadelphia, which will be enlarged, it is declared, to make up for the dearth of the German output, will enable the company to take care of all orders likely to be received in the near future.

**Steam Power Stations.**—An attractive second edition of the booklet "Steam Power Stations," published by the Stone & Webster Engineering Corporation, Boston, Mass., has just been printed. The booklet is designed to fit the coat pocket and contains photographs and drawings selected from a score of plants designed and constructed by the organization during the last few years. The installed capacity of these plants aggregates about 165,000 kw, and the views included cover stations of public utility companies and private owners located in the West and South and in New England. With the views of each station are tabulated the essential features of its structural, steam and electrical equipment.

**Texas Power Company Closes \$3,000,000 Contract.**—The Texas Power & Light Company, whose "transmission dis-

trict" is described on a preceding page of this issue, has closed a contract with the Texas Traction Company to furnish energy to operate the latter's railway system and has leased the McKinney (Texas) power plant of the railway company. The contract covers the sale of \$100,000 worth of energy annually for thirty years. Lines will be constructed connecting the present "transmission district" with the northern group of cities served by the Texas Power & Light Company. Construction will also be begun soon on the new power plant for the latter company on the Oklahoma bank of the Red River.

**Manufacturer of Boiler-Tube Cleaners Enlarges Plant.**—The Lagonda Manufacturing Company, Springfield, Ohio maker of cleaners for boilers, condensers and economizers is building an addition to its plant. The new structure will be 110 ft. long by 60 ft. wide, of brick and concrete construction, with a steel-supported slate roof. The Lagonda company is enjoying a wave of prosperity and reports that its volume of business for the past two months has been greater than it has experienced for years. In addition to the former equipment, a 34-in. Gisholt automatic lathe, a large multiple drill and a radial drill will be installed. A 10-ton electric crane with a span of 36 ft. will run the entire length of the building and over the railroad siding. A 100-hp gas engine will also be added to the power equipment.

**Southwest Electrical Conditions Unaffected by War.**—Voicing his belief in the early return of normal business conditions in Texas and the Southwest, Mr. J. F. Strickland, of Dallas, Tex., president of the Texas Power & Light Company, the Texas Traction Company and the Southern Traction Company, declared in a recent interview that Texas has nothing to fear from the ultimate outcome of European complications. "Our future does not rest with them—theirs seems to depend rather upon our own far productions. In a short time they must have what we raise and then a tide of prosperity is coming to the South, and to Texas especially. Speculation for the moment may cease, but normal business and the wage earner still wal hand in hand and can more than hold their own and uphold American prosperity. It seems that within thirty or sixty days business scares will cease."

**New Generating Station Site for Commonwealth Edison Company in South Chicago.**—Announcement has just been made of the purchase by the Commonwealth Edison Company, two or three years ago, of 24 acres of land in South Chicago. Ultimately this site will probably be the location of a large generating plant to serve the southeastern part of the Chicago district. The new station will be situated on the Calumet River, which is the commercial highway for water-borne commerce in the southern part of Chicago and will also be strategically situated for railroad transportation. South Chicago is a manufacturing region and the demand for electricity is pretty sure to increase in that part of the city. It has also been assumed that the proposed generating plant would be conveniently situated in case the steam railroads in that part of Chicago desired to equip their passenger service for electrical operation. However, Mr. Samuel Insull, president of the Commonwealth Edison Company, is quoted as saying that his company has no contract with steam-railroad companies to supply electric energy for the operation of trains. He says that the location of the new plant has nothing to do with the suggested electrification of the railroads, but is simply a part of the general engineering plans of the company to establish generating stations in advantageous locations in different sections of the city. Of course, the plant will be there for railroads and others to avail themselves of its resources desired.

**Central-Station Returns for June from the Atlantic States.**—In our issue of last week it was shown that the seventy-five companies in the Atlantic States which reported to the *Electrical World* gave an 8 per cent increase in gross income from the sale of energy, the actual increase being from \$5,670,820 in May, 1913, to \$6,121,907 in May, 1914. The same companies gave an increase in total energy output in kilowatt-hours of 7.8 per cent. At the present writing, the *Electrical World* has received returns for June from seventy-three companies operating

from twenty-one central-station companies, operating in New York, Pennsylvania and New Jersey, for four months. These results are strictly comparable and represent over 60 per cent of the central-station industry in the three Middle Atlantic States. While there seems to be a discrepancy owing to the increasing percentage in output and decreasing percentage in earnings, it must be remembered, as was stated above, that one of the largest companies showed a gain in May revenue but a decrease in May output. All of the companies in the Middle At-

TABLE I—MIDDLE ATLANTIC STATES—COMPARATIVE INCOME AND OUTPUT FOR MARCH, APRIL, MAY AND JUNE, 1914 AND 1913, FOR TWENTY-ONE CENTRAL-STATION COMPANIES

	GROSS INCOME FROM SALE OF ENERGY			TOTAL ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
March.....	\$5,197,932	\$5,094,575	2.3	196,185,860	184,210,326	6.6
April.....	5,272,312	4,872,534	8.2	188,159,631	172,782,703	9.0
May.....	4,912,282	4,379,306	7.8	179,105,558	169,399,673	6.1
June.....	4,616,436	4,434,022	4.0	172,773,653	159,660,960	8.1

in the Atlantic States. The gross income from the sale of energy for these companies for June, 1913, was \$5,714,626, and for June, 1914, was \$6,053,310, or an increase of 5.8 per cent. The output for the same companies was 220,881,104 kw-hr. in June, 1913, and 244,490,516 kw-hr. in June, 1914—an increase of 10.7 per cent. These results, however, are not strictly comparable since returns from some large companies were received for June which were not received for May, and also because some six or seven small companies which reported for May did not report for June. Nevertheless, a substantial increase is still shown in both gross income and output. Included in these returns are companies operating in New York, Philadelphia, Pittsburgh, Newark, Washington, Baltimore and Atlanta. In each case June, 1914, showed substantial increases over June, 1913. In May, however, one of the large companies which operates in the city of New York reported a slight increase in revenue and a considerable decrease in output. The fifteen companies which gave us figures from the State of New York showed an increase in gross revenue of 2.6 per cent

TABLE II—MIDDLE ATLANTIC STATES—INCOME AND OUTPUT FOR MARCH, APRIL, MAY AND JUNE, 1914 AND 1913, OF CENTRAL STATIONS REPRESENTING OVER ONE-HALF OF ENTIRE INDUSTRY OF NEW YORK, NEW JERSEY AND PENNSYLVANIA

	GROSS INCOME FROM SALE OF ENERGY			TOTAL ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
March (25 companies).....	\$5,603,720	\$5,282,154	6.1	210,843,247	196,343,544	7.5
April (31 companies).....	5,769,418	5,257,092	9.8	209,156,581	189,904,240	10.1
May (40 companies).....	5,406,135	5,058,371	6.8	191,412,368	184,477,734	5.5
June (41 companies).....	5,052,496	4,818,956	4.9	189,600,922	177,312,427	9.3

for June, 1914, over the same period in 1913, and also showed an increase of 5 per cent in kilowatt-hour output. With one exception all of these companies gave an increase in earnings and output. The one exception was a small company in the central part of the State whose monthly output is in the neighborhood of 250,000 kw-hr. This company increased its earnings by 5.6 per cent, but at the same time had a decrease in output of 2 per cent. Table I shows the figures received by the *Electrical World*

TABLE III—SOUTH ATLANTIC STATES—COMPARATIVE INCOME AND OUTPUT FOR MARCH, APRIL, MAY AND JUNE, 1914 AND 1913, FOR THREE LARGE METROPOLITAN COMPANIES (WASHINGTON, BALTIMORE AND ATLANTA)

	GROSS INCOME FROM SALE OF ENERGY			TOTAL ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
March.....	\$43,078	\$579,850	10.9	33,860,568	25,912,792	30.8
April.....	604,065	537,670	12.3	32,436,161	24,827,942	30.6
May.....	574,160	520,981	10.2	32,374,370	25,276,426	29.0
June.....	552,259	496,641	11.4	30,741,878	25,339,414	14.7

lantic States which reported for June—forty-one in number—bore out the figures in Table I, namely, an income increase in the neighborhood of from 4 to 5 per cent and an output increase in the neighborhood of 9 per cent. When we come to the South Atlantic States we find that a much healthier condition exists. The income percentage

TABLE IV—SOUTH ATLANTIC STATES—COMPARATIVE INCOME AND OUTPUT FOR MAY AND JUNE, 1914 AND 1913, FOR TWENTY-SEVEN COMPANIES

	GROSS INCOME FROM SALE OF ENERGY			TOTAL ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
May.....	\$969,643	\$877,704	10.4	50,009,426	42,114,509	18.7
June.....	925,194	830,081	11.4	50,346,379	42,900,963	17.2

increases are more than double what they were for the Middle Atlantic States. The figures in Table IV are strictly comparable, and while they do not represent a very large percentage of the entire industry, they nevertheless represent the operations of companies in nearly all of the cities of any size in the South Atlantic States. Table

TABLE V—SOUTH ATLANTIC STATES—COMPLETE RETURNS RECEIVED BY ELECTRICAL WORLD FOR THE MONTH OF JUNE, 1914 AND 1913, FOR INCOME AND OUTPUT

GROSS INCOME FROM SALE OF ENERGY			TOTAL ENERGY OUTPUT IN KW-HR.		
June, 1914	June, 1913	Per Cent Increase	June, 1914	June, 1913	Per Cent Increase
\$1,000,814	\$895,670	11.6	54,889,594	47,538,677	15.5

V gives the complete returns, so far received, from thirty-two companies operating in the South Atlantic States. They, it will be noticed, bear out in every way the returns received from the three metropolitan cities of Baltimore, Washington and Atlanta and also the returns received from twenty-one companies operating in the same region. In view of the retrenchment of many of the Atlantic manufacturers during June, the above returns must be considered as exceedingly satisfactory. Moreover, during the



last twelve months many of the companies reporting to us have had to make a revision downward of their rate schedules. Had the old rates been maintained in each case, the June income percentage increase would have been larger. This, of course, is particularly true of the Middle Atlantic States.

**Mine Orders for Electrical Equipment.**—The Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., reports the receipt of the following orders for mine apparatus: Anaconda Copper Mining Company, Butte, Mont., eight 150-hp, fourteen-pole motors, with impregnated windings, to be operated in couples of 300 hp, for driving quintuplex mine pumps, each complete with automatic auto-starter composed of type F magnetic switches and six relays mounted on slate panel, separately mounted auto-transformers, two 8-ton bar-steel locomotives and one 75-kw motor-generator set and switchboard; Daly West Mining Company, Park City, Utah, one 175-hp, sixteen-pole motor with magnet-switch hoist control, and one 400-hp, 150-r.p.m. synchronous motor with exciter and switchboard, for driving a Laidlaw-Dunn-Gordon air compressor; Utah Copper Company, Magna, Utah, four 10-hp special vertical motors for driving agitators for oil flotation; Utah Copper Company, Bingham, Utah, six 1-kw turbo-generator units, to be used for supplying light to steam shovels operating in the mine, each turbine being bolted directly to the shovel frame and supplied with steam from the shovel boiler; Yukon Gold Company, Idatrod, Alaska, six 125-kva oil-insulated, self-cooled transformers; Jualin Alaska Mines Company, Jualin, Alaska, one 100-kva waterwheel generator, three 25-kva transformers, one 75-hp motor and one two-panel switchboard; Kennecott Mines Company, Kennecott, Alaska, one 75-hp special motor with magnet brake and automatic control, to be used to drive a tramway and under certain conditions to be operated as an asynchronous generator; one 500-kva, 80 per cent power-factor, 480-volt, three-phase, sixty-cycle normal rated turbo-generator unit and one two-panel switchboard; Alaska Treadwell Gold Mining Company, Treadwell, Alaska, one 4.5-ton storage-battery locomotive, 25-in. gage, with 2 V-50 motors and 68 cells of Edison type A-8 Battery, one 8-ton bar-steel trolley locomotive, 25-in. gage, with No. 905 500-volt equipment, steel-tired wheels and D-20 trolley, and one No. 354 200-hp, 2200-volt motor, with magnet-switch control for automatic acceleration; Beaton Copper Company, Latouche, Alaska, two 625-kva, 80 per cent power-factor, 2300-volt, three-phase, sixty-cycle normally rated turbo-generator units, one six-panel switchboard and two 16-kw motor-generator exciter sets; Tonopah Merger Mining Company, Tonopah, Nev., one 250-hp, 200-r.p.m. synchronous motor with switchboard panel and motor-generator set for driving a Sullivan machinery compressor; Tonopah Belmont Development Company, Tonopah, Nev., one 125-hp motor for direct connection to a Nordberg mine hoist and one 75-hp motor for direct connection to an Aldrich pump; Burro Mountain Copper Company, Burro, N. M., four 300-kva, six 100-kva and three 375-kva oil-insulated, self-cooled transformers; United Verde Copper Company, Jerome, Ariz., three 300-kva and three 30-kva oil-insulated, self-cooled transformers.

#### NEW YORK METAL MARKET PRICES

Copper	Aug 18		Aug 25	
	Bid	Asked	Bid	Asked
Standard spot*	Selling Prices		Selling Prices	
	1	8	1	8
		01		01
London, standard spot*				
Prime Lake	12.50	to 12.62	12.50	to 12.75
Electrolytic	12.25	to 12.37	12.25	to 12.37
Casting	12.10	to 12.20	12.15	to 12.25
Copper wire base	13.75	to 14.00	13.75	to 14.00
Lead		3.90		3.90
Nickel	40.00	to 45.00	40.00	to 45.00
Sheet zinc, f.o.b. smelter		7.25		7.50
Spelter, spot	6.75	to 5.85	6.10	to 6.20
Aluminum	20.00	to 21.00	20.00	to 21.00

#### \*COPPER EXPORTS

Total tons to Aug. 25, 1914.....15,491

\*From daily transactions on the New York Metal Exchange.

†Nominal.

NOTE.—The New York Metal Exchange and the London Metal Exchange have been closed until further notice. No reliable quotations on old metals can be obtained for the present. There is no buying in this market.

## Corporate and Financial

**American Cities Company.**—Mr. Howard S. McNair, formerly secretary to the president, has been elected secretary and treasurer of the American Cities Company of New York to succeed Mr. R. E. Slade, whose resignation was recently announced.

**New York Bankers' View of War Situation.**—The New York banking firm of William P. Bonbright & Company in its *Fortnightly Review* has the following to say in regard to the present situation: "The normal requirements of American towns and cities for light and heat will not be lessened by war in Europe. Uncertainty as to the effects on some industries is natural, but the investor in companies supplying electricity and gas to American communities may safely repose confidence in the earning power whereon his interest or dividends depend."

**Washington-Oregon Corporation.**—A committee consisting of Messrs. Clarence M. Brown, J. Crosby Brown, of Brown Brothers & Company, Philadelphia; James D. Winsor, Jr., of Thomas A. Biddle & Company, and Lawrence J. Morris, of Morris, Johnson & Company, has been formed and is requesting deposits of the first and consolidated mortgage twenty-five-year gold 6 per cent bonds of the Washington-Oregon Corporation of Vancouver, Wash., due April 1, 1916. The company defaulted on the interest due April 1 last, and interest due July 1 last also remains unpaid. The authorized bond issue of the company is \$5,000,000, of which \$1,563,500 is outstanding. The Fidelity Trust Company, of Philadelphia, is trustee.

**Boston Bankers' View of Present Situation.**—The Boston banking firm of C. D. Parker & Company, Inc., in its August number of *Facts and Figures* makes the following statement: "War and business uncertainties do not stop the growth of the gas and electric light companies. The ability of the countries of Europe to furnish manufactured goods and other necessities of life has been greatly reduced and in many cases practically suspended; the world must then depend to a great degree upon the manufacturers and producers of this country. To keep this worldwide market supplied, our factories and producers will be taxed to the limit. This means the consumption of a greater amount of electricity for power and light. Gas and electric light companies have been particularly free from labor and political agitations and business depressions, and in times of business uncertainty such as are now prevalent show a steady and continuous growth."

**Pacific Coast Company Defers Dividends.**—The directors of the Portland (Ore.) Railway, Light & Power Company have decided to pay no dividend Sept. 1. They state that the surplus available for dividends has been steadily decreasing for the last two years and that now, when they thought they had overcome all the difficulties, they have the financial troubles of war times to contend with. The status of the company is fully given in a letter sent out to the stockholders by Mr. C. M. Clark, president of the company, in part as follows: "In ordinary times the finances of the company can be readily handled. At the present time, however, the company is not faced with ordinary conditions. The European war has brought about a situation throughout the civilized world for which we have no precedents, and it is impossible as yet to form opinions of any value concerning its immediate or permanent effect. Under present conditions any estimate of the immediate future is mere guesswork. Under these circumstances the interests of the stockholders require that the company should conserve its cash resources so as to be prepared for any eventuality, and the directors have accordingly determined to pay no dividend on the first of September, 1914. The directors hope for an early resumption of dividends, but this depends upon a return to normal conditions. Problems forced upon this country by the terrible situation in Europe are being solved and the return of business activity in many lines may be rapid. The competition in the light and power business in Portland has had little effect on our earnings, the greatest decreases being on the street-railway lines. The future, therefore, depends upon the effect of the European situation on the trade and industry of this country, and that may be determined in the near future."

## Business Notes

**The Best Electric Company**, of Pittsburgh, Pa., has moved its quarters to Fifty-first Street and Sarah Street.

**The Hart & Hegeman Manufacturing Company**, Hartford, Conn., has become the exclusive selling agent for the H. T. Paiste Company, Philadelphia, Pa.

**The Barnes & Kobert Manufacturing Company**, formerly of New Haven, Conn., has moved to Milldale, Conn., where it has opened up a new office.

**The Thompson Electric Company**, Cleveland, Ohio, has changed its address from 102 St. Clair Avenue, N. W., Cleveland, Ohio, to 5606 Euclid Avenue, Cleveland.

**The General Elevator Company**.—Mr. W. N. Dickinson, formerly with the Otis Elevator Company, is now connected with the General Elevator Company, 29 Broadway, New York City.

**The Defiance Manufacturing Company**, Summerdale Station, Philadelphia, announces that it is in a position to furnish manufacturers with parts of machines or whole machines, jigs, tools and dies.

**The Reliance Electric & Engineering Company**, Cleveland, Ohio, has appointed John Z. Kelly as its New York sales representative, with offices at 90 West Street, New York City. Mr. Kelly was formerly a member of the New York office of the Westinghouse Electric & Manufacturing Company.

**The C & C Electric & Manufacturing Company**, Garwood, N. J., has opened a branch sales office in the Security Building, Minneapolis, Minn. R. L. Wells will be in charge of this office. The Detroit office of the company has been moved from 144 Seyburn Avenue to Room 1111, Chamber of Commerce Building, Detroit. This office is in charge of R. K. Slaymaker.

## New Industrial Companies

**The Standard Plunger Elevator Company**, of Worcester, Mass., and New York, N. Y., has been incorporated with a capital stock of \$750,000. The officers are: A. B. Burgess, of Worcester, Mass., president, and L. G. Hagenbach, of New York, N. Y., treasurer.

**The Somerset Electric Company**, of Boston, Mass., has been incorporated by J. J. Hurley, of Somerville, Mass.; A. J. Shepard and F. M. Hill, of Saugus. The company is capitalized at \$50,000 and purposes to manufacture and deal in steam and electrical specialties.

**The Consolidated Engine Stop Company**, of New York, has been incorporated with a capital stock of \$120,000 to manufacture and deal in electrical devices, tools and machinery. The incorporators are A. W. Britton, T. S. Buckingham and W. P. Powell, 37 Wall Street, New York, N. Y.

**The Evolution Phone Company**, of New York, N. Y., has been incorporated with a capital stock of \$25,000 by Thomas E. Styles, 10 Hedges Place, Jamaica; Herman G. and Ida B. Pape, 54 Bank Street, New York, N. Y. The company will manufacture and deal in electrical and mechanical devices.

**The Dart Motor Truck Company** has filed articles of incorporation under the laws of the State of Delaware with a capital stock of \$600,000. The incorporators are C. W. Hellen and W. Galloway, of Waterloo, Ia., and C. C. Wolf, of Parkersburg, Ia. The company intends to manufacture and deal in motor trucks.

**The O'Connor Spiral Pump & Boiler Company** has filed articles of incorporation under the laws of the State of Delaware. The company is capitalized at \$50,000 and purposes to manufacture pumps, blowers, engines, motors, etc. The incorporators are T. O'Connor, A. E. Macatee and B. Macatee, of Philadelphia, Pa.

**The American Rotary Power Company**, of Portland, Maine, has filed articles of incorporation under the laws of the State of Maine. The company is capitalized at \$1,000,000 and will manufacture and deal in all kinds of machinery to generate and supply electricity. B. Thompson, of Portland, is president and treasurer.

## Trade Publications

**Linemen's Tools**.—The Dicke Tool Company, 61 Broadway, New York City, has issued a catalog on linemen's tools for construction work.

**Dish Washer**.—An electric dish washer is described and illustrated in a catalog prepared by the Walker Brothers Company, Syracuse, N. Y.

**Magnet Wire**.—A price list of magnet wire is being sent out by the Boller Insulated Wire Company, 122 North Curtis Street, Chicago, Ill.

**Electric Hot Pad**.—An aluminum electric hot pad is the subject of a folder sent out by the Hotpoint Electric Heating Company, Ontario, Cal.

**Insulating Materials**.—Various kinds of insulating substances are described in a booklet published by the Dielectric Company, St. Louis, Mo.

**Storage Batteries**.—Storage batteries for electric vehicles are described in a catalog published by the Titan Storage Battery Company, Newark, N. J.

**Lighting Fixtures**.—R. Williamson & Company, West Washington and North Jefferson Streets, Chicago, Ill., have issued a catalog describing lighting fixtures.

**Portable Power Table**.—Directions for operating a portable power table are given in a booklet issued by the Federal Sign System (Electric), Chicago, Ill.

**Pumping Machinery**.—Various kinds of steam and power pumps are described in an attractive bulletin issued by the National Transit Company, Oil City, Pa.

**Search-Lamp Projectors**.—These are described and illustrated in an attractive eighty-eight-page catalog issued by the Carlisle & Finch Company, Cincinnati, Ohio.

**Magneto Telephones**.—The Western Electric Company, New York, has issued a forty-page catalog in which are described magneto telephones and auxiliary apparatus.

**Charging Plugs and Receptacles**.—These are described and illustrated in Bulletin No. 29, issued by the Albert & J. M. Anderson Manufacturing Company, Boston, Mass.

**Porcelain Enameled Signs** and electric-lighted mountings therefor are described in a new catalog issued by the Royal Enameling Company, 326 West Madison Street, Chicago.

**Push-Button and Rotary-Switch Boxes**.—Push-button and rotary-switch boxes are described and illustrated in a leaflet issued by the V. V. Fittings Company, Philadelphia, Pa.

**Regulators**.—Regulators for alternating-current and direct-current generators are described in a folder issued by the Thompson-MacArthur Regulator Company, Buffalo, N. Y.

**Telephone Cords**.—Telephone cords and the uses to which they are put are described in a sixteen-page illustrated catalog prepared by the Western Electric Company, New York.

**Ball Bearings**.—An attractively illustrated catalog, issued by the Hess-Bright Manufacturing Company, Philadelphia, Pa., describes uses to which ball bearings are put in machine-tool work.

**Diesel Engines**.—Diesel engine installations in the Anheuser-Busch brewery and other plants are described in a bulletin published by the Busch-Sulzer Brothers Diesel Engine Company, St. Louis, Mo.

**Hydraulic Turbines**.—The turbine installation in the plant of the Duck River Power Company, Shelbyville, Tenn., is briefly described in a bulletin issued by the Trump Manufacturing Company, Springfield, Ohio.

**Opportunities of Young Men in Electrical Field**.—"The Young Man and the Electrical Industry" is the title of a descriptive article written by James H. Collins and published by the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.

**Molded Insulation**.—A circular has been issued by the Condensite Company of America, Glen Ridge, N. J., describing the properties of so-called condensite, a molding material for insulating purposes, and also enumerating the various uses to which it can be put.



## Personal Mention

Mr. E. F. Woodruff has been made manager of the Fort Stockton (Tex.) Light & Power Company as successor to Mr. R. B. Dudley.

Mr. Charles Selby has been appointed superintendent of the municipal lighting plant at St. Mary's, Ohio, succeeding Mr. Albert Buehler.

Mr. William Ross has succeeded Mr. Ralph R. Couper as superintendent of the municipal electric plant at Scott, Saskatchewan, Canada.

Mr. E. L. Hopkins, formerly of Manistee, Mich., has been appointed superintendent of the lighting plant at Niles, Mich., to succeed Henry Fogus.

Mr. C. Johnson has been elected vice-president of the Capital Light & Power Company, Jackson, Miss., as successor to Mr. O. F. Whitehurst.

Mr. J. T. Woodward has resigned as manager of the Lancaster (S. C.) Light & Power Company and has entered the contracting business in Lancaster.

Mr. Foster Hannaford has succeeded Mr. D. McAfee as acting general superintendent of the Galesburg (Ill.) Railway, Lighting & Power Company.

Mr. H. C. Cox, of Toronto, Ontario, has been elected a director of the Canadian General Electric Company, in place of his brother, the late E. W. Cox.

Mr. Edward Hansman has succeeded Mr. J. C. Sexton as superintendent and chief engineer of the municipal water and electric plant at Grayville, Ill.

Mr. H. C. Neal has resigned as superintendent of motive power and overhead construction with the Jackson (Miss.) Light & Traction Company.

Mr. Charles J. Crump, until recently secretary and general manager of the Marine (Ill.) Light & Ice Company, has sold out his interest in that company.

Mr. Charles A. Worthington has succeeded Mr. George Whitehead as manager and superintendent of the municipal electric plant at Schoolcraft, Mich.

Mr. L. W. Irwin, formerly vice-president of the Greenville (Ky.) Light & Water Company, has succeeded Mr. W. A. Wickliffe as president of the company.

Mr. John I. Beggs has been elected president of the Southern Illinois Railway & Power Company, Harrisburg, Ill., as successor to Mr. F. R. McMullin.

Mr. Paul Bond has been appointed chief power plant engineer of the Bloomington (Ill.) & Normal Railway & Light Company as successor to Mr. C. Schenck.

Mr. W. F. Douthirt, formerly secretary of the Sioux City (Iowa) Gas & Electric Company, has succeeded Mr. L. L. Kellogg as vice-president of that company.

Mr. John H. Gerecke has succeeded Mr. E. J. Muller as manager of the Sag Harbor Electric Light & Power Company, of Sag Harbor, Long Island, N. Y.

Mr. John V. Harding, formerly manager of the municipal electric plant at State Center, Ia., has been appointed to a corresponding position at New London, Ia.

Mr. Arthur C. Herren, formerly superintendent of the municipal plant at Tipton, Ind., has been appointed manager of the municipal electric plant at Peru, Ind.

Mr. H. U. Cooper has been appointed manager and superintendent of the municipal electric-service system at Mantorville, Minn., as successor to Mr. E. Steinbuck.

Mr. Robert Stranberg has been appointed superintendent of the Marquette County Gas & Electric Company, at Ishpeming, Mich., succeeding Mr. A. L. Brownell.

Mr. George Baldwin has been elected secretary of the Edison Sault Electric Company, Sault Ste. Marie, Mich., succeeding W. W. Edwards, recently deceased.

Mr. D. B. Neth, formerly superintendent of the United Electric Light & Water Company, Waterbury, Conn., has succeeded Mr. E. L. Gilchrist as chief engineer.

Mr. F. E. Treat, formerly superintendent of the Conneaut (Ohio) Mazda Lamp Works of the General Electric Company, has been appointed superintendent of the lamp works at Shelby, Ohio.

Mr. Ivar Lundgaard, industrial engineer with the Rochester (N. Y.) Railway & Light Company, has been elected president of the Rochester Engineering Society.

Mr. C. H. Grieser, formerly manager of the Rushford (Minn.) Power Company, has been appointed treasurer of that company, succeeding Mr. William Robertson.

Mr. Charles V. Brinkman, formerly treasurer of the Great Bend (Kan.) Water & Electric Company, has succeeded Mr. J. George Brinkman as president of the company.

Mr. Frank H. Hambleton, formerly chief engineer of the Consolidated Gas, Electric Light & Power Company, Baltimore, Md., is reported to be safe in Switzerland at Berne. With a friend, Mr. Hambleton was taking a vacation trip in Europe when war broke out.

Mr. Heinrich Beck, of Meiningen, Germany, whose search-lamp with vapor-cooled electrodes is being tested by the United States Navy as described on page 181 of our issue of July 25, was taken a prisoner of war by the British authorities while en route to his native country, Germany, last week, and suffered the confiscation of all his search-lamp data, specifications, drawings, etc. Mr. Beck was subsequently released when his identity was proved and will return to Boston next week.

Mr. William R. McCann, supervisor in the former division of erection of the Isthmian Canal Commission, Culebra, Canal Zone, has resigned and returned to the United States. Under the direction of the electrical and mechanical engineer of the Canal Commission Mr. McCann designed the electrical transmission system of the Panama Canal, remaining until the work of installation was nearly completed. Before going to the Isthmus Mr. McCann was connected with the Commonwealth Edison Company of Chicago. Recently he has been engaged in the preparation of a thesis on the transmission system of the canal to be submitted to the University of Wisconsin for a master's degree. Mr. McCann was secretary of the Panama Section of the A. I. E. E.

Mr. William Gould, for the past eleven years in the contract and inspection department of the New York Edison Company, has become commercial manager of the Gas & Electric Improvement Company, with headquarters at 77 Franklin Street, Boston, Mass. Prior to coming to Boston Mr. Gould was manager of the bureau of special canvassers in the New York company, and during the last two years had charge successively of the unused-meter bureau, survey work, and the training of new commercial employees. In his new field Mr. Gould will direct the commercial work of central-station and gas companies in the communities whose utilities are operated by the Improvement company, including North Adams, Northampton, Arlington, Milford, Clinton, Leominster and other cities and towns in New England.

Mr. J. E. Bigham, who was chosen president of the Southeastern Section of the N. E. L. A. at its convention held at Isle of Palms, Charleston, S. C., Aug. 19 to 21, is the assistant treasurer of the Tampa Electric Company, Tampa, Fla. Mr. Bigham was born in Ohio in 1877, and after graduating from the State Normal School was employed in the construction department of the American Bridge Company, Pittsburgh, Pa., and in the operating department of the American Tin Plate Company, Pittsburgh. He served successively in the Spanish-American War and in the Philippine campaign as sergeant of the United States Volunteers and as sergeant-major on the non-commissioned staff. In 1901



J. E. BIGHAM

Mr. Bigham entered electrical work with the Stone & Webster interests at Terre Haute, Ind. In 1906 he became assistant treasurer of the Paducah Light & Power Company, Paducah, Ky., and he was made assistant treasurer of the Jacksonville Electric Company, Jacksonville, Fla., in 1909. Since 1910 Mr. Bigham has been associated with the Tampa Electric Company as above mentioned.

## Construction

### New England

**BUCKSPORT, MAINE.**—The Bangor & Aroostook R. R. Co. has closed a deal with the Penobscot Bay El. Co. for furnishing electricity for lamps and motors at the former company's works at the Stockton terminal, which also carries the supply for the fertilizing plants and the Great Northern Paper Co.'s storehouse and dock at Cape Jellison. The railroad company has closed down its plant at Kidder's Point and has leased its wires in Searsport and Stockton Springs to the Penobscot Bay Co., which will furnish electricity from its East Grand plant.

**RUMFORD, MAINE.**—The Rumford Village Corporation has voted to appropriate \$2,000 for improvement to the street-lighting system on Congress and Waldo streets.

**HARRISVILLE, N. H.**—At a town meeting held recently the citizens voted to light the streets of the village by electricity.

**MANCHESTER, N. H.**—The American Duck Co., it is reported, has decided to install a new power plant at its mills. Three 750-hp boilers will be installed.

**BOSTON, MASS.**—The contract for furnishing electricity to the new Barton square court house has been awarded to the Somerset Co. for a period of five years. The company has secured contracts to furnish electricity to light several business buildings along Tremont Row.

**BROOKLINE, MASS.**—The Board of Selectmen has granted the Edison El. Ill. Co., of Boston, permission to install underground conduits and manholes with necessary wires and cables on several streets in Brookline.

**FALMOUTH, MASS.**—The Buzzards Bay El. Co., of Falmouth, has been granted permission by the State Board of Gas and Electric Light Commissioners to extend its service to the towns of Yarmouth, Dennis, Nahant, Harwich and Mashpee. The company proposes to extend its transmission lines from Yarmouth, also to install a small plant at Chatham, and to continue its transmission line over private right-of-way along the middle of the cape, the supply to be taken from the towns named on its station in Falmouth.

**SPENCER, MASS.**—The Board of Selectmen has engaged William Plattner, consulting engineer, Old South Building, Boston, Mass., to look into the street-lighting situation and to make terms with the Spencer Gas Co. for a new contract, etc.

**WOBURN, MASS.**—The Board of Public Works has voted to contract with the Edison El. Ill. Co., of Boston, Mass., for extension of the ornamental lighting system in the armory through the business district. All wires are to be placed underground.

**BRIDGEPORT, CONN.**—Contracts have been awarded for the construction of an addition to the power house of the United El. Co., of Bridgeport. Reported in the issue of Aug. 17 to have been granted a right to build an addition to plant. Charles A. Paul is manager.

**EAST NORWALK, CONN.**—Within the next 30 days the electric light commissioners expect to erect a new power house and install two 100-hp Lewis-Roth gas engines and gas generators, and a three-phase, 2300-volt General Electric generator. Contracts have been placed for machinery. The commissioners also contemplate the purchase of electric power from the next three months. E. Lingard manager.

### Middle Atlantic

**ALBANY, N. Y.**—Bids will be received from the Trustees of Buildings, Executive Chamber, Capitol, Albany, until Sept. 10 for construction, heating and ventilating, plumbing and electric wiring for rooms on the upper floor of the New York State Capitol. Drawings and specifications may be consulted at the Department of Architecture, Capitol, Albany, and at the New York office of the Department of Architecture, Room 1224, Woodcock Building, New York. Complete plans and specifications of blank form of proposals will be furnished to prospective bidders upon application to Lewis F. Filcher, architect, Capitol, Albany.

**AUBURN, N. Y.**—The Public Service Commission has authorized the Empire Gas El. Co., of Auburn, to issue \$137,000 in bonds, of which the proceeds of \$18,000 will be used for overhead lines, underground conduits and cables, street-lighting equipment, transmission lines and equipment.

**HANNAWA FALLS, N. Y.**—Work has begun on rebuilding the dam of the Hannawa Falls Wtr. Co., at Hannawa Falls. The cost of the work is estimated at \$40,000.

**LANCASTER, N. Y.**—The Lancaster & Depew Lt. Pwr. & Conduit Co., of Lancaster, has been awarded the contract for street-lighting in West Seneca, requiring 350 arc lamps. The company was also granted a franchise to furnish electricity in West Seneca for commercial purposes.

**NEW YORK, N. Y.**—The New York, New Haven & Hartford R. R. Co., it is reported, is negotiating with the New York Edison Co. of New York, to supply electricity to operate the New York, Westchester & Boston Ry. Co., in order that the railroad company may operate its trains from New York to New Haven by electricity, at a cost of 70 per cent. full capacity. When financial and other difficulties clear up, development of the aousantonic power enterprise will enable the railroad operation to cover the entire 70-mile stretch. The Cos Cob power plant is unable to meet the increased demands of the entire electrified zone.

**NYACK, N. Y.**—The Public Service Commission has authorized the Rockland Lt. & Pwr. Co. to issue \$463,000 in capital stock to purchase the property of the Rockland El. Co. and to pay certain outstanding indebtedness. In addition the company is authorized to acquire a controlling interest in the Rockland El. Co. of New Jersey. About 200 square miles will be served by the consolidated corporation and additional transmission and distributing lines are to be erected and also improvements made to the generating plants. The generating plants at Hillburn and Orangeburg are to be connected by a new transmission line. The Hillburn plant is to be enlarged and used as the main central station, while the Orangeburg station will be held in reserve.

**PORT JERVIS, N. Y.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Sept. 14 for construction, including mechanical lighting, heating and approaches, of the United States Post Office at Port Jervis, N. Y. Drawings and specifications may be obtained at the above office or from the custodian of site at Port Jervis. O. Wenderoth is supervising architect.

**CARLISLE, PA.**—Experiments are being made with the new nitrogen lamps by the Carlisle Gas & Wtr. Co. in Carlisle, satisfactory, the entire street-lighting system may be changed.

**ERIE, PA.**—Advertisements for applications for charters for five companies to be organized under the Consolidated Gas, Water, the Union, the Waterford and the Summit Township Power Companies have been authorized. Fred B. Hoff, Milward Oliver and Charles B. English are named as incorporators. The interests, it is said, are identical with those of the Erie City El. Lt. Co., which purposes to erect a transmission line to supply electricity in Corry, Union, City, Waterford and immediate points.

**JOHNSTOWN, PA.**—To place its wires underground to comply with the ordinance recently passed by the City Council will cost the Citizens' Lt. H. & Pwr. Co., of Johnstown, approximately \$50,000. H. H. Weaver is president and general manager.

**MONT ALTO, PA.**—The borough of Mont Alto will not install a municipal electric light plant for at least a year. It is said the issue of July 25 to be considering the construction of an electric plant.

**PENBROOK, PA.**—The Harrisburg El. Lt. & Wtr. Co., of Harrisburg, has been awarded for lighting the town for a period of five years.

**PHILADELPHIA, PA.**—The Pennsylvania R. R. Co. has awarded to Braun & Stewart the contract for the erection of the new power plant at Bryn Mawr, Pa. in connection with equipping the main line to the latter point for electrical operation.

**PITTSBURGH, PA.**—Bids are being received for electrical work in the Brashear, East Street, Larimer and Osceola buildings in Pittsburgh. Plans and specifications may be obtained on application to the superintendent of buildings, 735 Fulton Building, Pittsburgh.

**PORTAGE, PA.**—Bids will be received by the Portage Borough School Board until Sept. 7 for the construction of a new high school building, including heating and ventilating and electrical work. Plans and specifications may be obtained at the office of J. E. Adams, architect, 402 Lincoln Building, Johnstown, Pa.

**WILLIAMSPORT, PA.**—The City Commissioners of the City of Williamsport, Pa., have authorized C. L. Kitchin, consulting engineer, of State College, to prepare specifications for the contract for lighting the city.

**ATLANTIC CITY, N. J.**—Bids will be received by the Board of Commissioners of the city of Atlantic City, City Hall, Atlantic City, until Sept. 10 for furnishing 205 cast-iron lamp standards. Plans of lamp standards will be exhibited at the office of John W. Hackney, city engineer, Room 25, City Hall, and at the office of Frank Shinnen, chief of electrical bureau, Room 21, City Hall. Complete set of blue prints may be obtained upon application to the city engineer, chief of electrical bureau, for which a charge of \$5 will be made.

**BURLINGTON, N. J.**—The Riverside Trac. Co. has been granted permission by the Board of Commissioners to issue \$50,000 in bonds for the erection of a new power plant in Burlington.

**JERSEY CITY, N. J.**—The Public Ser. El. Co. has applied to the Board of Freeholders for a franchise to erect a new pole transmission line on the Belleville Turnpike.

**NEWARK, N. J.**—The Passaic Valley Sewerage Commission is planning to build a new pumping station on the Newark meadows, to cost about \$125,000.

**SUSSEX, N. J.**—The Woodburns El. Co., of Sussex, is installing a new boiler complete. A. W. Bedell is manager.

**TRENTON, N. J.**—Contract has been awarded by the Princeton Worsted Mill for a new power plant, two stories high, 33 ft. by 45 ft. The new plant will include a turbine engine and generator and motors, all of which have already been purchased.

**BAIRBORNE, V. VA.**—Within the next 30 days the managers of the Moriet Harvey College electric-lighting plant expect to purchase 100 incandescent lamps. P. H. Willis is president.

**CHATHAM, VA.**—The Pittsylvania Pwr. Co. recently incorporated, with a capital stock of \$550,000, it is reported, will take over the Chatham Lt. & Pwr. Co. The new company purposes to construct a hydroelectric plant on the Clinch River, near Falls to develop 2000 hp for transmission to Chatham, Gretna and other towns in this vicinity. The initial installation provides for two 75-hp units, transmission line to Chatham 15 miles long, and a branch line to Gretna about 9 miles long. The cost of the plant is estimated at from \$10,000 to \$50,000. Plans and specifications are being prepared by will Parks Rucker, consulting engineer, of Charlotte, N. C.

**CLIFTON FORGE, VA.**—Within the next six months the Virginia Western Pwr. Co., for Clifton Forge, expects to erect 50 miles of transmission lines and several substations. A. C. Ford is manager.

**WASHINGTON, D. C.**—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Sept. 1 for furnishing at the various navy yards and naval stations supplies as follows: Washington, D. C., Schedule 7183—10,050 rubber gaskets to be in one piece, 222,800 lb. sheet zinc; Schedule 7183—11,000 lb. black soft steel, 1 1/4 in. by 1/4 in., with half-round edges, 169,700 lb. sheet steel. Newport, R. I., Schedule 7183—100 lb. annealed sheet steel. Boston, Mass., Schedule 7184—360,000 lb. round iron for manufacture of chain cables. Bids will also be received at the same place until Sept. 3, as follows: Norfolk, Va., Schedule 7196—40 No. 125 crucibles, without covers; Schedule 7189—frog, plate switch points and portable climbing switch (one each); Schedule 7190—five 2-mfd condensers, two ringing dynamos, 120-volt motor and spare parts, one C-72, front-connection-type telephone switchboard and spare parts, 6 telephones, types HB, D, DE, HBC and spare parts; Schedule 7196—miscellaneous screwed, low-pressure, rough standard, composition pipe fittings, miscellaneous screwed, low-pressure, standard, galvanized and malleable-iron pipe fittings. Annapolis, Md., Schedule 7186—one condensing plant complete. Washington, D. C., Schedule 7192—4,000 100-watt-odd micro-incandescent lamps, 10 volts, 1-cp. 3000 ft. black wrought pipe, standard weight, 1570 lb. 2-in. I.P.S. seamless copper tubing, condenser and electrical world, Mass., Schedule 7191—one X-ray machine of the so-called interrupt-type. Brooklyn, N. Y., Schedule 7195—two 114-hp, 100-volt, 930 c.p.m. direct-current motors and spare parts; Schedule 7189—three 50-kva transformers, complete.

**WASHINGTON, D. C.**—Bids will be received at the Bureau of Supplies and Accounts, Washington, D. C., until Sept. 15 for furnishing at the various navy yards and naval stations supplies as follows: Gambrills, Md., Schedule 7213—one internally fired Scotch-type boiler, Brooklyn, N. Y., Schedule 7214—two 114-hp, 100-volt, 930 c.p.m. direct-current motors and spare parts; Schedule 7189—three 50-kva transformers, complete.



ables, with covers. Schedule 7218-15 portable hand, electric drills, 125 volts, 1/2 in. chuck (two speeds). Schedule 7215-1500 lb. capacity, 10 ft. height, 10 ft. length. Schedule 7204-23 3-in. 1 lb. m. steel rods. Schedule 7228-1550 lb. 1/2-in. and 2-in. copper pipe (iron pipe size). Norfolk, Va., Schedule 7205-2355 ft.-rubber gaskets, 8-10 in. to 10 in. tapered steel pins 112,000 lb. galvanized, flexible steel-wire rope (1-in. circumference and 3/16 in. diameter), 915 ft. brass tubing, 1200 ft. tubing, 1/2 in. outside diameter, 125 mil thick, commercial lengths. Norfolk, Va., Schedule 7206-4 pneumatic-gear, portable hoists, 6000 lb. to 8000 lb. capacity. Boston, Mass., Schedule 7216-400 lb. packing for condenser tubes (in 1-lb. balls). Washington, D. C., Schedule 7232-1850 lb. 3/4-in. round copper rod, commercial lengths. This will also be received at the same place until Sept. 22, as follows: Mare Island, Cal., Schedule 7233-300 headers, "B" and "E", intermediate front and back, and "B" and "E", headers. Schedule 7234-miscellaneous mica plate, sheet and tubings. Gambrills, Md., Schedule 7236-furnishing and installing miscellaneous insulation for generating plant, for furnishing and installing the refrigerating and ice-making plant. Applications for proposals should designate the schedule desired by number.

## North Central

**DETROIT, MICH.**—A large laundry will be installed in the basement of the new Statler Hotel. All machinery will be driven by electric motors.

**DETROIT, MICH.**—Plans are being prepared by Frank Van Wyk, architect, 1112 Union Trust Building, Detroit, for a power plant for the Detention Home in Detroit.

**DETROIT, MICH.**—It is understood that a power plant will be installed in connection with the power building to be erected by the Utility Fwr. Co. on Jefferson Avenue.

**DETROIT, MICH.**—Bids will be received by the Department of Public Works of the city of Detroit, at the office of the Commissioners, City Hall, Detroit, until Sept. 21 for furnishing machinery and equipment for a garbage-reduction plant to be erected near the city of Detroit. Separate proposals in duplicate to be submitted for each of the following items: (A) Eoliers and stokers; (B) engines and generators; (C) boiler-feed pumps; (D) feed-water heater; (E) air compressor; (F) engine room crane; (G) locomotive crane; (H) coal and ash-handling equipment; (I) repair-shop equipment; (J) green-garbage cranes; (K) conveying machinery; (L) cooking and pressing equipment; (M) ash-handling equipment; (N) evaporating equipment; (O) drying equipment; (P) percolating equipment; (Q) railroad-track scales; (R) railroad garbage cars.

**GRAND RAPIDS, MICH.**—The Grand Rapids Ry. Co. has applied to the City Council for permission to place its heavy voltage wires underground in the downtown district. The company proposes to carry all its wires from its power plant on Market Avenue through Monroe Avenue to Monroe Street.

**GRAND RAPIDS, MICH.**—The amount necessary (\$4,000) for the extension of the ornamental lighting system on South Division Avenue from Oaks Street to Bartlett Street has been subscribed. The Association of Commerce has petitioned the City Council to authorize the Board of Public Works to proceed with the installation of the lamps.

**KALAMAZOO, MICH.**—Plans are being prepared by Stahl, Kinsey & Chapman, architects, 117 West Port Street, Detroit, for a power plant for the Kalamazoo Normal School.

**MIO, MICH.**—Preparations are being made by the Eastern Michigan Fwr. Co. for the construction of a dam (the fourth) in Mio for the Commonwealth Fwr. Co.

**MOUNT MORRIS, MICH.**—The Village Council has adopted a resolution favoring the calling of an election to vote on the proposal to grant an electric-lighting franchise in Mount Morris.

**PINCONNING, MICH.**—The property and franchises of the Pinconning L. & Fwr. Co. have been purchased by J. J. Thorne, of Bay City, Mich. It is understood, will make improvements to the plant, including the installation of new machinery and equipment. The flat-rate system will be abandoned and meters will be installed.

**BLANCHESTER, OHIO.**—A bond issue of \$5,000 will soon be sold by the town of Blanchester to provide funds for the installation of a new electric-lighting system for the town.

**CHESTER, OHIO.**—The Council is considering the question of lighting the streets of the town with electricity. The East Chester Electric & Light Co. of East Chester, pool, furnishes electrical service in Chester.

**CLEVELAND, OHIO.**—A permit has been obtained by the Ursuline Sisters for the erection of a power plant, 57 ft. by 58 ft., for the convent buildings on the lake front in Nottingham. The cost about \$8,000. E. J. Schneider is architect.

**CLEVELAND, OHIO.**—Bids will be received until Sept. 8 by the clerk of Board of Education of Cleveland for material and labor to complete a school building situated at the corner of Rawlins and Holton Avenues, including heating and ventilating and electrical work.

**CLEVELAND, OHIO.**—Bids will be received at the office of the clerk of Board of Education of Cleveland until Sept. 21 for material and labor necessary to complete the remodeling of the electric wiring at East High School. F. G. Hogan is director of schools.

**COLLINWOOD, OHIO.**—The Cleveland Seating Co., 550 Rose Building, Cleveland, has purchased a site in Collinwood for the purpose of establishing a new factory. The new building will be 400 ft. by 100 ft., a power house will be erected and also a number of dry kilns. About \$75,000 will be expended for the buildings. C. C. Stanley of Chicago, Ill., is the architect.

**DEFIANCE, OHIO.**—The proceeds of the \$666,000 bond issue allowed the Auglaize Fwr. Co., of Defiance, by the Ohio Public Utilities Commission will be used to take up outstanding indebtedness, purchase additional electric wiring, erect a hydroelectric plant, erect an auxiliary steam reserve plant, and the additions and extensions to transmission and distributing lines.

**DE GRAFF, OHIO.**—Plans are being considered for the construction of a new municipal electric-light plant, to replace the power plant recently destroyed by fire.

**HURON, OHIO.**—The Council is contemplating extending the municipal lighting system of the municipal electric plant to a district south of the river road.

**LIMA, OHIO.**—Bids will be received by the Lima State Hospital Commission until Sept. 11 for lighting fixtures in the new hospital and for certain electric wiring.

**MARION, OHIO.**—The City Council is considering extending the electric-lighting service in several parts of the city and erecting additional street lamps.

**MIDDLEPORT, OHIO.**—Application has been made by the Pomeroy & Middleton Electric Co. of Pomeroy, for a franchise to furnish electricity in Middleport.

**MIDDLETOWN, OHIO.**—The installation of a municipal electric-light plant in connection with the proposed improvements at the city water-works is being considered.

**MILLERSBURG, OHIO.**—Bonds to the amount of \$35,000, it is reported, have been voted for the installation of a municipal electric-light plant in Millersburg.

**OTTOTVILLE, OHIO.**—Bonds to the amount of \$3,000 have been issued to provide funds for the installation of an electric-lighting system.

**STUEBENVILLE, OHIO.**—H. D. Hershey, of Irvin, Pa., has submitted a proposal to the City Council offering to supply electric lighting system and Mr. Hershey proposes to install a plant here.

**URBANA, OHIO.**—The Urbana Tel. Co. is preparing to place its wires and cables in underground conduits in the business district.

**CAVE CITY, KY.**—The Cave City Ice Co. is reported to be contemplating the installation of an electric-light plant in connection with its ice factory.

**HENDERSON, KY.**—Bids will soon be asked for the erection of a new boiler room, 64 ft. by 90 ft., to replace the one recently destroyed by a cyclone. L. P. Hite is superintendent.

**BREMEN, IND.**—The Council, it is reported, is considering improvements to the municipal street-lighting system.

**EAST GARY, IND.**—The town of East Gary has engaged George F. Peterson, of Miller, Ind., electrical engineer, to take charge of the erection of a transmission line from the city of East Gary.

**GARY, IND.**—Application has been filed by attorneys representing Charles H. Mone, Henry A. Vossler and Ingwald Moe, all of Gary, with the Public Service Commission for authority to acquire a new franchise from the city of Gary to establish a second electric plant here.

**CHICAGO, ILL.**—The Illinois Central R.R. Co. has appropriated \$50,000 for the equipment of a telephone system of train dispatching between Clinton and Centralia.

**CHICAGO, ILL.**—The Commonwealth Edison Co. has acquired a title to 24 acres of land in South Chicago and plans are being prepared for a large steam power plant in the center of the large manufacturing district there. The plant will also supply electricity in Burnside.

**EAST ST. LOUIS, ILL.**—The East St. Louis L. & E. Co. has submitted a proposal to the Prospect Park Improvement Association offering to furnish electrical service in Prospect Park subdivision.

**ELGIN, ILL.**—An injunction against the city of Elgin, in regard to issuing bonds or accepting bids for machinery, etc., for municipal lighting plant has been affirmed by the appellate court. At this time the City Council has not decided whether to appeal to the Illinois Supreme Court or call a special referendum election. In any event no bonds for lighting plant will be issued during 1914. William F. Sylla is city clerk.

**GALESBURG, ILL.**—The City Council is considering an ordinance providing for a uniform standard for ornamental lamps. Plans are being considered by the Simmons Street merchants for the installation of an ornamental lighting system on that street.

**JOLIET, ILL.**—The installation of an electric-light plant in the high school in connection with the new heated ventilation system is under consideration.

**WAUKEGAN, ILL.**—All bids submitted for the installation of an ornamental lighting system on Genesee and Washington Streets, it is reported, have been rejected by the committee.

**AUBURN, WIS.**—The installation of an electric-lighting system in Aubleman is reported to be under consideration.

**BLACK RIVER FALLS, WIS.**—Within the next two months the city of Black River Falls expects to purchase 8000 ft. of additional cable and 20 No. 2,121 Cutler ornamental posts carrying five-lamp clusters. W. L. Jones is city clerk.

**BOSCOBEL, WIS.**—The electric light commissioners expect to purchase within the next 30 days one 25-hp. motor, 80 cycle motor. Charles A. Blair is general manager.

**LADYSMITH, WIS.**—Within the next three months the Ladysmith Ltg. Co. expects to purchase a 60-hp generating unit H. W. Nease is manager.

**MINERAL POINT, WIS.**—Within the next 30 days the Mineral Point Pub. Ser. Co. expects to erect a 13,000-volt transmission line to Dodgeville, material for which has already been purchased. F. C. Luden is president.

**ORFORDVILLE, WIS.**—The Village Council is considering an application for a franchise to install an electric-lighting system in Orfordville.

**SUPERIOR, WIS.**—The Wisconsin Railroad Commission has authorized the Superior Wtr. L. & Fwr. Co. to issue \$100,000 in capital stock, the proceeds to be used for extensions and improvements to its system.

**BIWABIK, MINN.**—The Great Northern Fwr. Co., of Duluth, has been granted a franchise to furnish electricity in Biwabik. The company has also been awarded a contract to furnish electricity to operate the municipal electric plant.

**DULUTH, MINN.**—The City Commissioners have adopted a resolution to offer to purchase the property of the Duluth Edison Co. and the City of Duluth, F. M. Rittenhouse and C. L. Pillsbury, which fixes the value at \$97,940 and the gain value at \$200,000. If the company accept the offer, the city agrees to buy over the plant by Jan. 1, 1915. If the company refuses, the city may build a plant, or install a distributing system and purchase energy from the Great Northern Fwr. Co., or from the Duluth-Edison plant.

**MANKATO, MINN.**—The Village Council of Mankato is considering the installation of a municipal electric light plant. Estimates will also be secured for the cost of a new pump and engine for pumping station.

**ST. PAUL, MINN.**—The contract for the construction of the power house at St. Catherine's Academy has been awarded to John Hoffman.

**SOUTH STILLWATER, MINN.**—The municipal electric-light plant in South Stillwater, it is reported, has been destroyed by fire, causing a loss of about \$20,000.

**AKRON, IA.**—The installation of a municipal electric-light plant in Akron is under consideration.

**CEDAR RAPIDS, IA.**—Plans and specifications are being considered by the City Council for the construction of a dam across the Cedar river to cost about \$125,000. The Iowa Ry. & L. Co. will pay its share of the cost of building the dam.

The company, having purchased the Union Hills and the Anchor Mills, owns five-sixths of the waterpower and will pay one-fourth of the cost. The exact location of the company's power house has not yet been determined, but it will probably be somewhere on the site of the Anchor Mills.

**CHARTER OAK, IA.**—At a special election held recently the proposal to issue bonds for the installation of a municipal electric-light plant in Charter Oak was carried.

**CROTON, IA.**—The installation of a street-lighting system in Croton is reported to be under consideration.

**EARLHAM, IA.**—Improvements involving an expenditure of \$8,000, it is reported, are contemplated to the municipal electric-light and water plant.

**FOIT MADISON, IA.**—A committee has been appointed by the Fort Madison Commercial Club to make investigations with a view of installing an ornamental street-lighting system. C. F. Tingwald is a member of the committee.

**GRINDY CENTER, IA.**—The local electric-light plant, owned by J. B. Chidlow, it is reported, was recently destroyed by fire, causing a loss of about \$10,000.

**HARRIS, IA.**—The Council is contemplating submitting to the voters a proposal to issue \$7,000 in bonds for the installation of an electric-lighting system. Electricity to operate the system is to be obtained from the plant in Sibbey.

**SERGEANT BLUFF, IA.**—Plans are being prepared for the installation of a municipal electric-light plant in Sergeant Bluff to cost about \$10,000.

**WESTBRO, MO.**—The City Council has decided to install an electric-lighting system. Arrangements, it is reported, have been made with the Tarkio El. & Wtr. Co. of Tarkio, to furnish electricity to operate same.

**WHEELS, N. D.**—Soule Brothers, owners of the Kendall El. & Pwr. Co. of Kenmare, it is reported, have been granted a franchise to install and operate an electric-lighting plant in Bowbells.

**GRAND FORKS, N. D.**—Plans have been accepted by the City Council for extension to the electric-lighting system in the district about the court house and Masonic Temple.

**MANDAN, N. D.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Sept. 24 for construction, including machinery and electrical equipment, including foundations and approaches, of the United States district office at Mandan. Drawings and specifications may be obtained from the above office or from the custodian of the above plan. O. Wenderoth is supervising architect.

**ERWIN, S. D.**—The installation of an electric-lighting system is reported to be under consideration by the City Council.

**LAKE PRESTON, S. D.**—A franchise has been granted to E. G. Ostroff, president, for erection and maintenance of an electric transmission line between Lake Preston and De Smet.

**MONTGOMERY, S. D.**—Bonds to the amount of \$6,000, it is reported, have been voted for the installation of a municipal electric-light plant.

**NORFOLK, NEB.**—The City Council is reported, is negotiating with the Iowa-Nebraska Pub. Ser. Co. of Norfolk for the installation of a new street-lighting system.

**ST. PAUL, NEB.**—Plans are being prepared for a municipal electric-light and water plant and for improvements and new power station. An election will soon be held to vote on the proposal to issue bonds to same. Harper & Smith, Grand Avenue Temple, Kansas City, Mo., are consulting engineers.

**WYOMING, NEB.**—Bonds to the amount of \$5,000 have been voted for improvements to the water and light plant.

## Southern States

**GULFPORT, FLA.**—The Bayview Hotel Development Co. of Gulfport, it is reported, has awarded a contract for the installation of an electric-light plant to the Florida El. & Mfr. Co. of St. Petersburg. P. J. Davenport is manager of the bayview company.

**JACKSONVILLE, FLA.**—The city is contemplating the installation of underground conduits for electric wires on Main Street, between Bay Street and Hogan's Creek, at a cost of about \$20,000.

**PABLO BEACH, FLA.**—The City Council is reported to be considering the question of submitting the proposal to issue

\$10,000 in bonds to establish a municipal electric-light plant to the voters.

**PUNTA GORDIA, FLA.**—The contract for the installation of a municipal electric-light plant has been awarded to the Electric Co. of St. Petersburg. The plant will have sufficient output to maintain about 1,000 lamps. The electric plant and bus-line system will be operated by a ship-based engine.

**MEMPHIS, TENN.**—The city is installing an electric-lighting plant for the water-works system here. W. C. Jones is secretary of the league.

**NEWPORT, TENN.**—At an election to be held Sept. 12 the proposal to issue \$5,000 in bonds for the installation of a municipal electric-light plant will be submitted to the voters.

**ANDALUSIA, ALA.**—The property and franchises of the Andalusia El. & Wtr. Co. O. L. Benson, J. O. Wadsworth, J. L. Knox, and others, contemplate improvements to the system.

**MARION, MISS.**—The Board of Aldermen, it is reported, has awarded a franchise to F. H. Mudd to install and operate an electric-light plant in Marion.

**ARK. BONDS** have been voted, it is reported, for the installation of an ornamental street-lighting system on East Washington Street.

**GLENWOOD, ARK.**—John H. Fiedler, of Hot Springs, recently granted a franchise to install an electric-light plant in Glenwood, will begin work immediately on installation of the proposed system.

**GURDON, ARK.**—Albert C. Moore, of Gurdon, Mo., consulting engineer, has been engaged to prepare plans and supervise the construction of a municipal electric-light plant in Gurdon. As yet only preliminary reports have been made on the work.

**KNOWEL, ARK.**—The local electric-light plant, owned by G. A. Booser, is reported to have recently been destroyed by fire.

**MARSHALL, ARK.**—The Town Council has granted A. E. Barry E. Johnson, manager of the Marshall Milling Co. of Texas, to install and operate an electric-light plant in Marshall for a period of 10 years.

**ABITA SPRINGS, LA.**—Messrs. Aubert & Rauch, of Abita Springs, recently awarded contract for street-lighting, which includes one 2,200-volt Fairbanks-Kelly transformer, 80 ft. poles and 20,000 ft. of wire for overhead distribution system. The street-lighting system consists of 100 street lamps.

**OKLA.**—The proposal to issue from \$250,000 to \$500,000 in bonds to purchase the local electric-light plant was defeated at the election held Aug. 18.

**MCLOUD, OKLA.**—The contract for the erection of a high tension transmission line and electric distributing system in the Mater El. Co. of Guthrie, at \$6,000, to the Western Engineering Co., American National Building, Oklahoma City, has been awarded to the engineering work for the town.

**AMARILLO, TEX.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Sept. 24 for construction, including mechanical equipment, including elevator, lighting fixtures and approaches, of the United States post office and court house at Amarillo. Drawings and specifications may be obtained at the above office or from the custodian of the above plan. O. Wenderoth is supervising architect.

**BLUE RIDGE, TEX.**—The Greenville & White Wright Interurban Co., which has completed the construction of an electric railway between Anna and Blue Ridge, is preparing to extend the railway to either White Wright or Greenville.

**BRENNHAM, TEX.**—The construction of an interurban electric railway between Brenham and Independence is being projected by S. J. W. Low and associates. A power station will be built in Brenham.

**FLORESVILLE, TEX.**—Plans are being considered, it is reported, by the H. Poth for the installation of an electric-lighting plant in Floresville.

**MAURICE FALLS, TEN.**—An election will be held on Sept. 12 to submit the proposal to issue bonds for a water power development on the Colorado River. The project is for the construction of a concrete dam 110 ft. long and 6 ft. high, a power house 20 ft. by 10 ft. and a water works system with capacity of 50,000 gal. per min. The cost of the work is estimated at \$45,000. As yet an engineer has not been employed.

**McKINNEY, TEX.**—The Texas El. & Wtr. Co. of Dallas is reported to be considering the installation of a municipal electric-light plant in McKinney.

## Pacific States

**CATHLAMET, WASH.**—Plans are being considered by the City Council for the installation of a municipal electric-light plant. The local Electric Co. and the Cathlamet El. Co. both of Portland, Ore., have been asked to submit estimates of cost to install a street-lighting system. A special election will be called to vote on a bond issue to provide funds, but some as soon as estimates are submitted.

**SEATTLE, WASH.**—The city officers, committee of the City Council has recommended a bill appropriating \$25,000 for the purchase of five automobile buses for the city, to be operated in connection with the city's bus system. The bill is expected to pass the City Council.

**SEATTLE, WASH.**—Within the next 12 months the city of Seattle expects to begin construction of the Seattle Electric Co. generating plant and a 5,000-ft. penstock, which will drive a 10,000-hp impulse turbine, with exciter, oil switches and auxiliary apparatus for the above unit, also to install about \$20,000 for distributing transformers. The city has recently closed a contract for meters, to cost \$10,000, for the new street-lighting system, to cost \$50,000. J. J. Jones is superintendent of lighting.

**DEAN, ILL.**—A contract has been signed by the Mayor and city recorder whereby the Dean El. & Wtr. Co. of Rockburg, will supply this city with electric power. The company proposes to extend its transmission line from Oakland to W. H. Jones, of St. Louis, to take charge of the installation of the local distribution system. A street-lighting system will also be installed.

**LOS ANGELES, CAL.**—The City Council has passed the ordinance providing for the installation of ornamental lamps on Grand Avenue between Sixth and Main Streets, and on Figueroa Street between Sixth and Tenth Streets.

**SAN DIEGO, CAL.**—The San Diego Gas & El. Co. has closed a contract with the city of San Diego to furnish electricity to operate two pump pumps for the city water-works reservoir and also the city's reservoirs.

**PLUMMER, IDAHO.**—The Public Service Commission has granted Plummer Brothers a certificate of public necessity to install and operate an electric-light plant in Plummer, work on which will soon begin.

**DUKE, ARIZ.**—A building in the head addition, it is reported, has been purchased by J. E. Allen, who owns control of the local electric-light plant, and also in which a new electric-light plant will be installed in the near future.

**LOVELAND, CAL.**—At a special tax-payers' election held Aug. 12 the proposal to establish a municipal electric-light plant, to cost \$12,000, was carried. The Board of Aldermen was authorized to proceed with plans and to submit a proposition to issue bonds for same at the proposition election. It is proposed to erect a hydro-metric west of the H. Thompson River, 12 miles west of the city.

**SANTA FE, N. M.**—The Rio Grande El. & Pwr. Co., recently incorporated with a capital stock of \$1,000,000, proposes to build a dam and hydroelectric power at White Rock Canyon, about 10 miles above Albuquerque. The Rio Grande Electric Co. generated at the plant will be sold to Albuquerque. Santa Fe and Las Vegas. The incorporators are Charles L. Wilfong, James Morrison and F. E. Wilson.

## Canada

**EDMONTON, ALTA.**—Another power project has recently been submitted to the City Council by Sir John Jackson, consulting engineer. The plans provide for utilizing the water-power of the Bow River, west of Edmonton. Three developments are proposed, which at low-water period would give, it is estimated, a minimum of 35,000 hp.

**NEW DENVER, B. C.**—The power plant of the New Denver El. & Pwr. Co., it is reported, was recently destroyed by fire. The plant, it is understood, will be rebuilt at once.

**BERLIN, ONT.**—The City Council is considering the installation of a lighting



system on King Street from Union on the north to the city limits on the south.

**COMBER, ONT.**—The by-law providing for an expenditure of \$4,500 to secure electricity from the Hydro-Electric Commission of Ontario has been approved by the rate-payers.

**MONTREAL, QUE.**—The City Lighting Department, it is reported, will soon call for tenders for furnishing 200 ornamental lamp standards for St. Catherine and Hurvy Streets, 113 of which will be erected this summer.

**MONTREAL, QUE.**—The Montreal Lt. Ht. & Pwr. Co. has recently awarded a contract to the Northern El. Co., of Montreal, for 80,000 ft. of 300,000 circ. mil. three-core, 13,200-volt, paper-insulated, lead-covered cable.

**MONTREAL, QUE.**—A special meeting of the stockholders of the Laurentide Co. has been called for Sept. 23 to vote on the proposal to issue \$4,000,000 in bonds, the proceeds to be used in part for completion of the large hydroelectric development of the company at Grand Mère and the extension of the paper plant.

**OUTRETMONT, QUE.**—The Northern El. Co. of Montreal, has been awarded a contract for 1500 nitrogen-filled lamps for street-lighting in Outremont; also for 23,000 ft. of lead-covered cable and 3000 ft. of armored cable. The contract for lamp standards was awarded to the William Hamilton Co., of Peterborough.

**SHAWINIGAN FALLS, QUE.**—The Belfo Canadian Pulp & Paper Co. is planning to install a 500-hp steam turbine, the slow speed shaft to turn 250 r.p.m.

## New Incorporations

**COLUMBIA, ALA.**—The Columbia Pwr. Co. has been incorporated with a capital stock of \$16,000. The officers are: R. D. Croy, president; D. D. Dethard, president; D. D. Shemwell, vice-president, and J. E. Foy, secretary and treasurer, both of Eufaula.

**FLORENCE, ALA.**—The Carolina Central El. Co. has been chartered with a capital stock of \$5,000 by D. T. Mc-

Keithan, J. W. McCowan and George E. Dargatzis.

**PORTLAND, MAINE.**—The Royal River Mfg. & Pwr. Co. has been incorporated with a capital stock of \$150,000 to furnish electrical and other power. The company, it is understood, will not furnish electricity for lighting purposes. The officers are: John Tanner, of New York, N. Y., president, and Philip F. Nestal, of Cresskill, N. Y., treasurer.

**GALVESTON, TEX.**—The Lawrence El. Co. has filed articles of incorporation with a capital stock of \$10,000. The incorporators are David Lawrence and others.

**MONTREAL, QUE., CAN.**—The Southern El. Lt. & Pwr. Co. has been incorporated with a capital stock of \$500,000 and proposes to furnish electricity in the counties of Nicolet, Lotbinière, Arthabaska, Yamaska, Dummond, Richelieu and Mégantic.

**RAWDON, QUE., CAN.**—The Montclair El. Lt. & Pwr. Co. has been incorporated with a capital stock of \$90,000 by J. T. R. Gazelle, Joseph Amédée Fournier and E. Rowan.

# Weekly Record of Electrical Patents

## UNITED STATES PATENTS ISSUED AUG. 18, 1914.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York, N. Y.]

- 1,106,729. **WIRELESS-ELECTRIC INSTALLATION.** ABERNETHY, VISCOUNT. L. Rouzet, Paris, France. App. filed April 21, 1913. Tension lock at starting point of antenna.
- 1,107,246. **ELECTRIC SWITCH.** F. Barr, New York, N. Y. App. filed Aug. 2, 1912. Pendant pull socket.
- 1,107,247. **ELECTRIC SWITCH.** F. Barr, New York, N. Y. App. filed March 11, 1913. Rotary snap with radial detent.
- 1,107,250. **CONDUIT-WIRING DEVICE.** N. J. Bingham, Detroit, Mich. App. filed April 26, 1912. Reel for fishing wire.
- 1,107,255. **TELEPHONE TRANSMITTER.** L. Bradley and H. L. Bradley, Muskegon, Mich. App. filed Dec. 26, 1908. Special resistor.
- 1,107,257. **ELECTROLYTIC CELL.** J. B. Burdett, Chicago, Ill. App. filed Oct. 29, 1912. For manufacturing oxygen and hydrogen.
- 1,107,258. **ELECTROLYTIC CELL.** J. B. Burdett, Chicago, Ill. App. filed Nov. 6, 1912. For decomposing water, etc.
- 1,107,259. **ELECTROLYTIC CELL.** J. B. Burdett, Chicago, Ill. App. filed Nov. 6, 1912. Separate collection of gases.
- 1,107,261. **MUSIC GENERATOR AND MUSIC-DISTRIBUTING APPARATUS.** T. Cahill, Washington, D. C. App. filed Aug. 10, 1895. Alternating-current system (142 claims).
- 1,107,281. **INSULATOR.** R. Friese, Charlottetown, New Brunswick. App. filed Jan. 7, 1911. Condenser action.
- 1,107,290. **APPARATUS FOR METERING CONVERSATIONS IN AUTOMATIC TELEPHONE SYSTEMS.** G. Grabe, Nikolassee, near Berlin, Germany. App. filed June 24, 1911. Measures after the conversation.
- 1,107,309. **PROCESS FOR THE ELECTROLYSIS AND TREATMENT OF SULPHATE LIQUORS.** E. J. Hunt, Oldbury, and W. T. Gidden, Warley, England. App. filed March 21, 1914. Porous diaphragm.
- 1,107,316. **THERMOSTAT.** F. Kuhn and F. E. Shailor, Detroit, Mich. App. filed Dec. 2, 1909. Friction lock.
- 1,107,318. **ELECTRICAL PLUG CONNECTOR.** F. Kuhn, Detroit, Mich. App. filed Oct. 5, 1912. Metal housing.
- 1,107,319. **ELECTRICALLY HEATED RADIATOR.** F. Kuhn, Detroit, Mich. App. filed March 25, 1913. Household heater.
- 1,107,320. **ELECTRICAL HEATING UNIT.** F. Kuhn, Detroit, Mich. App. filed Sept. 8, 1913. Armored type.
- 1,107,321. **ELECTRICALLY HEATED HOT-PLATE.** F. Kuhn, Detroit, Mich. App. filed Sept. 8, 1913. Mechanical construction.
- 1,107,322. **ELECTRICAL HEATER.** F. Kuhn, Detroit, Mich. App. filed Dec. 27, 1913. Foot warmer.
- 1,107,323. **ELECTRIC HEATER.** F. Kuhn and F. E. Shailor, Detroit, Mich. App. filed Feb. 6, 1914. Exposed resistor.
- 1,107,333. **ELECTRIC HEATER.** G. H. Mansfield and C. E. Wild, Canton, Ohio. App. filed April 22, 1914. Air circulation.

- 1,107,336. **PRINTING TELEGRAPH.** F. R. McPart, New Rochelle, N. Y. App. filed May 31, 1912. Electromagnetic switching device; two wires with ground return.
- 1,107,365. **PRINTING TELEGRAPH.** C. E. Scribner, Jericho, Vt., and F. R. McPart, New Rochelle, N. Y. App. filed March 6, 1911. Controlled by two successive direct-current impulses.
- 1,107,366. **TELEGRAPH RECEIVER.** C. E. Scribner, Jericho, Vt. App. filed Nov. 28, 1911. Electromagnetic selection.
- 1,107,367. **TELEGRAPH RECEIVER.** C. E. Scribner, Jericho, Vt. App. filed Nov. 28, 1911. Selective relay system.
- 1,107,371. **TELEPHONE SYSTEM.** C. A. Simpson, Chicago, Ill. App. filed Oct. 6, 1911. Combination, common battery and local battery.
- 1,107,381. **ELECTRO-PNEUMATIC BRAKE.** W. Turner, Edgewood, Pa. App. filed Nov. 25, 1913. Equalizing.
- 1,107,401. **ELECTRIC COUPLING.** C. H. Bissel, Syracuse, N. Y. App. filed July 25, 1910. Cable plant.
- 1,107,438. **SELENIUM-CELL REGULATOR.** M. Moskowitz, New York, N. Y. App. filed June 18, 1910. For lighting systems.
- 1,107,441. **VULCANIZER.** M. W. Olson, Galesburg, Ill. App. filed March 17, 1913. For dental work.
- 1,107,465. **TROLLEY RETRIEVER.** P. N. Van Epp, Medina, Ohio. App. filed Jan. 25, 1913. Spring-actuated drum.
- 1,107,478. **ELECTRIC FURNACE AND METHOD OF OPERATING THE SAME.** R. A. Bayard, Niagara Falls, N. Y. App. filed May 27, 1913. Resistance type.
- 1,107,495. **ELECTRICALLY OPERATED MUSICAL INSTRUMENT.** C. Coleman, Chicago, Ill. App. filed Aug. 22, 1898. Piano expression.
- 1,107,498. **SPARK-PLUG TESTER AND TERMINAL.** H. Dalitz, Seattle, Wash. App. filed April 14, 1913. External attachment.
- 1,107,499. **JUNCTION BOX.** C. W. Davis, Edgeworth, Pa. App. filed Aug. 27, 1910. For underground cables, etc.
- 1,107,536. **RELAY.** F. R. McPart, New Rochelle, N. Y. App. filed Feb. 26, 1910. For telephone exchange.
- 1,107,552. **BRAKING SYSTEM.** W. Schaake, Pittsburgh, Pa. App. filed Oct. 8, 1910. Actual magnetic track brake.
- 1,107,555. **CONTROL SYSTEM FOR ELECTRIC MOTORS.** C. G. Tarkington, Chicago, Ill. App. filed May 9, 1911. Alternating-current hoist motor.
- 1,107,584. **LIGHTNING ARRESTER.** A. W. Burke, Wilkinsburg, Pa. App. filed March 11, 1912. Series loop.
- 1,107,610. **ANNUNCIATOR DROOP.** W. W. Henry, Wollaston, Mass. App. filed Oct. 24, 1912. Prevents rebound.
- 1,107,618. **STORAGE-BATTERY PLATE.** M. Kravetz, Cleveland, Ohio. App. filed April 6, 1914. Holding surface.
- 1,107,645. **CIRCUIT CLOSER.** B. Benedict, New York, N. Y. App. filed Sept. 30, 1913. For hand lamps.
- 1,107,645. **ELECTRIC SWITCH.** B. Benedict, New York, N. Y. App. filed Sept. 30, 1913. Pocket flashlight.

- 1,107,650. **INCANDESCENT LAMP.** A. W. Beutell, New York, N. Y. App. filed April 21, 1909. Filament support.
- 1,107,654. **HORN.** C. Carson, Detroit, Mich. App. filed May 12, 1913. Alternating-current noise device.
- 1,107,670. **ELECTROMETRIC APPLIANCE.** W. Jandus, Cleveland, Ohio. App. filed April 16, 1906. Expansion and contraction device.
- 1,107,767. **BURGULAR ALARM.** A. P. Dick Jr., Clarksville, Tex. App. filed May 28, 1913. Portable device.
- 1,107,794. **AUXILIARY SIGNAL DEVICE.** R. Ireland, Edison, Ohio. App. filed March 28, 1913. Telephone extension bell.
- 1,107,814. **ELECTRIC DRYING APPARATUS.** W. K. Mason, Cambridge, Mass. App. filed April 28, 1914. Comb.
- 1,107,861. **REFILLABLE FUSE.** C. N. Stout, Hamilton, Ont., Can. App. filed Jan. 19, 1914. Cartridge type.
- 1,107,914. **APPARATUS FOR GOVERNING THE SPEED OF MOTORS.** W. W. Dear, Chicago, Ill. App. filed Oct. 19, 1903. Direct-current type.
- 1,107,932. **MEANS FOR PREVENTING SPARKING IN ELECTRICAL DEVICES.** L. Grubman, New York, N. Y. App. filed April 16, 1912. Reversible field core.
- 1,107,945. **FIRE AND BURGULAR ALARM.** H. Heshe, Easton, Pa. App. filed April 18, 1914. Household type.
- 1,107,951. **INCANDESCENT-LAMP SOCKET.** H. Hubbell, Bridgeport, Conn. App. filed May 31, 1912. Shell interlocked.
- 1,108,025. **SNAKE PULLER.** F. A. Thies, New York, N. Y. App. filed July 26, 1913. Conduit fishing.
- 1,108,028. **SYSTEM OF ELECTRICAL SELECTION.** N. L. Tolstaid, Groton, S. D. App. filed Oct. 20, 1906. For telephone work, etc.
- 1,108,036. **REAR SIGNAL FOR VEHICLES.** M. F. Walsh, New York, N. Y. App. filed Nov. 21, 1912. Direction signals.
- 1,108,050. **COMPOUND TRANSFORMER.** W. J. Williams, Albany, N. Y. App. filed Dec. 21, 1909. Voltage regulation.
- 1,108,052. **SIGNAL DEVICE FOR AUTOMOBILES.** A. Winton and H. B. Anderson, Cleveland, Ohio. App. filed July 8, 1913. Operated through steering column.
- 1,108,062. **VOTIVE-OFFERING STAND.** G. B. Bohne, West Hoboken, N. J. App. filed Nov. 6, 1913. Alarm device.
- 1,108,084. **BLOCK SYSTEM FOR TRAMWAYS.** D. D. Samia, Milan, Italy. App. filed Sept. 29, 1911. Shell interlock.
- 1,108,086. **DYNAMO.** E. M. Tormin, Newton Center, Mass. App. filed March 3, 1911. For automobile use, etc.
- 1,108,087. **DYNAMO.** E. M. Tormin, Newton Center, Mass. App. filed Jan. 27, 1912. Direct-current lighting.
- 1,108,088. **CENTRIFUGAL SWITCH.** E. M. Tormin, Newton Center, Mass. App. filed Jan. 27, 1912. For motor-vehicle lighting system.
- 1,108,109. **TELEGRAPH SYSTEM.** A. E. Adams, Sparkill, N. Y., and A. F. Dixot, Newark, N. J. App. filed Feb. 16, 1911. Mechanical printing control.

# Electrical World

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## Stimulating Work in House Wiring

In the older sections of the country there is a total of unwired buildings which seems amazing to the central-station man from the Middle or Far West, where a residence, store or factory is provided with interior wiring as logically as with plumbing.

As pointed out in a paper before the New England Section of the National Electric Light Association in convention this week, 160,000 unwired houses await the efforts of the sales department of the Boston Edison company alone; and it is interesting to note that this business is now being sought systematically by a squad of seasoned solicitors. The company is not without experience in canvassing for this class of load and has the hearty co-operation of the electrical contractors in its territory, so that it will not be surprising if records already established are greatly surpassed. For the purpose of acquiring the business readily, the central station has established unit prices acceptable to contractors and has guaranteed to provide the money for the installations and to accept payment in instalments. As a result of this willingness to float its treasury upon the financial bus, the Boston company now has 200 contractors actively co-operating with it, and the plan of extra compensation for outlets secured by the contractor himself is working out admirably. That the consumers will not balk at the cost of interior wiring when the burden is lightened by instalment payments is evident from the fact that the average outlay on 918 contracts was \$83. The article on "Handling the Small Consumer in Europe" published in these columns on May 23, although not applicable in its entirety to American conditions, nevertheless gave a clear insight into the possibilities of house-wiring campaigns among the very poorest. The Boston Edison company shows what can be done in a typical American city without even approaching the irreducible limit of cost. If more lighting companies manifested the same enterprise, the industry would be greatly benefited.

## Life and Liberty for Industry

If great problems arise small differences lose significance. When the nation is attacked all parties unite

in its defence. As it is with nations so it is with families. When a common enemy arises the disputes in families end. At the moment when the banking integrity of this country was threatened the treasury officials in Washington forgot their previous unwillingness to treat with New York bankers; all interests contributed judgment and advice to overcome peril. That was a month ago. It is still a time when the

sober judgment and integrity of the nation need to co-operate to protect American industry. The commercial life of the nation is a large part of the life, the health and the prosperity of its people. Our political structure has given the authorities an increasing amount of power to question the basis of commercial life. We have commissions, departments and bureaus galore. The extent of their activities grows always larger, never smaller. They start gradually, they accelerate rapidly, and unless they are directed by uncommon good sense and moderation they soon become autocratic. As autocrats in a democracy they are out of place. Any man can attack a corporation; few can take up its affairs so constructively as to lead it to better things. The standard that the business of this country demands to-day in public office is that which is able to protect and build up commerce. If the voters do not vociferously demand that standard, the economic conditions of the country do. If the terrible European war has no other effect on this nation, may it bring office holders and business men together to co-operate in the sane end of life and liberty for industry.

## Advances in Rail- road Rates

Advances in mileage book rates, now being announced by Eastern railroads, follow the suggestion of

the Interstate Commerce Commission that passenger fares need readjustment. The suggestion of the commission was contained in the decision in the rate-advance case. The commission was unready or unwilling to permit the roads to make the freight-rate advances desired, but it was perfectly ready and willing to hint at increases in passenger fares as one of the means of providing more revenue. Its discussion on this point appears to apply mainly to Central States in which 2-cent-a-mile laws exist. The removal of statutory obstacles of that serious character is not a task in which success could be won except after long effort. The commission made itself subject to criticism by refusing the full advance in cases over which it had jurisdiction and by suggesting that the carriers try to make advances in rates determined largely by intrastate laws over which it had no jurisdiction. There is an element of politics here which the commission cannot be so blind as not to see. In appearance the passenger rate is a direct tax on the public and is therefore subject to political attack. So far as the great body of the public is concerned, the freight rate is an indirect tax. It is far easier to levy an indirect tax than a direct tax. Experiences of governments with taxation prove that this is so. The roads being admittedly in need of more



revenue, it is more important that they be permitted to have it than that an exact distribution of it between freight and passenger business be sought. If every regulating body should refuse to grant increases where it has authority and should suggest that the complaining public utility try to find a more friendly giver in another quarter, the hope of more advances would be dimmed to the point of extinction.

### Wireless Telegraphy in Aviation

A vivid idea of the activity which has been displayed, particularly in Germany, in the adaptation of wireless telegraphy to aviation, including sending and receiving apparatus and devices intended to facilitate position finding, is contained in an article referred to in last week's Digest. The importance of these matters from a military standpoint is obvious, especially in the case of dirigibles, which have a fairly long radius of action. This radius in recent airships amounts to several hundred miles, and consequently wireless apparatus of considerable power has to be installed to insure efficient communication between the ship and her base. The problem of adequate antennas is, of course, easily solved on a dirigible, the length of which is sufficient to provide plenty of room, and, indeed, there is no difficulty in getting a reasonable amount of power in the apparatus because of the great carrying capacity of this type of airship. For obvious reasons not very much information is given about the actual details of equipment as applied to military balloons. There is no doubt, however, that light generating sets are in existence which are quite capable of sending wireless dispatches over long distances if not interfered with. A daylight working range of 200 km is claimed for some of the German sets weighing scarcely over 50 lb. More than this can, of course, be reached with apparatus of a weight easily transportable in an airship, and several times this range might conceivably be at times necessary.

It must be admitted, however, that airship equipments of even this power would be very susceptible to "jamming" if operating far from their base. In a military sense, however, it is likely that most valuable scouting work will be done at inconsiderable distances over which wireless conditions would remain fairly good. As to position finding with long horizontal receiving antennas, it is possible, as the article before us indicates, to get considerable information from a properly organized system of sending stations. Inasmuch as flights at great height are not likely to be attempted by this class of flying craft, the present opportunities for successfully applying "wireless" to position finding seem to be somewhat limited. More interesting technically are the possibilities of wireless installations on aeroplanes. Material headway has been made, too, in this branch of the subject, but the somewhat limited size of the sending apparatus and the difficulty of carrying suitable antennas complicate the situation. Various methods of installing antennas have been tried,

the favorite one appearing to be a trailing bronze wire carried clear of possible interference with the propellers. A range of sending and receiving distance in the neighborhood of from 50 km to 100 km has been experimentally reached with equipment of practicable weight. As to the particular character of sending and receiving apparatus used, it is apparent that all the familiar equipment has been tried, the differences from ordinary practice being merely such as are consequent on the necessary reduction of weight and bulk. It would be exceedingly interesting to know how far, if at all, wireless communication has been tried on the present scene of hostilities; but the beautifully effective suppression of all ordinary sources of information leaves us quite in the dark as to the actual practice of aerial scouting in this respect. The time gained in sending home reports of observations by wireless telegraphy would evidently be worth something, let alone the possibility of receiving in this way messages from airships which might be unable to get home.

### Comparison of Silver and Iodine Voltmeter

The voltmeter is a well-known piece of electrochemical apparatus, derived from the researches of Faraday, who discovered that a unit quantity of electricity passing through an electrolytic cell effected a definite chemical transfer proportional to the atomic weight of the element so transferred. From this law it followed that the quantity of electricity which passed through an electrolytic cell could be determined by finding the amount of some simple elementary substance transferred therein. The earliest form of Faraday's voltmeter consisted of a pair of inverted graduated test tubes supported in dilute sulphuric acid over a pair of platinum electrodes. The volume of the gas collected in this way enabled the total quantity of electricity passed through the cell to be read off by inspection. However, such gas voltmeters are liable to appreciable error, owing to the solubility of the liberated gas in the solution where it is formed; but when the substance transferred is a metallic solid, such as copper or silver, the transfer can be determined with great precision. The silver voltmeter is, in fact, the internationally adopted means of measuring the international ampere, and, with the aid of a conventional technique, one international coulomb, or ampere-second, of electricity is that which will deposit 1.118 milligrams of silver.

The copper voltmeter has been employed to a considerable extent, especially in calibrating ammeters and wattmeters, but with a lesser degree of precision than that obtained with the silver voltmeter, owing to secondary oxidation of the copper deposit. The zinc voltmeter was extensively used by Edison during the early days of electric lighting, as a commercial ampere-hour meter. Experiments have been made with an iodine voltmeter for scientific purposes, as a check on the silver voltmeter. The care and skill required in order to secure accurate measurements seem to be at least as great with the iodine voltmeter as with the silver volt-

meter, but the latter in careful hands will, it is claimed, give results reproducible to one or two parts in 100,000.

In the last *Bulletin* of the Bureau of Standards is a paper by Messrs. G. W. Vinal and S. J. Bates on a comparison of the silver and iodine voltameter. The agreement which exists between the two is stated to be very close, and the discrepancy may be attributed to an error in the accepted atomic weight of iodine or to errors of observation and chemical impurities. Taking the international coulomb as depositing 1.1180 milligrams, and the atomic weights of silver and iodine as 107.88 and 126.92 respectively, according to recent international agreement, the coulombs per milligram of monatomic substance and unit atomic weight come out 96.515 from the iodine voltameter, against 96.494 from the silver voltameter, a difference of one part in 5000. The value recommended for this constant is 96.50. Such researches are valuable as providing checks on the silver voltameter and in extending our knowledge of quantitative electrochemistry, as well as verifying Faraday's law, but it is fortunate that the engineer does not have to make such elaborate measurements himself. The Weston cell is all that is necessary for his purpose as a standard, when used in connection with the potentiometer.

### Financing in War-Time Markets

The cost of temporary financing for central stations is necessarily affected by the demoralization of investment conditions. In the gravely altered state of the market temporary financing, however, is of less concern to companies than the cost of long-time financing. With temporary financing the burden of abnormally heavy cost lasts for only the life of the short-time notes, usually not over a year or two; in long-time, or so-called permanent, financing it is a fixed charge for the life of the bonds, which run seldom less than twenty years and generally longer. A company which has to borrow money during the present acute financial conditions expects to pay a rate measured by those unusual conditions; but when it puts out long-time bonds in the brighter days of its career it tries so to regulate the conditions of sale that it shall get a high price and its securities will reach permanent investors. The short-time borrower gives a security that invites the banks, which like the promise of early payment; but the seller of long-time bonds seeks his final market in the buyer who puts his securities in the vault and prefers not to disturb them until maturity. The short-time borrower pays substantially the going rate quoted on commercial paper, and when the cost of commission and examination is added to this figure it sometimes makes a staggering price. The strongest borrowers avoid the heavy costs of repeated short-time loans.

Needy corporate borrowers are now confronted by the disturbance or temporary absence of an investors' market, and they turn to the banks for funds and pay the rates demanded. When the New York Stock Exchange

suspended trading the leading outside bond houses followed. Except at the quoted prices prevailing before the war trading was stopped. Since bargain hunters have been few and buyers at normal prices have temporarily withheld funds, trading is still too quiet to be worth the name. Before war chilled all financial markets bonds here had shown signs of long-awaited improvement. Buying was freer and bond houses had begun to prepare for the return of active trading for which they had longingly looked. Money was available for loans with which to carry bonds at low rates. Whether or not these favoring influences would have generated the bounding activity which both dealers and borrowing companies wanted the effect of war upon the world's finances has now made it idle to speculate. In place of eager buyers and reluctant sellers there have not been even eager sellers and reluctant buyers.

If there had been trading in the days just following the signs of incipient panic on the Stock Exchange, it would have demoralized prices, sellers and buyers, and made a return to reasonable conditions far more difficult. It would have let the outside bond market be depressed by the frantic liquidation which made the closing of the Stock Exchange necessary. So long as the bond dealers could not sell they refused to buy, waiting until they could again test the power of investors to absorb securities, find whether it had been seriously crippled or was potentially strong, and make their purchases accordingly. Their business is to buy what they can sell, and if the prices at which they buy are out of range with the prices at which they can sell to investors they cannot do business at a profit.

Before a company can safely or wisely lay down a plan of financing probabilities and possibilities which obscure the markets must give way to facts. When the banking situation is safe and normal active trading in securities will be resumed. When free trading is resumed the altered selling values of securities will be plain. Upon this information as a basis new financing plans may be completed. There will be a flood of needy corporate borrowers. Their ranks will be increased by needy municipal borrowers. Europe will not buy our securities until it has restored some of its terrible losses and put its industries again on the road to activity and prosperity. Its own need of capital will be so distressing that it will in fact sell our securities. Therefore Europe is not likely to furnish an immediate good market for the securities of American companies. Whether or not it will do so until the lapse of months, perhaps years, has repaired the waste only time can tell. Companies whose stocks and bonds are held mainly in this country will find protection in that fact. Except as the level of the entire market may be borne downward they will not see their securities suffer from European liquidation. They will, of course, have to take chances on the future of the money market. There appears to be no reason to count on anything less than a future world-wide demand for American funds at rates that will operate to increase the cost of capital for every class of borrowers.



# The News of the Week

## Activities and Events in the Electrical Field— Reports of Meetings—Commission Findings, Etc.

### Adamson Bill Passed in House

Although the Adamson bill passed the House with the amendment of the Pinchot people requiring all water-power companies obtaining rights to build dams to pay a tax, Chairman Adamson of the interstate and foreign commerce committee is firmly of the opinion that the Senate will not accept the amendment. The wording of the amendment is as follows:

"The Secretary of War may provide, as a condition of such approval, for the payment to the United States of reasonable charges for the benefits that accrue to the grantee by the authority given under this act, and at the end of twenty years and every ten years thereafter the Secretary of War may readjust the annual charges as may then be just and reasonable."

The House adopted this amendment after one of the warmest fights seen this session, declining to follow the lead of the chairman of the committee which reported the bill. Chairman Adamson states that only a handful of senators will support the Sherley amendment and that when the bill is enacted the law will contain no reference to taxing companies for horse-power obtained under the act.

The Ferris bill has been passed by the House.

### Meeting of Executive Committee, Commercial Section, N. E. L. A.

The first meeting of the new administration executive committee of the Commercial Section of the National Electric Light Association was held at Association Island, N. Y., on Aug. 28. In addition to the chairman, Mr. E. L. Callahan, of Chicago, the following members of the committee were present: Messrs. F. D. Beardslee, St. Louis; J. F. Becker, H. N. McConnell, New York; N. H. Boynton, Cleveland; Douglass Burnett, Baltimore; F. H. Gale, Schenectady; J. D. Israel, Philadelphia; T. I. Jones, George Weideman, Brooklyn; J. C. McQuiston, Pittsburgh; L. R. Wallis, Boston; C. A. Littlefield, secretary, New York; Miss Burkhalter, assistant secretary, New York.

Mr. Russell, chairman of last year's "Salesman's Handbook" committee, reported that the sections of the handbook on electric elevators and the heating section are being printed, also additional sheets for the power section.

Mr. George B. Muth, of the Philadelphia Electric Company, was appointed to represent the section at the meeting of the Pennsylvania Electric Association at Eagle's Mere, Sept. 8, 9 and 10, and Mr. E. C. Kimball, of the Boston Edison company, to represent the Commercial Section at the New England Section convention at Narragansett Pier, Sept. 2, 3 and 4.

In addition to the regular standing committees, appointed from year to year—finance, publications, handbook and membership—the committee decided to appoint this year, subject to the approval of President Scott, the following: Committees on wiring of existing buildings, education of salesmen, merchandising and recent development of energy-consuming devices; power committee, covering electric furnaces, ice making

and refrigeration, pumping and irrigation, mill industries, electricity in mines, logging, electric farming committee on commercial department terminology, committee on foreign relations.

### Cleveland I. E. S. Convention Plans

Seven papers and two lectures have been added to the program of the Cleveland convention of the Illuminating Engineering Society since the notice of that meeting was published in the *Electrical World* of Aug. 22. The papers added are "Self-Contained Portable Electric Lamps for Mines," by Mr. H. H. Clark; "Factory Lighting: Cost, Maintenance and Installation Data," by Messrs. O. R. Hogue and A. O. Dicker; "The Visibility of Radiation," by Mr. P. G. Nutting; "Recent Improvements in Incandescent Gas Lighting," by Mr. R. F. Pierce; "Further Experiments on the Efficiency of the Eye Under Different Conditions of Lighting," by Messrs. C. E. Ferree and G. Rand; "Characteristic Equations of Tungsten-Filament Lamps and Their Application in Metachromatic Photometry," by Messrs. G. W. Middlekauff and J. F. Stogland, and "Diffusing Glass for Translucent Ceiling Lighting," by Mr. E. J. Edwards. The lectures will be on "Color Photography," by Mr. M. C. Rypinski, and on "Photo-Sculpturing and the Use of Light in the Reproduction and Illumination of Sculpture," by Mr. Smith J. Hammond. Two papers have been withdrawn from the program, one on "The Lighting of a Carpet Mill," by Messrs. Rose and Oakley, and the other entitled "Effect of Room Dimensions on Efficiency of Lighting Systems," by Mr. Ward Harrison.

### New England Electrical Contractors' Convention

The annual convention of the New England Section of the National Electrical Contractors' Association is to be held at Worcester, Mass., Sept. 23 and 24, with headquarters at the Hotel Bancroft.

Following the first day's open session, the second day's papers and addresses will deal with the subject of relations between contractors, central-station co-operation, relations between jobbers and contractors relation of manufacturers to the trade, the National Electrical Code, keeping of accounts, and overhead expense. Mr. Henry D. Temple, Worcester, is secretary of the New England branch.

Among the speakers will be Messrs. John R. Gallo way, of Washington, president of the National Electrical Contractors' Association; George H. Duffield, of Utica, N. Y., secretary of the National association; James R. Strong, of New York City, a member of the executive committee of the National association; C. C. Wells, of Middleboro, Vt., president of the New England Section, and J. M. Wakeman, of New York, general manager of the Society for Electrical Development.

The committee in charge of arrangements for the convention is composed of Messrs. H. W. Kimball, of Haverhill; Henry D. Temple, of Worcester; W. K. Tuohey, of Springfield; H. Andrews, of Brockton, and A. J. Hixon, of Boston.

## Indianapolis Street-Lighting Controversy

More than local attention has been attracted by the recent street-lighting contract between the city of Indianapolis and the Merchants' Heat & Light Company, owing to the low rate named—\$41.98 per year for 0-amp alternating-current flame arc lamps, including installation, operation and maintenance—and various complications.

### What the Contract Requires

The contract covers a term of ten years beginning at noon on April 1, 1915. By its terms the Merchants' Heat & Light Company agrees to furnish lamps, posts, conduits, wires and accessories, and to operate and maintain them, in such streets and public places as the Board of Public Works of the city of Indianapolis may direct. The number of arc lamps shall not be less than 2000 at any one time and the number of incandescent lamps for ornamental lighting shall not be less than 500. If the lighting system is not in operation by the time specified, the company shall pay the city \$500 a day for each day the lighting is not performed. The lighting is for every night from one-half hour after sunset until one-half hour before sunrise. The city's inspectors, supervising the opening of streets, location of poles, etc., shall be paid by the company at the rate of \$75 a month. During the life of the contract the company shall adopt all improvements in the art as ordered by the Board of Public Works, provided the changes are reasonable. The prices specified in the contract are as follows:

### The Prices as Given in the Contract

For each series 10-amp alternating-current inclosed-flame carbon arc lamp, \$41.98 per year for all-night and every-night schedule. Not less than 445 watts must be consumed between the terminals of each lamp.

For each 100-watt series tungsten incandescent lamp, except as specified for certain lamps in "underground district," \$17.83 per year for all-night and every-night schedule.

For each 100-watt series tungsten incandescent lamp used as the top lamp of a three-lamp or five-lamp cluster, \$8.92 per year for all-night and every-night schedule.

For Meridian Street and underground district series tungsten incandescent lamps as follows: (1) Single 100-watt tungsten lamps on standard, \$27.71; (2) clusters of three 100-watt tungsten lamps, \$40.35 per cluster; (3) clusters of one 100-watt tungsten lamp and four 60-watt tungsten lamps, \$45.18 per cluster. All prices are per year for all-night and every-night schedule.

For electrical energy furnished to City Hall and public buildings, 1.95 cents per kw-hr.

Five per cent of the company's receipts under the contract shall be paid back annually to the city. A deduction of 5 per cent from \$41.98, the price per arc lamp, leaves a net price of \$39.88.

The specifications on which the contract is based were drawn by Mr. B. J. T. Jeup, city civil engineer.

### What Followed the Awarding of the Contract

But the award of the contract by the city to the Merchants' company did not end the matter. A suit was brought by Mr. Herbert H. Rice, a taxpayer, against the city and the Merchants' Heat & Light Company alleging that the Public Service Commission of Indiana has exclusive control over that company in the matter of rates and that neither the municipality nor the defendant company has the right to enter into such a contract. Further, the rates fixed in the contract were alleged to be discriminatory in favor of the municipality

and against the plaintiff and other consumers. The judge held that the municipality had the right to make the contract except as to the rates. From this decision an appeal was taken to the Supreme Court, and this appeal is still pending.

### Case Taken to Public Service Commission

Meanwhile the Indianapolis Light & Heat Company petitioned the Public Service Commission of Indiana to take up the matter and investigate the street-lighting contract. A hearing by the commission has been set for Sept. 14. The Indianapolis company contends that it is not right for a newer company to duplicate the investment in its street-lighting plant and ask a return on this duplication. Further, officers of the Indianapolis company say that the price named in the new contract is so low that the business must be taken at a loss; in fact, there is a question whether their bid of \$60 is profitable. In other cities, they say, lamps taking from 425 watts to 500 watts and burning in the neighborhood of 4000 hours per year cost from \$56 (Buffalo) to \$124 (Brookline, Mass.) a year.

The Merchants' company is going ahead with its construction work for a new street-lighting system. When President Harrison was asked by an *Electrical World* man if it was true that the contract was taken at a loss he said: "We are doing business on business principles. We have excellent reasons for making the price we have made." Then, with considerable vehemence, "We have had to contend with a pretty raw political game."

Mayor Bell says the position of the city administration is that under the law the city has a right to enter into contract with a competing company; that the contract is a valid contract, and that the Public Service Commission has the right only to reduce the rate if found too high.

## Old-House Wiring and Special Campaigns

Mr. E. C. Kimball, of the Boston Edison company, presented a suggestive paper before the New England Section of the National Electric Light Association at Narragansett Pier this week in which the results of his company's wiring campaign during the past nine months were set forth. He outlined the maze of uncertainties which the average householder enters in trying to analyze competitive bids and recommendations by rival contractors, and pointed out the importance of steadying such development by central-station co-operation. In the long run the mere financing of a wiring plan is but equivalent to an acceptance of a customer's note with monthly payments to be matured within a stated period. There is not a company in the association which could not well afford to adopt such a plan and waive the interest charges on a wiring proposition as offset by the income possibilities.

In the nine months ended July 31, 1914, the company signed 918 contracts, adding 17,000 50-watt equivalents to the connected load. The estimated income from this business is \$21,000. House wiring as contracted for under the plan amounts to \$75,800, of which the Edison company has received in cash payments \$7,700, leaving a difference of about \$68,000 to be paid monthly, amounting on Aug. 1 to \$4,485 per month, so that the company's financial investment in the proposition will be entirely cared for within fifteen months and the real investment will be but the interest rate on \$6,800 for seven and one-half months. In other words, the company will expend but \$2,100 to secure a net increase in income of \$21,000 per annum. There are 160,000 unwired houses in the company's territory, so that the prospects are excellent for increased business. The



author outlined the plan of campaign, which was described in the *Electrical World* of Nov. 15, 1913, page 1013, and stated that, although some opposition at first developed from the contractors, there are now 200 contractors who are accepting such work as the company may turn over, and many who call daily to find out if more work cannot be had. The company arbitrarily set the price at which the work should be done, but in making up its price list it consulted a competent contractor, whose consent the company obtained to execute any contract which might be secured at the prices quoted, before putting the proposition to the contractors as a whole. Much co-operation has been obtained from the contractors by means of a plan whereby the company pays the contractor \$2 per customer plus 25 cents per outlet installed. Under this plan the company has secured from the contractors 248 contracts, for which it has paid in compensation \$1,265.25, or an average of about \$5.10 per house secured and wired by the contractor. This has been divided among fifty contractors.

The proposition consists fundamentally in wiring one outlet, with service installation, meter board, fuse plugs, etc., in armored cable on any first-floor location in a house except the ceiling for a price of \$14.35, payable \$2.35 down and \$2 per month. The effectiveness of this plan is indicated by the fact that but twenty-nine out of the 918 contracts signed were for the minimum amount of \$14.35. The tabulation of contract ranges is given herewith. The average contract has amounted to about \$83.

#### BOSTON EDISON HOUSE-WIRING CAMPAIGN RESULTS

No. of Contracts	Range in Amounts
38 .....	\$14.35 to \$25.00
116 .....	25.00 to 50.00
231 .....	50.00 to 75.00
227 .....	75.00 to 100.00
196 .....	100.00 to 150.00
37 .....	150.00 to 200.00
14 .....	Over 200.00

#### Store-Wiring Campaign

Considerable success has also been attained in a store-wiring campaign where the company has agreed to furnish a tungsten fixture for a minimum of 150 watts for outside lighting and 100 watts inside. The former is an ordinary spun-brass canopy with stem and chain fitted with Holophane prismatic glass. In addition to furnishing the fixtures, the company finances the wiring and has adopted the following schedule as a basis of wiring:

Five outlets .....	\$17.50
Four outlets .....	15.50
Three outlets .....	13.50
Additional outlets over five, each .....	2.50

Since the beginning of this campaign in December, 1913, the company has signed on a financing basis 946 contracts, totaling 13,933 50-watt equivalents, with a gross income of about \$50,000. The contracted price for the wiring totaled \$20,500, of which \$3,100 has been paid down, and from which the company is receiving \$1,800 monthly payments. Outside of the financing agreement, many of these fixtures have been installed in places where the user had a meter but was burning mainly gas. In so doing the company has changed actual conditions of use, and the customer is now using electricity, carrying gas as an auxiliary service. Very few of the customers use the fixtures solely as a part of the decorative scheme by continuing to burn gas to the exclusion of electricity. A large class of small shopkeepers is being educated in the use of electricity, the cost of which is reasonable with the present equipment

and rates. Up to Aug. 1 the total number of tungsten fixtures installed for outside service was 1027 and the number of interior fixtures 8771.

At present the company is starting in the field one of its agents, who secured the greatest number of contracts under the plan of district agent, and has transferred him to the suburban territory with a corps of men who will make an intensive canvass of each town on the system. By this plan, when the agent starts in a town the house-wiring campaign will be confined entirely to this squad of special solicitors, and any work which the district agent may have under that plan will be in charge of the special agent.

#### California Commission's Rules on Inductive Interference

The California Railroad Commission has just issued its general order No. 39, dealing with the construction and operation of electric distribution systems and communication circuits which are, or are intended to be, so located as to create inductive interference. The order is based on the report of the joint committee on inductive interference, which is made up of the chief engineers of the principal telephone, telegraph, electric and railway companies, for the utilities, and the engineers of the California Railroad Commission, for the public. Investigations in the field, in the laboratory and in the office began December, 1912, and have been carried on very actively by the committee and its staff ever since that time. The principal part of the investigation has been completed, and the report of the committee covers several hundred pages with a mass of diagrams, photographs and mathematical computations treating the subject exhaustively.

The following definitions are given of certain technical terms employed:

**Power Circuit.** The term "power circuit" includes any overhead constant-potential alternating-current power transmission or distribution circuit or electrically connected network which has a voltage of 5000 volts or more between any two conductors or of 3000 volts or more between any conductor and ground.

**Communication Circuit.** The term "communication circuit" includes any overhead, open-wire telephone telegraph or signaling circuit which is used in the service of the public.

**Telephone Circuit.** The term "telephone circuit" includes any inter-exchange metallic telephone circuit and therefore excludes subscribers' circuits. This term also includes any metallic telephone circuit operated by any railroad or other company for dispatching purposes or for public use between separate communities.

**Line.** The term "line" means any circuit or aggregation of circuits carried on poles or towers.

**Parallel or Parallelism.** The terms "parallel" and "parallelism" refer to cases where a power line and a communication line follow substantially the same course or are otherwise in proximity for a sufficient distance so that the power circuit is liable to create inductive interference in the communication circuits.

**Residual Current.** The term "residual current" denotes the vector sum of the currents in the several conductors of a power circuit.

**Residual Voltage.** The term "residual voltage" denotes the vector sum of the voltages to ground of the several conductors of a power circuit.

**Transposition.** The term "transposition" denotes the interchange of position of the several conductors of a circuit.

The rules promulgated by the commission are as follows:

### I. Avoidance of Parallelism

Every reasonable effort shall be made to avoid new parallelism. The party proposing to build a new communication or power line which will create a parallel, or generally to reconstruct an existing line involved in a parallel, shall give due notice (at least thirty days wherever possible) of its intention to the other party, including detailed information as to the location and character of the proposed line. If a plan can be devised and agreed upon by the two parties for maintaining an adequate separation between the two classes of lines so as to avoid interference, this shall be done. In case it is impracticable to secure adequate separation between a power line and a communication line, parallelism will be permitted subject to the conditions set forth in II.

### II. Condition Under Which Parallelism Will Be Permitted

(a) *Minimum Horizontal Separation.* The minimum horizontal separation between the power line and communication line shall be equal to the height of the taller line. The only exceptions to this provision are angle crossings and other unavoidable cases of close proximity, and in all such cases the power line shall be kept above the communication line and constructed in conformity with the National Electric Light Association's specifications for overhead crossings or other approved equivalent which may be agreed upon by both companies.

(b) *Balance of Power System.* The power company shall exercise due diligence to keep the currents in, and the voltages to ground of, the conductors of any power circuit involved in a parallel as closely balanced as practicable. In all cases where telephone circuits are involved special consideration shall be given to the prevention or elimination of harmonics in the residual current and in the residual voltage.

(c) *Limitation of Residual Currents and Voltages.* Pending additional rules on specific means other than those given herein, the parties concerned shall endeavor to agree upon the means to be employed for the prevention or limitation of residual currents and voltages, and in the event of disagreement the matter shall be referred to the Railroad Commission of the State of California.

(d) *Transpositions Inside Limits of Parallel.* An adequate system of transpositions shall be installed in the power circuit (or circuits) and in the communication circuit (or circuits), provided the latter is metallic. When both circuits are transposed the transpositions in both the communication and power circuits shall be located with due regard to each other.

Every reasonable effort shall be made by both parties concerned to fix the limits of the parallel and the location of crossings, branch lines and connected apparatus so as to facilitate the application of an effective transposition scheme.

In the case of a parallel between a power line and a telephone line the company owning or operating the telephone line involved shall have the right to specify the number, type (in respect to electrical characteristics) and location of the transpositions in the power circuit subject to the following limitations:

(1) For power circuits of 50,000 volts or over the average distance between successive transpositions shall not be required to be less than 1 mile, and the minimum distance between any two successive transpositions shall not be required to be less than two-thirds of a mile.

(2) For power circuits of less than 50,000 volts the distance between successive transpositions shall not be required to be less than one-sixth mile.

The transposition system of the telephone circuits shall be modified where necessary in order that the

power and telephone circuits shall be, as nearly as practicable, mutually non-inductive.

For short parallels less than 6 miles in length (or short sections of longer parallels which have to be treated independently because of abrupt change in conditions) with power circuits of 50,000 volts or over, where it is impracticable to obtain an adequate balance by the location of transpositions in accordance with the limit specified above, the company owning or operating the telephone line involved shall have the right to specify the number, type and location of transpositions, provided the distance specified between successive transpositions is not less than  $\frac{1}{2}$  mile.

When necessary (owing to variations in lengths of telephone transposition sections) in order to secure an adequate balance, a reduction of 10 per cent in the limiting distance between successive power circuit transpositions as given above shall be allowed.

In the case of a parallel between a power line and a telegraph line or other grounded communication circuit the location of the transpositions in the power line shall be with due regard to the limits of the parallel in order to form as nearly as practicable a balanced system. The location and type of such transposition shall be as specified by the communication company, subject to the condition that the transpositions in the power circuit may not be required to be less than 1 mile apart.

In no case shall the power company be required to relocate poles or towers for the transpositions.

The parties concerned in any proposed parallel shall endeavor to agree upon a transposition scheme for such parallel in accordance with the above. In the event of a disagreement the matter shall be referred to the Railroad Commission of the State of California.

(e) *Transpositions Outside Limits of Parallel.* In addition to transpositions within the limits of a parallel, as provided in "d" hereof, each new power circuit isolated from ground (or extensions of such existing circuit) which is constructed subsequent to the date when these rules become effective shall be transposed throughout its entire length in such manner as to balance the electrostatic capacities to earth of its several conductors, so as to avoid inequalities among the voltages to earth of the several conductors, which would create inductive interference. Such transpositions shall not be more than 8 miles apart, provided, however, that circuits less than 3 miles in length are not required to be transposed until they are extended to a greater length; except that extensions or spurs from existing lines the electrostatic capacities to earth of whose conductors are balanced shall be so constructed as not to change materially the balance of the existing lines to which they are connected.

(f) *Uniformity of Parallel.* To facilitate the application of effective transpositions, both parties shall endeavor to maintain uniform separation, uniform arrangement of conductors and uniform relative location of the two classes of circuits within the limits of a parallel. However, when it is feasible to secure a substantial increase of separation between the two lines for a considerable portion of a parallel this shall be done, as such an increase of separation is of more benefit than uniformity.

(g) *Transformer Connections.* (1) On any power circuit involved in a parallel no grounded single-phase or grounded open-star transformer connections shall be employed.\* On a power circuit involved in a parallel no star-connected transformers or auto-transformers with grounded neutral shall be employed unless delta-connected secondary or tertiary windings or other equivalent means are used of suppressing the third harmonic

\*This does not apply to railroads operating alternating-current trolleys with ground return, which are covered by V.



components of the residual voltages and currents introduced by the transformers. (3) Where single-phase loads are connected to a polyphase power circuit involved in a parallel the power company shall endeavor to arrange successive connections of this type so as to equalize the loads upon the several phases. (4) On a three-phase circuit involved in a parallel the power company shall use, wherever practicable, a closed-delta connection in preference to an open-delta connection, and where the latter is employed an effort shall be made to distribute such connections equally upon the several phases.

(h) *Switch Equipment.* A power circuit involved in a parallel shall be equipped, between the source of supply and the parallel, with oil switches, all poles of which shall be mechanically interconnected for simultaneous action. With the exception of stations where an operator is constantly on duty, these switches shall be rendered automatic for short-circuits, grounds and abnormal neutral currents.

(i) *Switching.* All switching on all parts of a system connected to a circuit involved in a parallel which causes harmful transient disturbances in communication circuits shall be done by means of oil switches, all poles of which are mechanically interconnected for simultaneous operation.

(j) *Use of Air Switches.* The use of air switches on a power circuit involved in a parallel is prohibited except for purposes of isolating sections of dead line or for disconnecting transformers under no load. This applies to the entire power system any circuit of which is involved in a parallel, unless such switching is so remote as not to cause harmful transient disturbances in the communication circuits.

(k) *Abnormal Conditions.* A power circuit involved in a parallel shall not be operated at any time with an open, grounded or short-circuited line wire or wires or transformer winding.

(l) *Devices for Indicating Abnormal Conditions on Systems Isolated from Ground.* If a power circuit involved in a parallel is electrically isolated from ground, reliable indicating devices shall be installed at its source of supply to inform the operator immediately of abnormal conditions, such as grounds, and wherever possible open circuits which have not operated automatic switches. Upon indication of trouble by such devices, the operator shall immediately open the oil switches and proceed in the manner outlined in "m."

(m) *Procedure Under Abnormal Conditions.* In case of the opening of an oil switch owing to an abnormal condition in a power circuit involved in a parallel, or any circuit supplying or supplied by the same, such switch may be closed once. If opened a second time owing to the continuance of the fault of abnormal condition, said switch shall not be closed again until the line has been sectionalized. The fault may then be located by energizing sections of line, provided that further sectionalization of the line be done in such sequence as to cause the minimum disturbance to parallel communication circuits, and provided further that where practicable the faulty section of line shall be energized but once in this process of sectionalization, where the fault exists within or beyond the parallel, until such fault is remedied.

(n) *Ammeters in Neutral Ground Connections.* Wherever a neutral ground connection is employed on a circuit involved in a parallel, an ammeter suitable for measuring as accurately as practicable the current in the neutral under normal operating conditions shall be installed in all neutral connections at the main generating station and substations on the power system electrically connected to the circuit involved in the parallel. The power company shall maintain a record of hourly

measurements of the neutral current at all such points.

(o) *Charging Electrolytic Lightning Arresters.* Where a power system is equipped with electrolytic lightning arresters so charged as to cause inductive interference in communication circuits, the method of charging the arresters shall be modified to eliminate the disturbances as far as possible. The charging of such lightning arresters shall be done at such time as to give the minimum liability of interference with communication circuit operation, preferably between the hours of 2 a. m. and 4 a. m.

(p) *Wave Form of Rotating Machines.* The power company shall make every effort to obtain generators and synchronous motors for use on all parts of the system, giving, as nearly as reasonably possible, pure sine waves of voltage at fundamental frequency. In no case shall the deviation from a pure sine wave exceed the limit set forth in the Standardization Rules of the American Institute of Electrical Engineers.

(q) *Exciting Current of Transformers.* In order that the wave shapes of voltage and current may be distorted as little as practicable by transformers, the main line transformers employed on circuits involved in a parallel and on future extensions of such circuits shall have an exciting current as low as is consistent with good practice, and in no case shall the exciting current at rated voltage exceed 10 per cent of the full load current. Such transformers shall not be operated at more than 10 per cent above their rated voltage.

### III. Provisions Applying to Existing Parallels

The following sections of II shall apply also to power circuits involved in existing parallels: b, i, j, k, l, m, o, p and q. Also g-3 and g-4 shall apply to existing parallels to the extent that transformers added hereafter shall be connected as provided in said rules.

### IV. Waiver of Conditions by Communication Company

At the option of the company operating the communication circuit or circuits any of the provisions of II and III may be waived provided that such waiver does not increase the hazard.

### V. Parallelism with Alternating-Current Railways

It is recognized that railroads operating alternating-current trolleys with ground return create serious inductive interference with parallel communication circuits. In the present state of the art no means for completely overcoming inductive interference from such parallels is known, hence they are to be avoided if possible, and where unavoidable the responsibilities arising therefrom must be settled by mutual agreement, or in case of inability to agree the matter shall be referred to the Railroad Commission of the State of California.

### VI. Applicability to Past and Future Construction

These rules shall apply to all future construction in this State of the character herein indicated and to all construction now existing, provided that if any party desires to make a departure from these rules as to construction now existing such party may file his written petition with the Railroad Commission, whereupon the commission will take such action as may seem to it proper.

### VII. Rules Subject to Laws and Orders of Commission

These rules are to apply in all cases where they are not in conflict with any law of this State or order of this commission now or hereafter in effect. In case of conflict, where these rules add to the requirement of any law of this State or order of this commission, these rules shall prevail, otherwise not.

# Domestic and Foreign Business Outlook

Electrical Manufacturers Express Encouraging Views as to Present Situation and Prospects for the Future

## FIND BUSINESS CONDITIONS PROMISING

Statements Show that Careful Consideration Is Being Given to Export Trade

In order to get accurate information concerning the condition of business, the *Electrical World* has asked manufacturers in the electrical industry to state their opinions on the outlook. The views of some of the manufacturers follow:

### No Adverse Effect

Mr. H. B. Logan, president Dossert & Company, New York: "We do not find that war-time conditions have affected us adversely as yet. We received a good volume of orders during the month of August and have a greater aggregate of unfilled orders on hand now than at any time during the past fifteen months. We are not dependent upon Europe for raw materials; all materials used in our manufacturing are produced in this country. We are unable to estimate the effect of the war on our export business, which is chiefly with countries in the Western Hemisphere. We have not reduced or increased our organization and have taken no extraordinary steps to develop export trade. We do not anticipate any material falling off in the volume of our business in this country."

Mr. E. E. Cary, treasurer Edward E. Cary Company, Inc., New York: "Our present efforts are confined to exporting electrical specialties which we have imported the past fourteen years. Part of our business has been exporting from European ports to various foreign countries, and we are in a most favorable position to take advantage at the present time of our past experience."

### Will Care for Carbon Business

Officials of the National Carbon Company, Cleveland, state that preparations are being made to take care of all the carbon business that comes from those countries which have been depending upon Europe for their supplies. That they must look elsewhere for carbons is a foregone conclusion and, without doubt, a demand will be made upon the producers of the United States to meet their needs now. So far as the battery business is concerned, the situation remains unchanged. The company has had a good battery business from almost all foreign countries for some years, and the war can make but little difference with the countries that are not now affected by it.

### Satisfied with the Outlook

Mr. E. G. Hatch, manager the Clark Electric & Manufacturing Company, New York: "In normal times our business is about equally divided between domestic and export. For about ten days after war was declared we received very little new business and a few cancellations. We believe the reason for this was, undoubtedly, because the actual declaration of war came very much as a surprise; nine out of every ten people here, up to the last minute, were of the opinion that, although matters looked very bad, no country in Europe would actually take the responsibility of declaring war. When war was actually declared, business men here were more or less stunned and stood aside for the moment to watch results. After about the first ten days our orders began to come in just about as before for

this season of the year. Since then we have done a very good business and have been very well satisfied with the general outlook. So far our export business has not been harmed; in fact, with better conditions in Mexico and South America, we have experienced a renewed demand for material from these parts. We do a considerable business direct with Great Britain, which has not been interfered with in the slightest, except during the first few days. As a matter of fact, we have received a number of large inquiries from Great Britain since the war started. As regards the South American trade, the people there are ready to buy our goods, but are largely prevented by the poor understanding as to credit existing between us. Until we have branches of American banks in South America, or until, possibly, the government lends its assistance, only a small proportion of the South American business actually available will be secured here. We find very little new electrical construction work going on, but, as a matter of fact, conditions are no worse now than they have been for some time past. For a year or more it has not been an easy matter to obtain money for new enterprises. We are not dependent in any way on European countries for raw materials. Our organization is just about the same as last year at this time. So far the war has not hurt us in the slightest, and although business would undoubtedly be better were financial matters in better shape, as to the new building lines, we know that these lines will eventually be built and are very well satisfied with the orders we are receiving under the present conditions. A great deal is being said about the wonderful opportunities in South America. Opportunities do exist, but we think these have been slightly overestimated. There are plenty of ships available from ports here for South America now, and those leaving, in most cases, have not a full cargo. South America is just as badly off as regards the financial situation as we ourselves, or a little worse. Although it needs material, it has not the ready cash to pay for it."

### Export Association to Be Active

Mr. W. N. Dickinson, General Elevator Company, New York: "We are all most anxious to obtain a correct perspective regarding the results accruing from the tremendous events which are occurring at the moment, and each should do his part in assisting toward this end. While I spent nine months of last year in European and South American countries, I am not at all clear concerning the ultimate situation, although I find that certain views are commencing to shape themselves more clearly in my mind. It is not, however, the opinion of any one man which is of particular value at this time, as we are all apt to be influenced by the conditions familiar to ourselves. The American manufacturers who are interested in the export trade have an association known as the American Manufacturers' Export Association, with offices at 66 Broadway, New York City. The directors of this association have conscientiously endeavored to arrive at some common view concerning the important questions regarding which you are seeking information. While they have gone some distance in reaching general conclusions and have taken steps regarding the dissemination of authentic information as to points on which such information is obtainable, they have decided that a general discussion



between men who are actually handling the export business of a number of manufacturing companies would be the best method of arriving at a consensus of opinion which would be of real value and they have arranged for a luncheon at which such discussion will take place on Sept. 18. Some of the well-known manufacturers of electrical apparatus and material are members of this association."

## BANKS AND CREDIT IN SOUTH AMERICA

Report Made by Mr. Edward N. Hurley to Department of Commerce Shows Need of American Banking Facilities

A report on banking and credit in South America has been made by Mr. Edward N. Hurley, president of the Hurley Machine Company, of Chicago, to Secretary Redfield of the Department of Commerce. The report was made at the request of Mr. Redfield and is the result of a study of conditions in South America which was undertaken by Mr. Hurley during a trip to South America as chairman of a delegation representing the Illinois Manufacturers' Association. The conclusion of Mr. Hurley is that, although American trade is well established in Argentina, Brazil, Chile and Peru and is growing despite the lack of direct banking facilities, there is an imperative need for American banks as a dependable resource in the campaign for trade.

Foreign and native banking houses reasonably will accommodate the ordinary routine of American trade, Mr. Hurley states, but they naturally withhold the full measure of interest and solicitous support accorded to enterprises of their own nationality. Moreover, many valuable collateral benefits arising from the financing of overseas trade are lost through American reliance upon London banking mediation, while the compulsory use of European materials in many South American enterprises financed in Europe is steadily restricting the potential market for American goods.

The United States pays London annually a large toll in the form of bankers' commissions, but more important is the fact that once an American obligation is converted into a bill on London and slips into foreign financial channels it passes out of the hands of those who might be interested in obtaining return purchases by the selling country, and an obligation that ought to stimulate a demand for products of the United States is transferred to London and exerts an influence toward purchases from the United Kingdom.

### Credit Agencies

Since the foreign and native banks in South America are called upon to accept drafts representing credits, they must maintain credit information services, no less for their own protection than for the accommodation of customers. For many years these banks have supplied this need, but mercantile credit agencies have also been established in recent years. Foreign banks supply their home offices with the ratings and characteristics of South American firms and individuals. German trade has been extended largely by the aid of longer credits than are granted by other countries, and German banks have been more minute in their organizations of this service. As South American countries are being developed largely with funds from European countries, information as to the character and standing of persons back of the various enterprises is the first need of those whom they approach abroad, hence foreign banks have become channels through which investments are made in railways, light and power companies, etc.

In recent years the practice of stipulating the use of materials from countries loaning the money for railways, port works, etc., has increased, and this operates

to restrict the field for American manufacturers, since American capital does not largely enter the South American field.

Mr. Hurley states that it is obvious that various kinds of banking must be carried on by an institution adapted to assist American trade, for its business, like that of European banks in South America, cannot be limited to strictly commercial banking. Banking services there are intimately connected with loans to governments and cities, with industrial investments, etc., which would not come under the operation of the United States federal reserve act. The conclusion seems correct, therefore, that some of the banking facilities demanded for South American trade may have to be provided by some institutions outside the federal reserve system. Consequently large state banks and trust companies receiving their charters from states are institutions from which assistance may be sought in order that American business men may get the same facilities as the Germans and the English receive from their banks established for the encouragement of foreign trade.

## ENGLAND ACTS ON FOREIGN PATENTS

Announcement from Board of Trade on Patents Owned by Subjects of Warring Countries

The London Board of Trade made an announcement on Aug. 22 in regard to patents owned by subjects of countries with which England is at war, as follows:

"The Board of Trade has issued rules under the patents, designs and trade-marks (temporary rules) act, 1914, regulating the procedure for the avoidance or suspension of any patent or license or trade-mark granted the proprietor of which is a subject of any state at war with His Majesty where an application is made to the board for this purpose. The board must be satisfied that the applicant intends to manufacture the article concerned or carry on the patented process, and also that it is in the public interest that this should be done. The rules provide also for the avoidance or suspension of any application for a patent or trade-mark by a subject of an enemy state."

## SHIP EXPOSITION FOR SOUTH AMERICA

Illinois Manufacturers' Association Proposes to Send Steamer with Samples of American Machinery and Goods

Under the chairmanship of Mr. E. N. Hurley, of Chicago, the foreign trade committee of the Illinois Manufacturers' Association has been very active in its efforts to expand trade with South America. The association has decided to go ahead with the project of chartering a steamship of about 5000 tons to go to South American ports with samples of American machinery and manufactured goods of all kinds. It is planned to fit up the main deck of the boat and also portions of the hold as an exposition of manufactured products suitable for the South American market. Salesmen, and possibly saleswomen as well, will be on board to explain the exhibits, and it is planned to make stops of perhaps several weeks' duration in the principal South American ports, on the east coast at all events and possibly on the west coast. A particular effort will be made to show the goods of smaller manufacturers, as it is felt that a co-operative effort such as this should appeal particularly to those American producers who have not the great resources of the large manufacturing concerns. Novelties and specialties of all kinds are especially desired. Electrical manufactures are wanted.

## PUBLIC SERVICE COMMISSION NEWS

## Ohio Commission

In order to be in position to make appraisals as requested by municipalities throughout the State, the Public Utilities Commission has appointed twenty appraisal engineers and ten appraisal clerks. The selections were made from lists certified to the commission by the State Civil Service Commission, before which the applicants took competitive examinations. The salary paid to the new appointees is \$125 per month. It is probable that the commission will now be able to make requested appraisals more promptly than in the past.

## New York Commissions

The Public Service Commission for the First District has authorized the Edison Electric Illuminating Company of Brooklyn to acquire 122 shares of the capital stock of the Amsterdam Electric Light & Power Company, making it possible for the Edison company to own all of the stock of the Amsterdam company. The order, however, is not to be interpreted as an approval of the merger of the two companies.

At the State Fair in Syracuse, which opened on Aug. 31, the Public Service Commission for the First District has a large exhibit showing the character of its work.

## Massachusetts Commission

The Gas and Electric Light Commission has issued a decision refusing the petition of the municipal light board of the town of Wakefield for authority to sell gas at \$1.20 per 1000 cu. ft. The town also desired to sell electricity at 12 cents per kw-hr. The commission found that this price did not exceed the cost of production as defined by the statute, but in view of the fact that since the hearing the town has made a contract with the Edison Electric Illuminating Company of Boston for the purchase in the immediate future of all its electricity at a price which should effect some saving in its operating costs, the commission found no occasion for action with respect to the proposed maximum net price. With regard to the existing differentials charged for energy used in motor service and commercial lighting, the commission stated that these rates have been in force for some time, and while they are in many cases less than the average cost as determined by the legally defined method, they have secured an amount of custom which probably otherwise could not have been obtained and which has proved advantageous to the business as a whole. These rates are therefore left unchanged. The commission analyzed the cost of manufacturing gas, including fixed charges, and found that even if depreciation were reckoned at 3 per cent, as is permitted for a different purpose by the Acts of 1906, Chap. 411, and if the maturing debt requirements were omitted, the fixed charges exceed 30 cents per 1000 cu. ft., while the operating costs for the past two and one-half years have averaged \$1.08. The average net operating expenses for the past two and one-half years have been \$32,700 and the average annual sales 30,129,375 cu. ft. The commission therefore refused to permit the town to establish the desired net price of \$1.20 and further states that there is no sufficient reason to believe that a loss so substantial is likely to be absorbed by the increase in output to come from the lower price.

The commission has authorized the Buzzard's Bay Electric Company to supply electricity in the towns of Yarmouth, Dennis, Chatham, Harwich and Mashpee. The company plans to extend its lines into Yarmouth from Hyannis, to install a small plant and distributing system in Chatham, and to extend its transmission line over private right-of-way along the middle of Cape Cod.

## Current News Notes

OFFICIALLY ILLUMINATED.—An American, writing from London of his experiences during the sacking of Louvain by the Germans, said that it was always possible to distinguish a German officer after dark by the electric torch he carried strapped to his chest.

\* \* \*

WATER WAS NOT MADE ONLY TO DRINK.—Because of the high price of coal, owing to the fact that the bulk of it is imported, Sweden has come to depend extensively on her water-power for electrical energy. Consul-General Ernest L. Harris writes from Stockholm that 72 per cent of Sweden's towns and cities are lighted by electrical energy derived from waterfalls.

\* \* \*

ELECTRIC MEALS AT POCATELLO, IDAHO.—Passengers over the Oregon Short Line railroad will shortly be served with electrically cooked meals at Pocatello, Idaho, where electric cooking apparatus is being installed in the new station restaurant. All the mixing, baking and cooking in this model kitchen will be done by electricity. If the installation proves as successful as the company's engineers anticipate, the use of electricity will be extended to the railroad's hotel service at many other points on the system.

\* \* \*

FILIPINOS AS LINEMEN.—According to American electrical men in the Orient, the natives of the Philippines make good linemen, even though they may not have very definite ideas of the nature of electricity. They are unafraid without being careless, and willingly use rubber gloves whenever such protection is insisted upon, although at the same time assuring their foremen that their feet, which are calloused, are "all same rubber" for insulation purposes. While converting a 3300-volt transmission line about a mile long from four-pin to six-pin cross-arm construction not a single mishap occurred, although only native linemen were employed and the conductors were energized all the time.

\* \* \*

AN IOWA TRANSMISSION SYSTEM.—The transmission system centering about Clarinda, Ia., which is owned by the Lee Light & Power Company, has been growing for a number of years until now it includes 70 miles of 13,200-volt transmission lines and substations in New Market, Bedford, Gravity, Corning, Blanchard, College Springs, Braddyville and Shambaugh, Iowa, as well as Elmo, Mo. Twenty-four-hour electric service is supplied as well as central-station heating and artificial ice. Mr. Rufus E. Lee, the manager of the Lee Light & Power Company, was also at the head of its predecessor, the Lee Electric Company of Clarinda, and is the president-elect of the Iowa Electrical Association, affiliated with the N. E. L. A.

\* \* \*

ENCOURAGING CANADIAN ELECTRICAL EMPLOYEES TO ENLIST.—To its employees who have enlisted under the British colors the Montreal (Que.) Light, Heat & Power Company makes the announcement that these men will not only be retained in their status as employees as regards the company pension fund and other benefits, but will moreover be allowed the difference in pay between the government rate and the employee's former wages, from date of enlistment to date of discharge or death. If desired, this accrued pay will be sent to the employee's dependents at intervals of two weeks. The present regulation covers the organization



of the first Canadian contingent, but additional orders will be issued in case further Canadian troops are called for.

\* \* \*

**AN ILLUMINATED BOX-OFFICE PLAN.**—A Waukegan (Ill.) inventor has originated an illuminated auditorium plan for theater box offices, which has each seat represented by a small lamp. By means of contacts under the seats in the theater the corresponding lamp is extinguished when any seat is turned down ready for use, thus showing the box-office clerk and the intending purchaser which seats are available at any time.

\* \* \*

**NIAGARA-WINDSOR TRANSMISSION LINE TESTED.**—The new transmission line of the Hydro-Electric Power Commission of Ontario serving Windsor, Ont., the Canadian city across the Detroit River from Detroit, Mich., has now been tested out and made ready for operation. The line is 250 miles long and is carried on both steel towers and wooden poles. The Windsor line and the Welland line were built by the commission under the supervision of its own engineers. The Welland line will carry 18,000 hp to the factories of that place. A large proportion of this energy will be consumed in the electric furnaces of the local carbide works.

\* \* \*

**THE FERTILIZING ACTION OF LIGHTNING DISCHARGES.**—At the high temperature of the lightning flash the nitrogen of the air is burned with the oxygen, forming nitric oxides which, dissolved in rain, are precipitated on the earth in the form of weak solutions of nitric acid. In tropical countries where thunder showers are frequent and severe, this nitrogen-fixing phenomenon of the elements has important value in fertilizing the earth. A French geographer estimates, for example, that in the Tonkin delta in Indo-China the amount of atmospheric nitrogen thus obtained annually is equivalent to nearly 200,000 tons of nitrate of soda, or 150,000 tons of ammonium sulphate, worth \$20,000,000.

\* \* \*

**HOTEL ACCOMMODATIONS, SAN FRANCISCO, 1915.**—Visitors to San Francisco during the 1915 convention of the National Electric Light Association, the International Electrical Congress and other important meetings to be held coincidentally with the Exposition are promised accommodations in nearly a thousand hotels and apartment houses, most of them fireproof and new. It is estimated that some 60,000 rooms will be thus available, and even this number may be increased to 100,000 before the close of the Exposition. The hotel men of the city have also agreed that there shall be no mutual increase in rates. A hotel bureau has already been organized and has booked about 25,000 reservations to date.

\* \* \*

**HOW UNCLE SAM KEEPS EMPLOYEES' PIANOS DRY AT PANAMA.**—Employees of the Panama Canal are furnished gratis with electricity for all lamps in the original outlets in their quarters, but must pay extra for energy required for additional lamps or for the operation of heating appliances, etc. An exception is made, however, in the case of extra lamps installed by the electrical division to keep moisture out of pianos. For lamps burned for this purpose no charge is made. Extra lamps for lighting up to 50 watts rating cost 50 cents per month, flat rate, and lamps of from 50 watts to 100 watts rating cost \$1 per month. For electrical appliances the monthly charges are as follows: 100 watts or less, 50 cents; 100 to 550 watts, 75 cents; 550 to 1000 watts, \$1; 1000 to 1500 watts, \$1.50. No

charges are made for less than a full month, and bills not paid within fifteen days are increased by 25 per cent, service meanwhile being cut off, not to be resumed without authority of the Governor of the canal.

\* \* \*

## SOCIETY MEETINGS

**JOINT OUTING OF ELECTRICAL SOCIETIES IN DETROIT.**—The American Institute of Electrical Engineers, Detroit Section, and the Industrial Electrical Engineering Society of that city held a joint outing at Bois Blanc Park on Aug. 29. It is reported that plans are under way for the consolidation of the two organizations.

\* \* \*

**KANSAS CITY ELECTRIC CLUB.**—The Electric Club of Kansas City, Mo., will hold its first meeting of the fall on Sept. 8, at the Baltimore Hotel, Kansas City. The club is composed of electrical engineers, manufacturers, jobbers, etc., and meets every second Tuesday at noon. At these luncheon sessions speakers address the club on subjects pertinent to the electrical industry.

\* \* \*

**INDIANA ASSOCIATION CHANGES MEETING PLACE.**—Revising its tentative plan, the Indiana Electric Light Association has decided to hold its convention at Indianapolis, Sept. 23 and 24, instead of at Terre Haute, Sept. 24 and 25, as noted in the *Electrical World* of July 18 and Aug. 29. Meetings will be held at the Hotel Severin. Mr. Thomas Donohue, Lafayette, Ind., is secretary of the association.

\* \* \*

**PROMOTION OF SAFETY IN BOILER CONSTRUCTION.**—On Sept. 15 the committee on boiler specifications of the American Society of Mechanical Engineers will hold a hearing at 29 West Thirty-ninth Street, New York, at which it will make its report on "Specifications for the Construction of Steam Boilers and Other Pressure Vessels and for the Care of Same in Service." Tentative drafts of this report have already been submitted to various recognized authorities for suggestions. The proposed standard specifications are intended to reduce the loss of life and property from boiler explosions.

\* \* \*

**CONVENTION OF KANSAS GAS, WATER, ELECTRIC LIGHT AND STREET RAILWAY ASSOCIATION.**—The date of the annual meeting of the Kansas Gas, Water, Electric Light and Street Railway Association, which was scheduled for Oct. 15, 16 and 17, has been changed. In order to avoid a conflict with the annual meeting of the Jovian Order, to be held in St. Louis, the Kansas association has postponed its meeting until Oct. 22, 23 and 24. The convention will be held at Arkansas City. Mr. W. H. Fellows, Leavenworth, Kan., is secretary of the association, and Mr. A. L. Newman, Arkansas City, is president.

\* \* \*

**PACIFIC COAST REJUVENATION.**—On Sept. 12, during the joint convention of the Pacific Coast Section of the A. I. E. E. and the Northwest Section of the N. E. L. A. at Spokane, Wash., a rejuvenation will be held by members of the Jovian Order in attendance. Mr. H. B. Haggemiller will be in charge of the degree work, and Mr. E. J. Simons will supervise the degree team, which will be made up as follows: Mr. C. L. Bankson, Hercules; Mr. H. B. Peirce, Mercury; Mr. C. F. Uhden, Vulcan; Mr. M. Sebern, Mars; Mr. F. Austin, Jupiter; Mr. H. K. Stacy, Neptune; Mr. H. L. Bargion, Pluto; Mr. L. N. Rice, Avernion, and Mr. J. A. Gorman, Apollo. Following the initiation there will be a banquet at which Mr. H. L. Bleecker will preside as toastmaster.

## Rapid Plant Construction at Hot Springs, Ark.

Handsome new 2500-kw turbine station ready 115 days after the destruction of former plant in conflagration of a year ago—Emergency service and construction methods

THE Citizens' Electric Company, Hot Springs, Ark., a subsidiary of the Federal Light & Traction Company, New York, has the distinction of breaking all previous records in constructing its new 2500-kw generating plant within 115 days after the destruction of its old station by fire Sept. 5, 1913, exactly one year ago. The old plant and several miles of feeder and distribution lines radiating therefrom were in the path of the conflagration which swept Hot Springs that September day, devastating nearly one-third of the city

station, a feat to which is ascribed the fact that the whole city was not destroyed. These men left only when the fire was upon them and fortunately escaped without injury. The water-pumping station contained auxiliary steam-pumping equipment which was put in operation more than an hour before the electric service was interrupted. Though no rain had fallen for several weeks prior to the fire, the reserve capacity of the company's reservoirs was sufficient to maintain excellent pressure during the entire fire. This fortunate circumstance,



FIG. 1—RUINS OF BURNED PLANT, AND STATION FURNISHING EMERGENCY SERVICE



FIG. 2—HURRYING CONSTRUCTION NIGHT AND DAY. SIXTEEN DAYS AFTER BREAKING GROUND

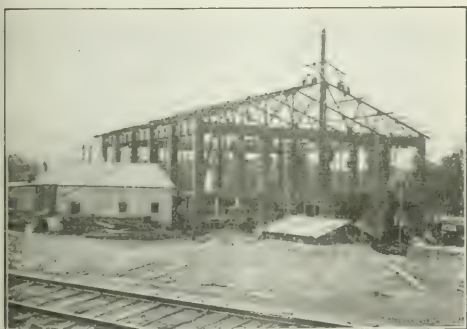


FIG. 3—THE STEEL FRAME ERECTED THIRTY-TWO DAYS AFTER BREAKING GROUND



FIG. 4—THE FINISHED PLANT 115 DAYS AFTER BEGINNING CONSTRUCTION WORK

### BUILDING A 2500-KW STEAM-TURBINE STATION IN 115 DAYS

—an area of fifty-five blocks—and crippling all electric service, including that of the street railways.

Although the doomed generating station was in the heart of the fire-swept district, it is interesting to note that electric service was supplied from the threatened plant to a motor-driven pumping station on the outskirts of the city throughout the early part of the fire and until long after the steam-pumping station had been placed in service. Great bravery was displayed by the power-plant engineers, who remained at their posts to operate the electrical equipment furnishing energy to the pumping

taken with the devotion of the plant engineers, was the only thing that saved the rest of the city from destruction. An account of the damage caused by the fire was published in the *Electrical World* of Sept. 13, 1913.

#### Re-establishing Service

Before the fire was out at Hot Springs, the New York office of the Federal Light & Traction Company had become a scene of intense activity. Mr. W. A. Haller, general superintendent and chief engineer of the Federal Light & Traction Company, started for Hot Springs on



the afternoon of the fire, even before the destruction of the power station was reported. He examined the ruins and quickly outlined plans for the restoration of temporary service and the construction of a new station. Meanwhile the executive and purchasing departments began to rush new equipment to the stricken city, and manufacturing companies were called upon to aid. Tele-

developed sufficiently to permit ordering apparatus and material for the construction of a new station on a new site. From this new plant regular service was established on Jan. 1, 1914, just 115 days after the fire. The new station, although built in this record-breaking time, is well arranged and presents the appearance of a beautiful and efficient piece of construction.

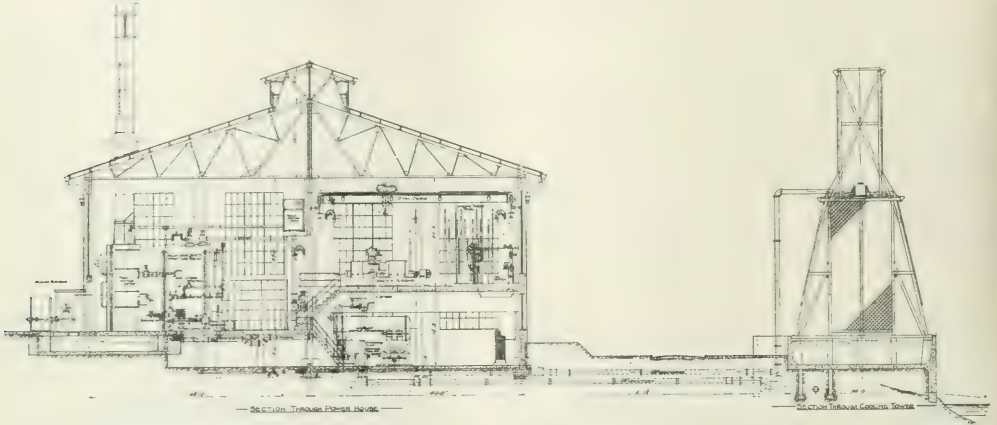


FIG. 5—VERTICAL SECTIONS OF STATION AND COOLING TOWER

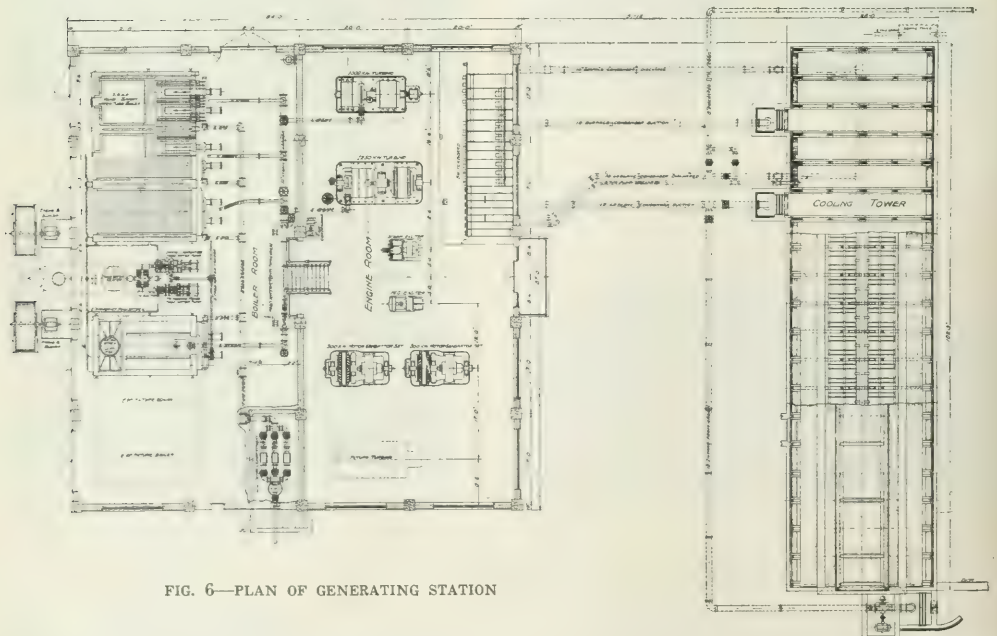


FIG. 6—PLAN OF GENERATING STATION

grams were sent to all parts of the country tracing turbines and other equipment, either new or second-hand, which could be bought and hurried to Hot Springs. Rush orders were also placed for transmission, trolley and feeder wire.

Within ten days after the disaster emergency service was furnished the city, which had not yet recovered from the demoralizing effects of the fire, and coincident therewith the designs for a new station had been

#### Old Equipment Recovered

The destroyed station, which was a brick-frame structure, contained 2600 kw in Westinghouse and General Electric generating equipment, 450 kw of which was engine-driven and the remainder turbine-driven. The steaming apparatus consisted of 1860 hp in Stirling boilers. The entire building was demolished and most of the equipment was rendered unfit for operation. Upon investigation, however, it was found that the

1250-kw General Electric turbine-driven generator could be used if rewound and the external mechanical parts replaced. Expert repairmen were sent by the manufacturer to put the unit in condition for operation, which was accomplished in three days and nights from the time the material was received. Although the boilers were badly damaged, several of them were restored and



FIG. 7—ENGINE ROOM

temporarily operated at reduced pressure until the new station took over the load. A temporary corrugated sheet-iron building was erected on the site of the burned plant to house the turbines, switchboard and railway apparatus.

As the rest of the equipment was unserviceable, the surrounding territory was canvassed for auxiliary apparatus. A 30-kw engine-driven exciter was secured from the Springfield (Mo.) station and shipped to Hot Springs by express; a motor-generator set for railway supply was shipped on a personally accompanied car from Lynn, Mass., and a new switchboard which was

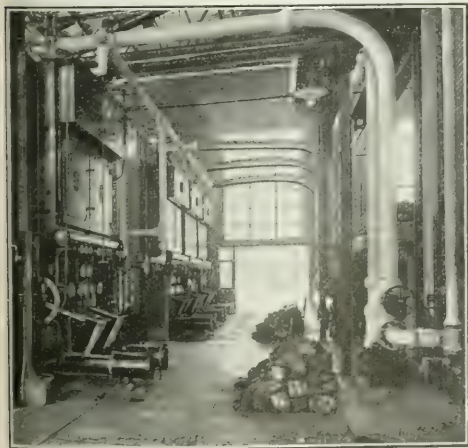


FIG. 8—GAS-BURNING BOILERS

just being installed by the Federal Light & Traction Company in Albuquerque, N. M., was expressed to Hot Springs for use in the temporary station. As the distribution system in the burned district had to be replaced, new poles were secured from the local telephone company and from telephone companies in Little Rock, Ark., and Memphis, Tenn. Wire was obtained

from different branches of the American Steel & Wire Company.

Materials were received and workmen were engaged so that about 5 miles of line had been strung by the time the temporary generating station was ready for operation. Emergency lighting and motor service was restored on Sept. 15, railway service being re-established seven days later.

#### Emergency Railway Service

During the rehabilitation period emergency service was furnished by the railway department of the company by operating horse cars in various parts of the city. To render this service the smaller electric cars were stripped of electrical apparatus to reduce their weight and were equipped to be drawn by mules. The mule cars were later supplemented by tally-ho coaches and automobiles giving transportation service at the regular 5-cent rate. It is worthy of note that the mule cars proved to be the smallest revenue producers, while the

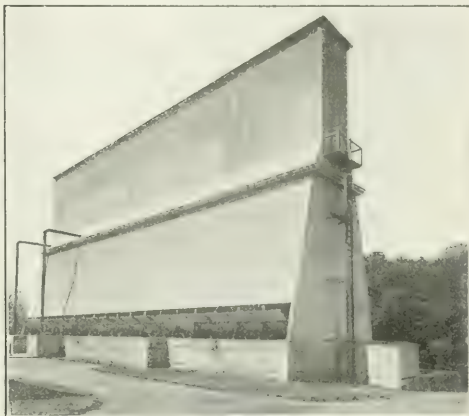


FIG. 9—COOLING TOWER

automobiles, hired at \$20 a day, gave the best service, were the best earners, and almost paid for their rental.

#### Preparations for New Station

To build a power plant under the best of conditions requires elaborate preliminary investigations to determine upon the location and the type and size of station to be constructed, and detailed study to develop the construction plans. In addition to the time consumed in assigning contracts for equipment, material and labor, and in actual construction, there are usually numerous delays brought about by bad weather, failure of material to arrive, labor conditions, etc. The work of constructing the new Hot Springs station was, however, carried on with unprecedented dispatch, and the apparatus and materials arrived on the job in most instances within a day or two of the time required.

Designing and construction engineers employed on other properties of the parent company were ordered to Hot Springs even before the fire had ceased. These men rendered valuable and efficient help, first in establishing temporary service and later in designing and constructing the new station.

As the old property had acquired a value which made it undesirable to reconstruct the generating station on that site, the company's representatives selected and purchased a tract of land about a mile south of Hot Springs on the "Iron Mountain" railroad and the Hot Springs Creek. Although the new site is not so near the load center of the system as was the old plant, the site is



[illegible]

FIG. 10—OPERATING RECORD ON STATION LOG SHEET

admirably located for the future since the city is rapidly extending in that direction.

Building plans for the new station were started on Sept. 10, all the engineering and designing being done on the job so that actual construction could be carried on in parallel with the drafting, thus avoiding delay. Ground was broken on Sept. 16, a work office was constructed, and temporary electric-service lines were erected to supply energy for lighting and motors on the job when emergency service from the temporary station was restored on Sept. 15. Meanwhile rush orders for immediate shipment had been sent out for equipment and building material. Roof trusses and crane runways were obtained from Memphis, Tenn.; sand, cement, brick and gravel from local firms, and reinforcing steel from St. Louis. A crane was shipped to the site in ten days, two boilers were ordered for delivery by Oct. 21, a 1000-kw turbo-generator set was ordered from stock

The removal of the 300-kw railway motor-generator from the temporary station to the new station was a feature worthy of note. The second motor-generator had not arrived in Hot Springs at the time the new station was ready for operation; therefore it became necessary to remove to the new station the machine then being operated in the temporary station. To insure the least possible interruption to the railway service, the motor-generator was shut down at midnight Jan. 14, disconnected and transported 800 ft. on rollers, there loaded onto a flat car and transferred to the new station, installed, connected and placed in operation by 7:15 the following morning, the total time consumed being six hours and forty-five minutes.

#### Description of Plant Equipment

The new station is a reinforced-concrete structure with brick curtain walls, steel sash and doors fitted with wired glass throughout, and steel roof trusses carrying a roof consisting of two layers of corrugated galvanized iron with a layer of 1-16-in. asbestos placed between to prevent sweating.

The present equipment of the new station consists of two 2300-volt turbo-generator units rated at 1000 kw and 1250 kw respectively, two 300-kw synchronous-motor-generator sets, one 30-kw induction-motor-driven exciter, one 30-kw marine-engine-driven exciter, four 316-hp Heine boilers equipped to burn gas or coal, a 20-ton Whiting crane, and the usual auxiliaries. The motor-generator sets operate at 2300 volts. The switch-board was constructed, assembled and shipped thirty days after the order was given. Space has been provided in the station for the addition of two more boilers and one more turbo-generator set. All of the electrical equipment, except the motor-driven exciter, was furnished by the General Electric Company. The exciter was built by the Westinghouse Electric & Manufacturing Company.

#### Cooling Tower

As the water in the creek adjoining the plant comes from the famous hot springs and is too warm for condensing purposes, besides containing considerable sewage, it was necessary to erect a cooling tower. This tower, which is of the natural-draft type, consists of a long trough at the top connecting with projecting laterals which are slotted to allow water to trickle down over the cooling surfaces. The latter consist of square wooden bars supported in a horizontal position with one diagonal in the vertical position. By arranging the bars in this position a larger effective cooling surface is presented to the water, which is also assisted in its downward course by the sharp edges of the bars being lowermost.

#### Gas-Burning Furnaces

Each boiler is equipped to burn either gas or coal. Eleven Gwynn gas burners are employed under each boiler for burning gas, and two Jones underfeed stokers are installed under each boiler for coal firing. The gas nozzles are arranged above the furnace doors so that they do not interfere with coal combustion, it being possible to carry on both methods of firing at the same time. When only gas is being burned the grates are kept covered with ashes to prevent their being fused by heat reflected from the furnace arch. Natural gas is piped into this plant from the Caddo-Louisiana fields.

The Hot Springs plant is now producing an average of 1 kw-hr. of energy per 50 cu. ft. of gas burned. The gas contains 850 lb.-Fahr. heat units per cu. ft. The amount of labor required per kilowatt-hour developed is also very low for a station of this size, an average of 160 kw-hr. of energy being generated per hour of operating labor.



FIG. 11—TYPE OF TRANSMISSION LINE FROM NEW STATION

and shipped three days later, followed by personal tracers, and the condenser was sent within three days.

To hasten the work, night shifts were employed wherever double shifts could be employed to advantage, and light was provided by tungsten lamps suspended from poles erected along the sides of the building line. Messenger wires supporting additional lamps were strung from these poles to a wooden elevator tower at one side of the building. Riveting, concrete chipping, etc., were performed by compressed-air apparatus.

#### Progress on New Station

By Sept. 23 foundation forms were in place and concrete was being poured. The concrete up to the main engine-room floor was all poured within two weeks, and by Oct. 21 the roof trusses, with the exception of the monitor, were in place. Boilers were being installed early in November, and steam was raised and some of the apparatus had a preliminary try-out on Dec. 10. The station was operated intermittently thereafter until Jan. 1, when the electrical equipment was in shape for regular service. From that time on energy for lamp and motor service has been delivered regularly from the new station. The 1250-kw generator and the 300-kw motor-generator set in the temporary station were then transferred to the new plant, making the total rating of the station 2250 kw.



## High-Tension Distribution in Central Texas—II

**Commercial organization of the Texas Power & Light Company and sale of service to local industries—Electrical operation of cotton gins, pumping plants, railway shops, etc.**

**F**OR the purpose of commercial organization the territory served by the company is divided into five "branches," each branch's headquarters being in the chief town of its district. The manager of such a branch has general charge of all matters relating to dealings with customers in his territory, which usually includes, besides the headquarters city, several smaller outlying towns where no company representative is regularly stationed.

The branch manager reports directly to the general superintendent and the general manager and maintains his own staff of clerks, meter readers and linemen. The latter are under the orders of the local manager for all work in connection with distribution construction, but are subject to call by the power department for assistance on the high-tension lines when needed.

Salesmen, on the other hand, are detailed to the local manager on request to the sales department, and during the time the salesman is in the branch territory his salary and expenses are charged to the local office. The commercial department now has a dozen trained salesmen, many of whom specialized on some particular department of central-station service. The assistance of these experts is particularly valuable, of course, when special campaigns are to be undertaken. Credit for sales is in each case assigned to the local business office, the branch manager being held entirely responsible for results.

Construction work being done in any of the branch

districts is in charge of a resident engineer who is detailed by the construction department to "be on the job" and to confer with the local manager if the latter has suggestions to offer. Attached to the main office staff there is also a general meter inspector who travels about the system and supervises the care of meters, switches and electrical apparatus in general.

### Meter Reading and Billing

The customers' meters of the entire branch territory are read by a man from the branch headquarters, and bills are later sent out from the same office. Customers in the "section" towns where the company has no office may remit by check to the branch headquarters or they may pay cash to some designated local merchant who receives a fixed monthly sum for handling these collections for the electric company. As the arrangement is one which brings people to his store, the merchant usually finds this service a good local advertisement for his own business.

In the smaller towns of this system residence meters are, whenever possible, installed on the back or front porches so that they may be read without the inspector entering the house. This accessibility proves especially useful on muddy days and at times when the occupants of the house are absent. As the meter reader may remain in a small town only part of a day before moving on to the next one, it is important that he be able to make all of the readings quickly and conveniently.

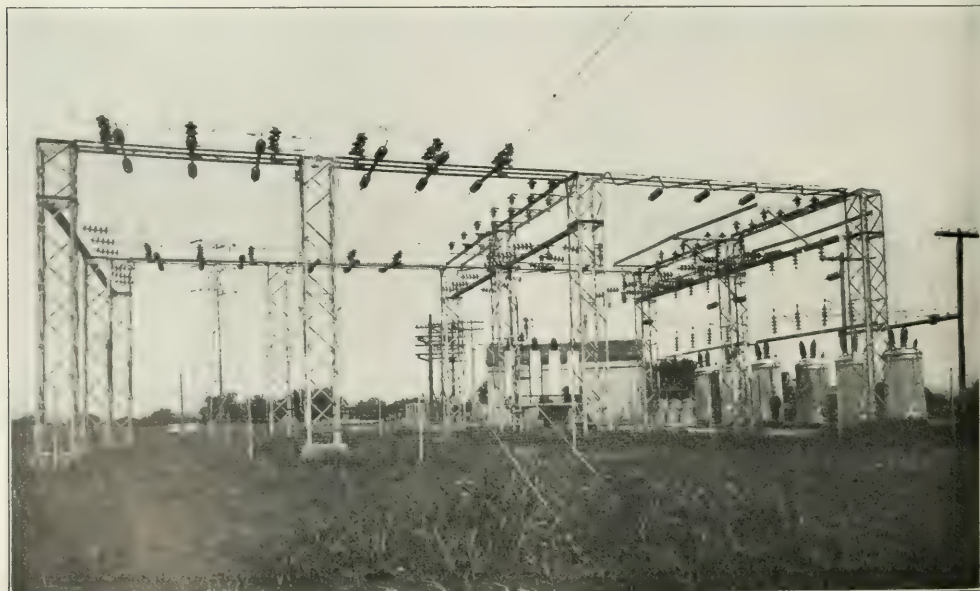


FIG. 17—COMBINED RAILWAY AND LIGHTING SUBSTATION AT WAXAHACHIE

The rates of the Texas Power & Light Company are thoroughly standardized despite the large territory and wide variety of conditions under which the company furnishes service. In the larger cities the residence-lighting rate is 14 cents per kw-hr. for the first 20 kw-hr. and 7 cents for all thereafter. In the smaller communities the corresponding rates are 15 cents and 8

affected, however, by the large number of negroes in some of the communities. The ratio of wired to unwired business buildings similarly varies from 58 per cent to 100 per cent.

All service is metered, and no flat rates are offered

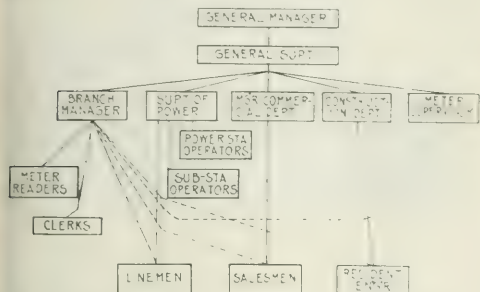


FIG. 18—OPERATING ORGANIZATION. TEXAS POWER & LIGHT COMPANY

cents per kw-hr. The minimum monthly bill is \$1, and customers receive a cash discount of 10 per cent for prompt payment.

#### Co-operation with Dealers and Contractors

The company handles no supplies or lamps, referring all merchandise business to the local dealers and contractors in its communities. Motors are sold by the power company only when necessary to serve the customer's interest, as in the case of hurried installations, etc. In every way possible the contractor and dealer is encouraged to expand his own business to its fullest extent, and to this end there is even offered the co-operation of the company's advertising department to assist the dealer in preparing his advertising matter.

In cases where a prospective customer desires to have his house wired and to pay for the work on the installment plan the company will, after having solicited the business, turn the job over to the contractor at a discount of 10 per cent, meanwhile repaying itself from

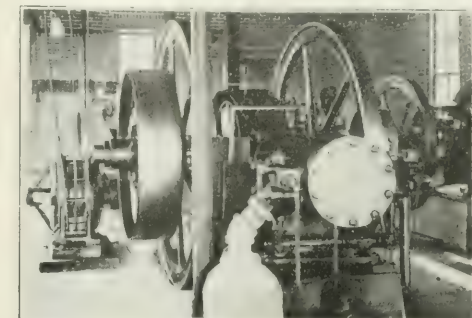


FIG. 20—35-HP MOTOR REPLACING GASOLINE ENGINE IN WATER-WORKS PUMPING STATION

except for patrolled sign and outline lighting and "awning" lamps. In the towns served by the company many business establishments have permanent wooden "awnings" sheltering the sidewalks in front of their show windows. Lamps on the undersides of these awnings serve to light the thoroughfares after dark and provide a form of ornamental illumination which corresponds to "white-way" lighting in other communities.

Street-lighting service furnished by the company is by 4-amp series tungsten lamps in towns of less than 10,000, and by 4-amp magnetite-arc lamps and tungsten units in the larger cities. Lamps are lighted and extinguished on the all-night basis, the rates for the service being as follows:

100-cp series tungsten lamps.....	\$2.00 per month
80-cp series tungsten lamps.....	1.50 per month
60-cp series tungsten lamps.....	1.25 per month
4-amp magnetite lamp.....	72.00 per year

Among the principal motor loads of the Texas Power



FIG. 19—ELECTRIC-SERVICE LINES TO COTTON GIN

the customer in four or six monthly instalments. A fixed schedule of unit housewiring costs is agreed upon between the contractors and the company. A recent survey of the territory showed that in the towns served the proportion of wired to unwired dwellings ranges from 26 per cent to 69 per cent. These ratios are

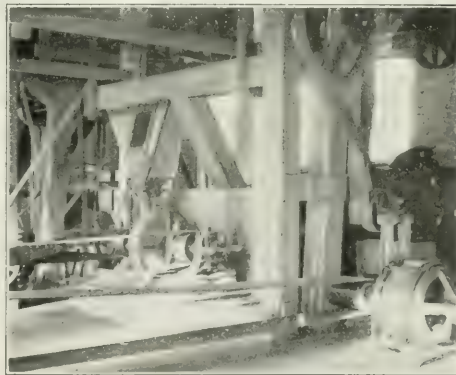


FIG. 21—ATTRITION MILL DRIVEN BY 75-HP MOTOR

& Light Company are the electric interurban and street railways in its territory, cotton gins, cottonseed-oil mills, cotton mills, flour mills, city pumping plants, railway shops, brick plants and small refrigerating outfits. Owing to the warm climate of this section of Texas, the company also enjoys a large day fan load which con-





FIG. 22—OUTDOOR INSTALLATION OF RESIDENCE METER

tributes considerably to the improvement of its load-factor.

Some twenty cotton gins are now served by the lines of the company. These establishments secure the special gin rate under which the first 3000 kw-hr. are sold at 5 cents per kw-hr., the second 2000 kw-hr. at 4 cents per kw-hr., and all over this amount at 3 cents per kw-hr.

The ginning load begins about the middle of August

and continues until January. The average gin has a connected load of about 100 hp in motors and is usually operated twelve hours daily.

A typical ginning installation is that shown in Fig. 19. The incoming 4000-volt lines are led to the trans-

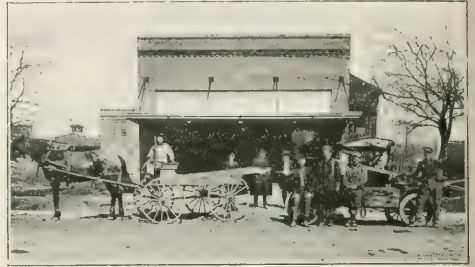


FIG. 24—BRANCH OFFICE AND STAFF, HILLSBORO

former-pole structure shown at the right of the illustration. At one end of the platform is seen the pole-type oil switch which interrupts the main circuit. This switch is manipulated by a pull rope reached from the ground, so that by giving the handle a jerk the entire mill equipment may be de-energized when service is not required.

A 20-hp motor drives the suction blower in the octagonal cotton house seen in the foreground. By means of air pressure the cotton is first removed from the wagons to the bins inside this building, and is later transferred to the gin, which is shown in the background of the picture. Each "side" of the gin, consisting of four "stands" of eighty "saws" each, is



FIG. 23—INTERIOR OF ELECTRICALLY OPERATED COTTON GIN

driven by a 75-hp motor. A 15-hp motor drives the air compressor with which water is pumped to operate the hydraulic compress in which the bales receive their initial squeeze. The energy cost for ginning a bale of cotton at this plant has been found to average about 60 cents. The introduction of electrical service in the Texas region has worked great economies for the local gin owners, for the installation of an electric motor saves at least one-half the cost of a boiler and engine, besides avoiding the necessity of hauling water and fuel, which are sometimes difficult to obtain in this section. With electric drive the services of a stationary engineer can also be dispensed with.

#### Cottonseed-Oil and Cotton Mills

The cottonseed-oil mills, of which the company operates about half a dozen, start in July and run until the first of the following April. These mills average connected loads of about 300 hp and during the period of operation are run continuously all the twenty-four hours of the day, so that the load is a valuable one from the standpoint of load-factor improvement. The cottonseed-oil mills, like the flour and cotton mills, take advantage of the company's special high load-factor rate, which comprises a connected-load charge of \$1.50 per kw per month plus 1.25 cents per kw-hr. for the energy consumed.

The commercial department is now making special efforts to acquire cotton mills, several of which are already in operation from the company's lines. These mills operate long hours daily and are therefore particularly desirable on account of their high load-factors.

Brick plants, of which the power company serves a number, also offer a favorable element in their summer operation, which is coincidental with the season of greatest building activity. These plants ordinarily be-

gin in February and are operated until September, shutting down soon after the wane of the building season.

A number of small refrigeration plants are served from the transmission system, but there are as yet no ice factories such as have been operated successfully in the larger cities of the North. Southern people have



FIG. 26—400-HP MOTOR DRIVING COMPRESSOR IN RAILROAD SHOPS

been so accustomed to perfectly clear artificial ice that they do not take kindly, it is explained, to raw-water ice. For this reason the electrically operated ice factory in Texas cannot yet compete with steam-operated plants which provide their own distilled-water supply.

In ten of the cities and towns reached by its lines the company has also acquired the municipal water-supply pumping. These pumping installations range from 3 hp

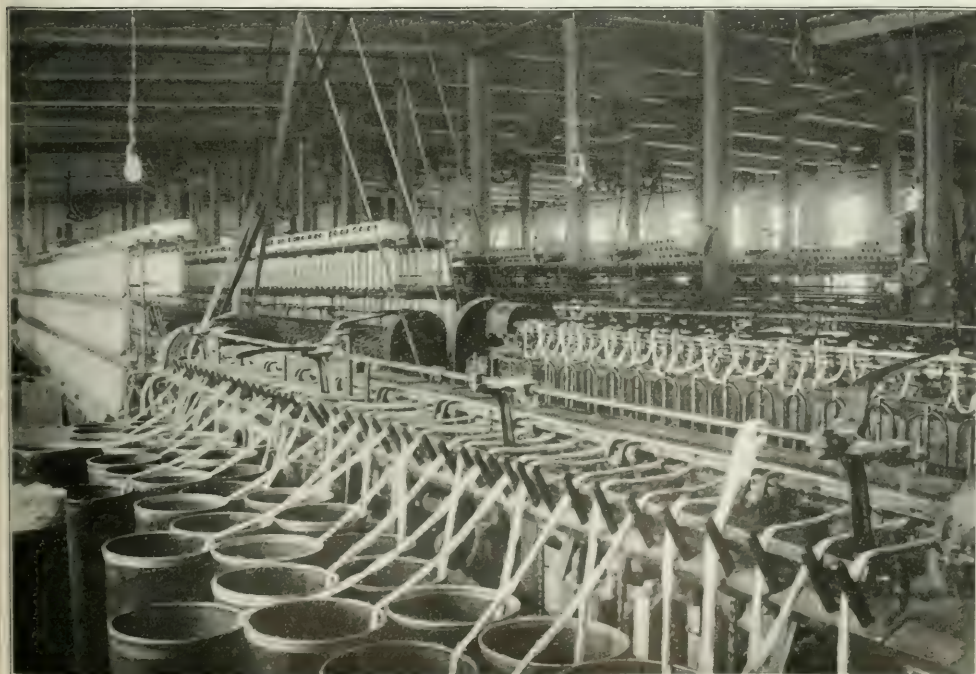


FIG. 25—MOTOR DRIVE IN COTTON MILL, WEST, TEX.



to 180 hp in motor rating and are served on the kilowatt-hour basis, the municipality furnishing the motors and equipment and purchasing from the central-station company the energy required.

Mr. J. F. Strickland is president of the Texas Power & Light Company and Mr. George S. Haley is vice-president and general manager. Mr. F. R. Slater is general superintendent, Mr. G. S. Schmauder is superintendent of power, and Mr. Hartwell Jalonick is manager of the commercial department.

## Simplified Hyperbolic Calculations for Transmission Lines

By H. B. DWIGHT

It is generally agreed that the voltage of long transmission lines obeys the laws indicated by the hyperbolic theory of transmission lines, and electrical formulas, to be acceptable to engineers, must give the results of the hyperbolic theory with good accuracy. It is still a mooted question, however, what method is best for calculating the above results. This should not be the case, for it can be shown that if all the proffered methods are conscientiously used for solving a given problem on long transmission lines, one method will undoubtedly be chosen as superior to the others, because of its easiness to learn, its shortness for routine work, and its complete accuracy. This is the method of convergent series.

The method of convergent series in its present simple form was first announced, so far as the writer is aware, in the *Applied Science Magazine*, University of Toronto, March, 1909, by Prof. T. R. Rosebrugh, who shortly after gave a further description of it in the *Proceedings*, A. I. E. E., November, 1909. The method has been thoroughly described and recommended in various articles and books, and hence in the present article an attempt will be made merely to show by a definite example how advantageous this method is.

The article by Dr. A. E. Kennelly and Dr. Harold Pender in the *Electrical World* of Aug. 8, 1914, contained many valuable results. It was shown that, in the absence of extremely exact test measurements of actual long transmission lines for checking the hyperbolic theory, an artificial line can be used to good advantage. It was also shown that for certain problems of practical engineering importance the results of the hyperbolic theory are necessary. However, the two methods shown in the above article for calculating the results are, to say the least, forbidding to many electrical engineers. It is only fair to show an alternative method of obtaining exactly the same calculated results, and the choice of methods can then be made by anyone, whether skilled or not in the use of trigonometric tables or of special charts and tables for hyperbolic cosines, etc.

The problem of finding line voltages, which is solved in two ways in the article referred to, can be accurately solved without the use of any tables whatever, and without any mathematical feature of any difficulty except the usual use of complex quantities, which is becoming quite common in alternating-current calculations. In order to show how short this method is, every step which would be made by anyone solving this problem for the first time will be given in the following paragraph.

Formula:

$$E_r = E_b \left( 1 + \frac{YZ}{2} + \frac{Y^2Z^2}{2 \cdot 3 \cdot 4} + \frac{Y^3Z^3}{2 \cdot 3 \cdot 4 \cdot 5 \cdot 6} + \frac{Y^4Z^4}{2 \cdot 3 \cdot 4 \cdot 5 \cdot 6 \cdot 7 \cdot 8} + \text{etc.} \right)$$

$$Z = 8 (3.83 + j 66.28)$$

$$(\text{From data given}) Y \div 2 = 4 (3.2 + j 577.2) 10^{-4}$$

$$= 1.2242 + j 0.0068$$

$$+ 0.0004 + j 0.0707$$

$$YZ \div 2 = -1.2238 + j 0.0775$$

$$YZ \div 12 = -0.2040 + j 0.0129$$

$$+ 0.2496 - j 0.0158$$

$$- 0.0010 - j 0.0158$$

$$Y^2Z^2 (2.3 \cdot 4) = + 0.2486 - j 0.0316$$

$$YZ \div 30 = -0.0816 + j 0.0052$$

$$- 0.0203 + j 0.0013$$

$$+ 0.0002 + j 0.0026$$

$$Y^3Z^3 \div (2 \cdot 3 \cdot 4 \cdot 5 \cdot 6) = -0.0201 + j 0.0039$$

$$YZ \div 56 = -0.0437 + j 0.0028$$

$$+ 0.0009 - j 0.0001$$

$$0 - j 0.0002$$

$$Y^4Z^4 \div (2 \cdot 3 \cdot 4 \cdot 5 \cdot 6 \cdot 7 \cdot 8) = + 0.0009 - j 0.0003$$

Further terms of the series are plainly negligible.

Adding the series,

$$+ 1.00$$

$$+ 0.2486 - j 0.0316$$

$$+ 0.0009 - j 0.0003$$

$$+ 1.2495 - j 0.0319$$

$$- 1.2238 + j 0.0775$$

$$- 0.0201 + j 0.0039$$

$$- 1.2439 + j 0.0814$$

$$\text{Sum} = + 0.0056 + j 0.0495$$

$$\text{Effective value of series} = 0.0495 + \frac{0.0056 \times 0.0056}{2 \times 0.0495}$$

$$= 0.0495 + 0.0003$$

$$= 0.0498$$

$$\text{Therefore } E_b = E_a \times \frac{1}{0.0498}$$

$$= 51.5 \times 20.06$$

$$= 1033 \text{ volts.}$$

In contrast to the above small amount of arithmetical and slide-rule work, the "calculation by simple trigonometry" requires finding with exactness from the tables angles  $\theta$ ,  $\phi$  and  $\psi$  and calculating four rather long algebraical formulas. So, also, the "calculation in terms of hyperbolic functions" requires looking up three angles in trigonometric tables and one value from a chart of hyperbolic cosines, besides an amount of multiplying, taking square root, etc. The actual labor of doing this work with exactness consumes more time than calculating the series, and there is increased risk of error due to complicated and unusual formulas.

It may be true that the use of hyperbolic functions is necessary for solving high-frequency problems in telephone and wireless work. Hyperbolic functions will have the best chance of being advantageous for energy-transmission lines in high-frequency problems, such as the one herein considered. If, then, the convergent series are less laborious, even for a line of quarter wave-length, it is evident that for more ordinary problems the series should be the only method considered, since one or two terms of the series are all that are needed.

The result of the above comparison of methods is the same for load conditions as for no-load conditions. It is, therefore, reasonable to suggest that before electrical engineers are asked to use hyperbolic functions directly in energy-transmission problems, a thorough comparison be published showing the relative laboriousness of the different available methods.

# Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods and Current Practice Among Successful Utilities

## A Dollar-a-Month Wiring Offer at Kansas City

The Kansas City Electric Light Company has been prosecuting an especially effective campaign for the installation of electricity in homes. The central idea in the movement is the comfort and convenience of the housewife in the kitchen, and the company offers to have a kitchen wired for electric service with a two-outlet wall bracket, and to provide a 60-watt lamp and a 6-lb. electric iron, fully equipped and ready for use, for an initial payment of \$1. The total cost of the installation and equipment is \$12, the remainder being payable at the rate of a dollar a month. Not only have the women responded in numbers to the inducement and secured the comfort of electricity in the kitchen, but the attention attracted to the subject has resulted in at least half the customers buying additional wiring and equipment. The idea originally entertained was that if householders learned the usefulness of electricity in the kitchen, they would later extend the service to the rest of the house; but the contractors who make the installations for the company have, as mentioned in a large number of cases, secured the orders for the larger work at once. The \$12 barely covers the actual cost of the work, but the campaign has already been thoroughly successful in adding customers to the lines of the company.

## New England Electric-Vehicle Business Growing

Signs of an increased demand for electric vehicles and industrial trucks are apparent in New England, after a somewhat quiet summer in this branch of the industry. Two new machines, one of 5-ton and one of 0.5-ton capacity, have just been purchased by the New England Confectionery Company, Boston. The lighter outfit will be used in the company's banking affairs and in making quick deliveries of special orders. Two 2½-ton trucks have lately been purchased by Brown & Wales, dealers in rolled steel and iron, Boston, and the Pittsburgh Plate Glass Company has ordered two 2-ton trucks. The Tallulah Paper Company, Fitchburg, Mass., Lowell Bleachery, Claremont (N. H.) Gas Company, the Pairpoint Corporation, cut-glass dealer, New Bedford, Mass., the J. V. Spare Dry Goods Company, New Bedford, and the Outlet Company, a large department store in Providence, R. I., have just purchased electric trucks, the last-named concern having ordered seven machines of from 1500-lb. to 2-ton capacity for retail city deliveries. A large garage equipped to care for both gasoline and electric cars will shortly be completed by this house, the gasoline cars being used only on the suburban long-distance work. One electric-vehicle dealer in Boston has sold six industrial trucks within the past week, and inquiries are increasing regarding prices and equipment. A number of industrial concerns owning electric trucks are having their equipment overhauled in anticipation of an early resumption of rush business. New rates for electric-vehicle battery charging have been put in force at Providence and by the New London division of the Connecticut

Power Company. The Copley-Plaza Hotel has leased its ballroom for a passenger-car salon to be held this fall, and meetings of the Electric Motor Car Club of Boston will probably be started soon.

## An Electrical Appeal to the Tourist

An energetic campaign has been waged during the present summer by the Cumberland County Power & Light Company, of Portland, Maine, to develop the use of electrical conveniences by tourists, thousands of whom visit Portland during the vacation period. In general the local hotels and boarding houses are liberally wired for electric service, and Portland is well provided with these accommodations, for the city is one of the chief points of departure for coast resorts and the White Mountain region besides being an at-



ELECTRIC REMINDERS FOR VACATION TRAVELERS

tractive summer residence town in itself. The company shares its appliance-exchange store with the local board of trade, which runs an information bureau and tourist registry directly opposite the table shown in the accompanying photograph. Toaster stoves, immersion heaters, shaving mugs, curling irons, heating pads, milk warmers, disk stoves and flash-lamps find a ready sale in this store, which is comfortably equipped with easy chairs and other aids to the weary traveler. The demand for electric curling irons has at times threatened to exceed the supply. A miniature electric sign above the table is an effective part of the equipment, and the large number of daily visitors to the establishment affords the company excellent material for missionary work in the ever-widening field of electric service.



### Electrical Equipment of a City Asphalt Plant

Many cities operate plants producing asphalt mixtures for street-paving repairs, but few of these plants are driven electrically, as is the new one belonging to the city of Chicago. Essentially this plant consists of huge kettles for melting the raw asphalt and mix-

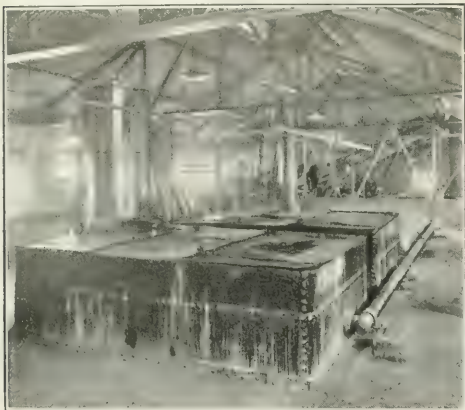


FIG. 1—KETTLE ROOM, SECOND FLOOR

ing apparatus for combining the melted material with sand and stone to produce the asphalt pavement.

Arriving at the plant, the raw asphalt is hoisted electrically to the kettle mouths, heated in oil-fired kettles, and conveyed to motor-driven mixers, where it is added to proportionate amounts of the other pavement ingredients. As shown in the accompanying table of motor applications, the handling of practically all the material is accomplished by motor-driven machinery.

Energy for operating the installation is supplied by the Sanitary District of Chicago over a three-phase, 2200-volt, sixty-cycle line. Mr. Frank Galligan, foreman, says that with the plant producing fifty to seventy-

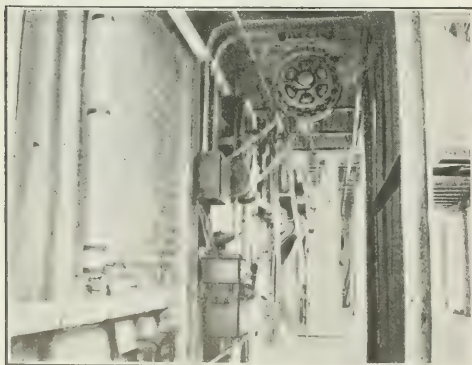


FIG. 2—75-HP MOTOR DRIVING AGITATOR PADDLES

five wagon-loads of pavement material a day the large motor (which drives a line shaft from which several machines are operated) requires about 28 kw. This machine is started at about 5 a.m., but is seldom in service after 3 p.m. The 7.5-kw motor driving the agitator paddles operates twenty-four hours a day. The others run intermittently.

In the contract between the Sanitary District and the city of Chicago the present connected load of the municipal asphalt plant is put down at 87.5 hp. The city agrees to pay at the rate of \$2.20 per hp of the maximum demand, plus \$22.05 a month to cover fixed charges.

The asphalt plant was built for the city by Hetherington & Berner, Indianapolis, Ind., at a cost of about \$46,000, and can be utilized for the manufacture of top,

#### MOTOR APPLICATIONS IN CHICAGO ASPHALT PLANT

Motor Rating in Hp	Applications
50	24-ft. by 3-ft. sand drum. 24-ft. by 3-ft. stone drum. Five belt conveyors, total 120 ft. in length. Two 9-ft. mixers. Two 8-ft. screens (mesh, No. 8 and No. 1).
7.5	Paddles in two agitators.
10	2.5-ton elevator.
20	10-ton elevator.

binder and bituminous mixtures. Its rated output is 2000 sq. yd. of finished pavement (2 in. top and 2 in.

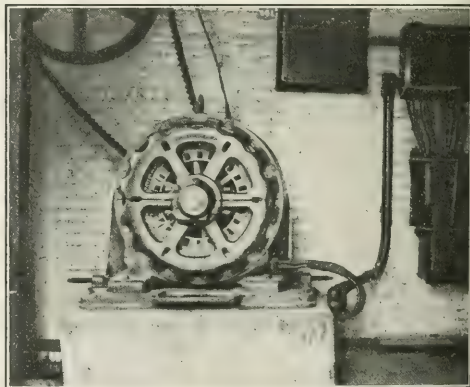


FIG. 3—50-HP MOTOR DRIVING LINE SHAFT

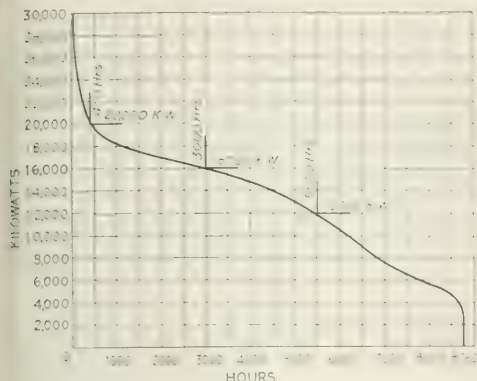
of binder) per twenty-four-hour day. The operating force consists of about thirty men. The storage bins hold 860 cu. yd. of sand and stone and 500 barrels of cement.

From the storage bins the material is carried by conveyors to the hoppers at the top of the plant. From these hoppers it is fed to the different mixers as required. After mixing, the product is conveyed to the wagons and arrives on the job at a temperature of from 280 deg. to 320 deg. Fahr. The plant is in charge of the Chicago Bureau of Streets, of which Mr. Walter G. Leininger is superintendent.

### Some Revelations of the Load-Duration Curve

Much interest was aroused at the recent Philadelphia convention of the N. E. L. A. by Mr. J. C. Parker's reference to the load-duration curve as a means of investigating the efficient operating conditions of a central-station system. Reproduced herewith is the load-duration curve for the Rochester (N. Y.) Railway & Light Company, of which Mr. Parker is electrical engineer. The curve shows the relation between the load carried and the number of hours in the year for which

the load endures. For example, only about 4000 kw of load continues every hour in the year. The equipment necessary to carry 12,000 kw is used 5500 hours per year. But, on the other hand, of the 30,000 kw in plant installed, two-thirds is used less than 450 hours per year, or an hour and a quarter a day. Figuring this



LOAD-DURATION CURVE OF ROCHESTER COMPANY

equipment at \$500 per kw, including plant, lines, etc., the investment required to serve this short-time demand is \$5,000,000. Allowing 15 per cent for interest, depreciation and insurance charges, the cost of keeping this equipment ready is \$750,000 per year, which is the equivalent of a tax of nearly \$60 per year on each of the Rochester company's 13,000 electric customers.

### Preparing for Fall Lighting Activity

The striking newspaper advertisement reproduced herewith was run in local newspapers last fall by the Worcester (Mass.) Electric Light Company during its

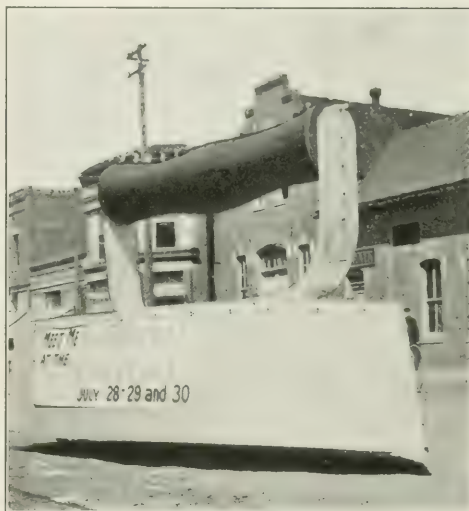
NEWSPAPER ADVERTISING USED IN HOUSE-WIRING CAMPAIGN

house-wiring campaign. The display attracted much attention outside as well as within the company's territory. The essential features of the wiring-on-installment plan in force during the month of September were

easily explained to prospective customers over the telephone, and the method of emphasizing the installment feature in the blocked-out advertisement by type set on an angle as shown was most effective in catching the reader's eye.

### An Electric Carnival in War-Riddled Walsenburg

Almost as if under the auspices of the United States army, then patrolling the town, the Trinidad (Col.) Electric Transmission, Railway & Gas Company recently conducted a successful electric show at Walsenburg, Col. The federal troops were at the time encamped in the city to preserve order during the coal strike, yet despite the facts that the town was under martial law and that it had been battered by shot and shell from miners, mine guards and troops alike, the electric carnival proved a huge success in every way, amply justifying the enterprise of its promoters.



ELECTRIC-LIGHTED FLOAT ADVERTISING WALSENBURG CARNIVAL

Soon after the pacification of the Walsenburg district, following the arrival of the troops, Mr. Franklin P. Wood, manager of the electric company, decided that, despite all handicaps, such a carnival would "live" up the city and help bring it back to its natural state. The strike, and matters before the strike, had engendered antagonistic feeling among the business men, splitting up the citizens into factions. Though the show was given primarily to encourage the use of electricity, it worked to produce a closer spirit of co-operation between the business men and helped to broaden the public policy of the electric company.

An electrically cooked luncheon for business men, served on the first of the three days, was attended by all factions, who broke bread together and then and there "buried the hatchet." Plans for a commercial club were formed, and now apparently all is serene with the local business interests.

The show was held under the management of Mr. Franklin P. Wood, general manager of the Trinidad Electric Transmission, Railway & Gas Company, who was assisted by Messrs. W. P. Wooldridge, H. H. Hoyt, S. J. Ballinger, H. J. Reed and W. R. Shade, the latter local manager at Walsenburg.



## Illumination and Wiring

### Lighting of Subway Crossings Beneath Railroad Tracks

In Chicago there are 830 "subways" where streets pass beneath railroad tracks elevated above grade. Much attention has been given to the lighting of these crossings by the Chicago department of gas and electricity. Research into track-elevation ordinances showed that 420 of these subways are to be lighted by the city and 410 by the railroads. As the result of a study of the proper illumination of the subways it was determined that the standard should be one 16-cp incandescent lamp for every 400 ft. of area under the subway. In the city-lighted subways the standard lighting unit is a 25-watt (20-cp) tungsten lamp. Lamps are suspended over the center line of sidewalks, while the roadways are lighted from reflectors at a 45-deg. angle supported on the curb-line pillars.

### Aligning Poles by Aid of Anchor Guys

Many line foremen can recall poles which have given trouble on account of their seeming persistence in getting out of alignment. In most of these cases the set-



MAINTAINING ALIGNMENT OF POLE BY THE USE OF ANCHOR GUYS

ting of the poles has been done improperly or the character of the soil is such as to prohibit satisfactory pole-line installation. Such a line is shown in the accompanying sketch, the poles, carrying high-tension, trolley and auxiliary circuits, being set too near the edge of the embankment for stability.

As the earth behind the pole becomes soft in wet weather the pole has a tendency to lean away from the track, for as vibration at right angles to the line is set up by winds or passing cars the earth at X offers little resistance in a longitudinal direction. After such a pole has once settled toward the right from its perpendicular position its own weight tends to increase the trouble.

To correct this condition a transmission and railway company in northern Illinois has adopted the expedient of attaching a guy wire to the end of the mast arm, tying it to a light anchor which can be quickly and cheaply installed. With this wire drawn taut while the

pole stands upright no difficulty is experienced in keeping the poles in line and the line is given an added factor of safety against wind.

### Wire Tables for Alternating-Current and Direct-Current Motors

BY WILLIAM SHERIFF JONES

In comparing various tables for alternating-current motors, it appears that both the tables assembled together by the Western Association of Electrical Inspectors and those given in the "American Electrician's Handbook," which provide for starting fuses, give current ratings which are in excess of the safe carrying capacity of the wires recommended. Assuming the connections shown in the accompanying diagram, which are probably intended by both authorities, A representing the fuses at the point of distribution where the installation consists of more than one motor, B the running fuses and C the starting fuses, the A fuses should

TABLE I—DATA FOR 220-VOLT, THREE-PHASE MOTORS

220-Volt Three-Phase Motors, Hp	A. E. HANDBOOK		W. A. E. I.		X	
	Starting Fuse, Amp	Size Wire, B. & S.	Starting Fuse, Amp	Size Wire, B. & S.	Starting Fuse, Amp	Size Wire, B. & S.
1.0	10	14	10	14	15	14
2.0	15	14	20	12	15	14
3.0	25	12	30	10	20	12
4.0			40	8	25	10
5.0	35	10	50	8	25	10
7.5	45	8	60	6	50	6
10.0	65	6	75	4	50	6
12.5					70	4
15.0	100	4	100	3	80	3
20.0	130	2	140	2	100	1
25.0	150	1	175	0	125	0
30.0	200	0	200	0	150	0
35.0	200	0	250	0	175	0
40.0	225	0	275	0	225	0
50.0	250	0	350	250,000 circ. mil.	255	250,000 circ. mil.

not be larger than the safe current-carrying capacity of the circuit wires and must be large enough to allow passage of the starting current without blowing. The function of the C fuses is performed by the A fuses, and therefore the C fuses are of no value. In some cases it is found desirable to have at B fuses of such capacity as to protect the motor itself and not the wiring to the motor, and these fuses would naturally be smaller than those at either A or C.

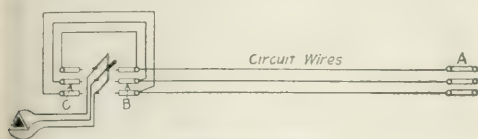
In Table I is given a tabulation of data for 220-volt,

TABLE II—RATING OF N. E. C. STANDARD FUSES

Rating, Amp	Indefinite Carrying Capacity, Amp	50 PER CENT OVERLOAD	
		Amp	Time Before Operating
15	16.5	22.5	30 sec.
20	22.0	30.0	30 sec.
25	27.5	37.5	30 sec.
50	55.0	75.0	1 min.
65	71.5	97.5	2 min.
80	88.0	120.0	2 min.
90	99.0	135.0	2 min.
125	137.5	187.5	4 min.
150	165.0	225.0	4 min.

three-phase motors as proposed by the authorities given above. It will be noticed that in the first two columns the starting fuses for machines with ratings of more than 2 hp have a greater capacity than is re-

quired for protection of the respective wires recommended. Code standard fuses are made to carry indefinitely a current 10 per cent greater than that at which they are rated, and they will carry 50 per cent



WIRING DIAGRAM

in excess above the rating as is specified in Table II.

In calculating the running current for a three-phase, 220-volt (*E*), 10-hp induction motor, assuming a power-

TABLE III—EFFICIENCY OF POLYPHASE MOTORS (STANDARD HANDBOOK)

Hp.	1	5	20	300
Efficiency	0.80	0.85	0.88	0.93

factor of 80 per cent (*K*), an efficiency of 86 per cent and a load of 100 per cent,

$$I = 746 \times 10 \div (381.04 \times 0.80 \times 0.86) = 28.5.$$

Referring to Table I and Table II, it will be found

TABLE IV—EFFICIENCY OF DIRECT-CURRENT MOTORS ON 110-VOLT AND 220-VOLT CIRCUITS (STANDARD HANDBOOK)

Hp.	0.5	1	2	3	5	7.5	10	15	20	25
Efficiency	73	77	82	83	84	86	86	86	87	89

that if 50-amp fuses are used, which would have a maximum continuous rating of 55 amp and a rating of 75 amp for one minute, there will be an allowance for starting current of 263 per cent of running current for

TABLE V—DATA FOR ALTERNATING-CURRENT AND DIRECT-CURRENT MOTORS

(Sizes in B. & S. gage or circ. mils.)

Hp.	Efficiency, per Cent	D. C. 110 Volts		D. C. 220 Volts		D. C. 500 Volts	
		SINGLE-PHASE		THREE-PHASE			
		A. C. 110 Volts	A. C. 220 Volts	A. C. 220 Volts	A. C. 440 Volts		
0.5	73	14	14	14	14		
1.0	77	10	14	14	14		
2.0	82	6	10	11	14		
3.0	83	4	8	12	14		
4.0	83	2	6	10	14		
5.0	84	1	6	10	14		
7.5	86	00	3	6	12		
10.0	86	0000	1	6	10		
12.5	86	300,000	0	4	8		
15.0	86	400,000	00	3	8		
17.5	86	500,000	000	2	6		
20.0	87	500,000	0000	1	6		
25.0	89	900,000	250,000	0	4		
30.0	89	900,000	350,000	00	4		
35.0	90	1,100,000	400,000	000	3		
40.0	91	1,300,000	500,000	0000	2		
50.0	91	1,700,000	700,000	250,000	0		

one minute. As a load of 100 per cent is not generally obtained until normal running speed has been reached, this would seem sufficient for most practical purposes.

The "X" column of the table is based on the follow-

ing equations as to carrying capacity of wires required:  
 110-volt single-phase alternating current =  
 $2 \times 110$ -volt direct current, or  $4 \times 55$ -volt direct current;  
 220-volt single-phase alternating current =  
 110-volt direct current;  
 220-volt three-phase alternating current =  
 220-volt direct current;  
 440-volt three-phase alternating current =  
 550-volt direct current.

On the basis of the above have been calculated the current and size of wire required for a 10-hp, 220-volt, three-phase motor. According to the foregoing equations, this motor would require the same size of wire as is required for a 10-hp, 220-volt direct-current motor at 125 per cent load and 86 per cent efficiency, and this wire would have a safe carrying capacity as follows:

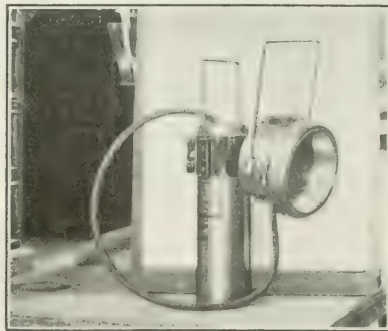
$$I = 9325 \div 189 = 49.$$

A No. 6 B. & S. gage wire would satisfy this requirement.

Figures given in Table III and Table IV for efficiencies of commercial motors were obtained from the standard handbook. These tables form the efficiency basis for the calculation in Table V, which shows a proposed tabulation for alternating-current and direct-current motors. The size of the conductors is given in B. & S. gage. The calculations for direct-current motors are based on a load of 125 per cent. A reasonable allowance for starting current is made for alternating-current motors, and the overload time-limit of fuses also receives consideration. Where the wires under this table would be "over-fused" in order to provide for the starting current, as may be the case with certain types of motors or certain kinds of connected load, the wires must be of such size as to be protected by these larger fuses.

### Inspecting Transmission Lines with Gas Lamp

On the 38,000-volt transmission circuits of the Cumberland County Power & Light Company, Portland, Maine, line troubles are effectively hunted at night by the use of a motor-cycle head-lamp equipped with a Prestolite tank and flexible gas hose as shown in the accompanying half-tone. The tank, 4 in. in diameter and 13 in. high, is equipped by the company with a



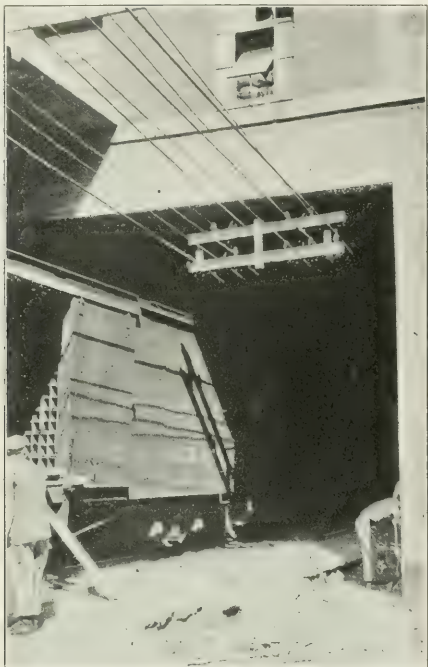
ACETYLENE HAND-LAMP FOR LINE INSPECTION

clamp 3 in. wide, bales being provided for the tank and reflector lamp to facilitate handling. The bales are of 5-16 in. brass wire. The reflector is 4 in. in diameter and the entire outfit weighs about 15 lb. In night inspection work the apparatus is especially useful in illuminating insulators, tie wires, etc., from the ground level.



### Meeting Difficulties with Temporary Construction

Recent extensions of the Quaker Oats Company's factory at Cedar Rapids, Ia., necessitated the erection of a covered passageway over an intervening street at the second-story level. It so happened, however, that a lead of 35-ft. poles carrying several heavy high-voltage lines occupied the portion of the street at the second-story level, forming an obstruction which not only had prior rights but which could not be moved to another site without involving considerable work. Meeting the improvement half way, however, the central-station men removed the obstructing poles and resorted to the method of support shown in the illustration herewith to hold the cross-arms in place till the cables were either placed underground or re-routed. Cleats nailed to the cross-arms at their ends and in the middle held



TEMPORARY CONSTRUCTION AT CEDAR RAPIDS

them separated at the desired distance. Using wood strains as insulators, the framework of cross-arms and cleats is held suspended by wires extending from the top arm to eye-bolts in the concrete above.

### Separation of Lighting and Telephone Wires

Officials of the Lexington (Ky.) Utilities Company and of the Fayette Home Telephone Company, of Lexington, have agreed on plans for the separation of the lighting and telephone wires on the city's streets, according to an agreement filed for the approval of the Board of Commissioners. The plan provides that all of the telephone wires shall be assembled on those sides of the streets on which they are now in the majority, while the same arrangement holds for the lighting conductors. The agreement as drawn up covers all of the streets, subject to the approval of the commission.

### Recent Telephone Patents

A device patented by Mr. R. J. Robinson, of Romulus, Okla., is called a telephone cut-off. It provides means whereby a party line may be cut in two for use in case the desired station is on an idle section. The restoring of the hook switch reconnects the line.

Some twenty years ago a transmitter was patented in which a closed helical spring of carbon served as the microphonic member. Mr. R. S. M. Mitchell, of Syracuse, N. Y., has now adapted a flat spiral spring to the same purpose. The inner or middle end of the spring is attached to the diaphragm and the outer to a carbon block. As the diaphragm vibrates, the spring is pulled more or less out of its normal plane, with the result that the number of convolutions in direct contact is varied accordingly.

## Letter to the Editors

### Building a Competing Plant

*To the Editors of the Electrical World:*

SIRS:—Should a concern whose sole business is engineering and construction work accept a commission from a city government to build an electric-service plant—or other public utility—to be owned and operated by the municipality and to compete directly with a similar plant, privately owned, in the same city which has been established and in successful operation for several years?

That is a question that may confront, almost any day, almost any large corporation engaged in the building of public utilities. It came before the chief executives of one such concern recently. Two sessions and several hours of debate were required to reach a decision.

The proposition was tempting. The engineering and contracting company was informed that it could have the contract on the basis of cost plus a certain percentage. The city was large and in good financial condition. Payment for the work seemed sure of being prompt.

Yet, on the other hand, there was the privately owned plant which represented an investment of a large sum of money. Investigation showed that it had been making only a reasonable profit ever since it had been installed. The service it was furnishing was of the best and the prices it was charging were reasonable—the market rates for similar service in that region. There was no economic reason or necessity for another plant. The only excuse that the municipality's representative gave for the city's going into the electric business was that, with its own plant, the city thought it could save money.

It seemed a profitable and desirable contract from the ordinary engineering and contracting point of view. The concern to which it was offered had no personal or financial affiliations with the owners of the plant already in operation.

But, after long deliberation, the corporation receiving the offer from the municipality decided to refuse it. Some of the executives argued that the company was in business to get all the orders it could. Others pointed out that the company, like most others in the field, was opposed to the idea of municipal ownership of public utilities, and that it would not be consistent to accept the offer—that there were other questions besides "Will it pay?"

Is not this attitude toward municipal ownership one that will be as untenable in the long run as that of King Canute toward the Atlantic Ocean? Perhaps some of your readers have ideas on the subject they will be willing to express.

New York.

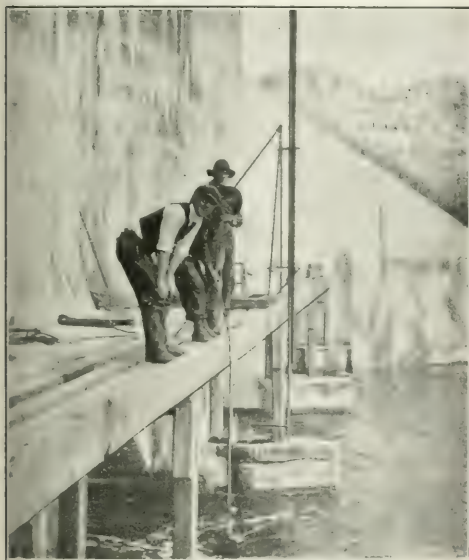
T. D. DAY.

# Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects Questions and Answers

## Consumption of Low-Head Turbine Determined by Titration Method

The titration method of measuring fluid discharges which has been employed successfully in determining the water consumption of high-head turbines was used recently for the first time with satisfactory results in an open-flume short-draft-tube hydroelectric plant. The test was made on a 7200-hp eight-runner horizontal water turbine operating at 225 r.p.m. under a head



SAMPLING WATER AT TAILRACE

of 39.5 ft. at the Croton (Mich.) plant of the Grand Rapids & Muskegon Power Company.

The titration method of measuring fluid flow consists of injecting a salt solution of definite concentration and under a constant head into the tube conveying the fluid to be measured, and comparing the concentration of the original salt solution with that in the discharge tube after thorough and uniform mixing has been allowed to take place. The unit flow through the discharge tube may then be computed by multiplying the rate of flow from the solution tank by the ratio of the concentration in the tank to that in the tube.

As the flumes of the plant tested were open and the draft tubes were only 40 ft. long, the salt solution was injected directly into the turbine through four nozzles and samples of the diluted solution were taken out at the outlet of the draft tube. It was found by analysis that the percentage of salt in different samples taken from the draft-tube outlet did not vary more than 1 per cent. This showed that the solution disseminated itself uniformly through the discharge water, even in

the short distance, hence proving that the titration method could be relied on in measuring the discharge.

On comparing the results thus obtained with the unit flow measured by Epper-Ott screw-type current meters, a difference of only 1.3 per cent could be detected.

## A Year's Electrical Accidents in Chicago

One of the important functions of the Bureau of Electrical Inspection of the Department of Gas and Electricity of the city of Chicago is the investigation of electrical accidents to reduce the life-and-limb hazard. Commissioner Ray Palmer, in his recent annual report, says that the time has come when some decided action must be taken to reduce the number of electrical accidents. He points out that fifteen children were killed in Chicago last year by electrical accidents. The department has undertaken an investigation having for its object the formulation of rules which shall tend to reduce accidents on pole lines from electrical causes. Later the investigation may be extended to indoor electrical work. Mr. Palmer says that the department should be empowered to prevent the sale of dangerous electrical appliances, meaning possibly appliances that are not properly made or "fool-proof" rather than any fixed class of apparatus.

Many of the accidents to children are caused by climbing poles to high-potential wires on a "dare." A few records of other accidents may prove useful:

"Jan. 2, Walter Link, age thirty-two, assistant engineer, while operating field rheostats, preparing to cut in another generator, was killed. The 110-volt exciter circuit was grounded. One of the rheostat hand-wheels was grounded, and the other not. The operating chain of the ungrounded hand-wheel touched a live contact on rheostat while deceased had hands on the two rheostat wheels. His hands were wet, and he was unable to release himself."

"March 24, Joseph Ruthowski, age twenty-eight, electrician, while replacing insulators for railway storage battery, accidentally touched battery with that part of his arm above his rubber glove, and received shock which killed him."

"March 24, Thomas Giranowicz, age thirty-five, came out of barn, and evidently attempted to push out of the way a wire that was hanging down, and received a shock which killed him. The primary wire of a 2300-volt circuit had broken down during storm."

"May 27, Mrs. William Smith, while pumping water, touched a charged electric meter with her arm, and received severe burns. The primary insulation of the transformer feeding the house had broken down; voltage 2300."

"May 31, George W. Krummer, age twenty-one, while in a bathtub, was using an electric vibrator attached to a lighting circuit. He received a shock, was unable to let go of the vibrator, and was killed. The vibrator was of a type necessitating a lamp in series with it on a 110-volt circuit. A wire had broken off one of the brushes of the motor, and the person who made the repairs had left the wire grounded to the frame of the machine."



"Aug. 21, Charles Haug, age thirty-three, steamfitter, was unscrewing pipe and in so doing pushed it against a drop cord on a 220-volt two-wire direct-current circuit. The rough sides of the pipe cut into the insulation of the cord. He received a fatal shock."

"Oct. 31, Norman L. Campbell, aged fifteen, attempted

#### SUMMARY OF ELECTRICAL ACCIDENTS

	PERSONS INJURED					INJURY				VOLTAGE		
	Employers	Others	Minor	Adult	Slight	Serious	Fatal	Low	High	Extra High		
<b>Street-car accidents:</b>												
Injured by controller flash	12	..	12	12	..	..	12	..	..	..	..	..
Shocked while adjusting trolley	7	..	7	7	..	..	7	..	..	..	..	..
Flash from canopy switch	..	..	..	..	..	..	..	..	..	..	..	..
Blowing of fuse	10	..	10	9	1	..	10	..	..	..	..	..
Broken trolley wires	..	1	1	1	1	..	1	..	..	..	..	..
Burned or shocked other than above	10	..	10	9	1	..	10	..	..	..	..	..
<b>Short-circuit or flashover:</b>												
Operators	17	..	17	14	3	..	13	..	4	..	..	..
Electricians (inside)	28	..	28	26	1	1	28	..	..	..	..	..
Meter men	25	..	25	25	..	1	25	..	..	..	..	..
Crankmen	8	..	8	8	..	..	8	..	..	..	..	..
Linenmen or repairers	18	..	18	15	3	..	10	7	1	..	..	..
Others, not electricians	13	2	11	12	1	..	13	..	..	..	..	..
<b>Accidental contact:</b>												
Repairmen (inside)	3	..	3	3	..	..	3	..	..	..	..	..
Electricians and station employees	8	..	8	3	4	1	6	12	..	..	..	..
Linenmen and troublemen	20	..	19	8	2	7	6	15	..	..	..	..
Trespass climbing lamp-poles	15	12	3	2	2	7	6	1	2	1	..	..
Trespass interfering with wires	4	3	1	1	2	1	1	2	1	..	..	..
Persons at work near live circuits	16	..	15	7	3	1	6	15	..	..	..	..
Broken wires	1	..	1	7	3	1	4	1	7	1	..	..
Defective wires	3	1	4	3	2	1	1	3	..	..	..	..
Crossing of power with other wires	2	5	..	7	5	..	1	2	4	..	..	..
Shocked from electric vibrator	1	..	1	1	..	..	1	..	..	..	..	..
Miscellaneous	2	1	2	2	..	..	2	..	..	..	..	..
Totals	208	34	202	180	34	28	180	30	32	..	..	..

to remove a tungsten lamp from series street-lighting system, and received a fatal shock. Voltage 4250."

"Nov. 14, Michael Tolend, age twenty-seven, painter, climbed a tower supporting spans of 6600-volt circuit at a river crossing, came in contact with one of the wires and was killed. He climbed the tower for a view of surrounding country."

The accompanying table contains a summary of accidents for the year 1913.

#### Drawing Plans to Scale

In marking the location of electrical apparatus or any other machinery, it is particularly desirable that the plan on which the apparatus is shown should be drawn to scale.

The architect, for instance, develops a plan. Subsequent alterations may possibly be made by the change in a dimension but without redrawing to scale the part affected. The plan then goes to the electrical engineering department. This department will proceed to distribute on the plan the various power apparatus. Bits of cardboard representing each piece of apparatus and drawn to the same scale as the plan are temporarily pinned to the sketch in the positions desired to find proper clearances.

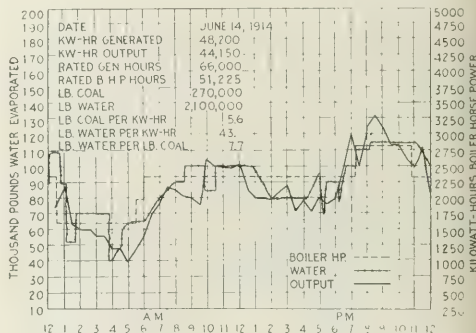
A switchboard, for example, is so placed that apparently it does not obstruct an adjacent doorway. This may not prove true, however, if the dimension for the doorway has been increased or decreased.

No doubt the architect and the engineer are both equally responsible for any resulting error. Nevertheless, protection at the source is the best, for an error in the field usually involves the expenditure of considerable money.

#### Interesting Firemen in Boiler-Room Economy

In order to stimulate the interest of the firemen at the Danville (Ill.) station of the Illinois Traction System, a curve sheet such as is shown in the accompanying illustration is posted in the boiler room each day. The three graphs on the cross-sectioned paper are drawn in red, black and green ink, the red line indicating the output in kilowatt-hours, the black line the boiler-horse-power, and the green line the thousands of pounds of water evaporated. By an ingenious arrangement the scale of the curve is such that all three curves should theoretically coincide. Under proper operating conditions the station evaporates about 40 lb. of water per boiler-hp-hour. The engine takes about 40 lb. of steam per kw-hour, so that the number of pounds of water per kw-hour of output should equal approximately 40. This simplifies the reading of the curve.

Mr. J. E. Johnson, manager of the company's Danville property, reports that after a month's trial he has found that the men in the various shifts watch the bulletin board closely, endeavoring never to let their own por-



CURVE SHEET SHOWING EFFICIENCY IN BOILER ROOM

tion of the curve show results below those of the other crew. The curves may also be easily interpreted to show whether the correct number of boilers has been in operation. It has been found that this phase of the work pays well, for it is often easier for the firemen in a boiler room equipped with mechanical stokers to fire a larger number of boilers than necessary than it is for them to operate just the right number at full force.

In addition to the curves the daily fire-room sheet carries data showing the electrical output of the station and the amount of coal and water used.

#### Smoke from Chimneys of Oil-Burning Furnaces

Is it safe to assume that oil is burning properly when no smoke is being emitted from the chimney of an oil-burning furnace?

W. G. H.

The fact that smoke is absent is not a sure sign that combustion is perfect, although in connection with other indications such as a clear, bright flame and a certain roaring sound that is produced when the oil is being entirely consumed it usually signifies efficient operation. The supply of air to the burner may, however, be excessive, and in that case, though there is no smoke at the chimney, economical results cannot be obtained. It often happens in plants where converted furnaces are used that the fireman who has been used to coal-burning allows too much air to be intermingled with the oil. In order to determine whether too much air is being used the flue gases should be analyzed frequently or a continuous carbon-dioxide recorder should be used.

# Digest of Current Electrical Literature

## Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

### Generators, Motors and Transformers

**Testing Potential Transformers.**—H. B. BROOKS.—A description of the method for testing transformers of which the novel feature is the use of facilities which are available in any properly equipped alternating-current power plant in addition to a potential transformer whose ratio and phase angle are known. From the practical point of view, an error in ratio or phase angle which produces a visible error in the reading of an indicating wattmeter is an error which should be known, while errors smaller than this are negligible. We may, therefore, use an indicating wattmeter in such a way that differences in ratio or phase angle of an unknown transformer and a standard transformer have the best possible opportunity to produce a deflection. By properly choosing conditions this deflection may be readily made to give the numerical values of the quantities desired. The primary windings of the standard transformer and the transformer to be tested are connected to the same supply, as shown in Fig. 1. The secondary windings

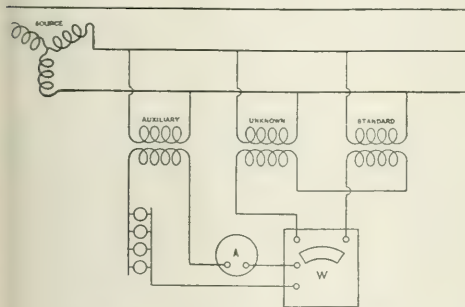


FIG. 1—DIAGRAM OF CONNECTIONS

are connected in series so that their voltages are opposed. The secondary voltages will be nearly equal and will rise and fall in unison as the line voltage varies. The thing to be measured is the difference between the two secondary voltages, which difference would in general be only a few volts. As the lower end of the scale of an alternating-current voltmeter is practically useless, this small voltage cannot be measured satisfactorily with even a low-range voltmeter. However, a 5-amp indicating wattmeter may be used as a voltmeter by separately exciting its current coil. This may be done by passing 5 amp through the coil to a lamp load. This exciting current must not be drawn from either of the two transformers whose ratios are to be compared, but must come from the secondary of some other available transformer connected to the same phase as the transformers under comparison. The current through the series coil of the wattmeter should be kept at approximately 5 amp, but this current needs to be measured with only moderate accuracy. The potential circuit of the wattmeter may now be used as a voltmeter to measure the small difference in the secondary voltages

of the two transformers under comparison. For example, if the wattmeter is made for 5 amp, 150 volts, 750 watts, and has a 150-division scale, then one division is 5 watts and will be given by 5 amp in the current coil and 1 volt on the potential circuit; hence the difference between the two secondary voltages, in volts, will be shown by the number of division deflections of the wattmeter. Since the ratios of good voltage transformers change very little with ordinary fluctuations of line voltages, the difference of the secondary voltages will be practically constant. As the wattmeter reading is steady and can be taken to one-tenth of a division, the ratio of one transformer in terms of the other can be read to 1 in 1000. The question as to which transformer has the greater ratio may be easily answered from the fact that increasing the non-inductive load on the secondary always lowers the secondary voltage and thus increases the ratio of transformation. The above method is a suitable one for determining the regulation of power transformers, by using one transformer of a bank on no load as the standard transformer and determining the drop of voltage of another transformer as the load on it is increased. If the test for ratio is made with the primaries connected to one phase of a two-phase circuit, a determination of the difference of the phase angles of the two transformers may then be made by connecting the wattmeter series coil and 5-amp lamp load to the other phase. To determine which of the two secondary voltages is leading the other, use may be made of the fact that increasing a non-inductive load connected to the secondary of a potential transformer tends to make the reversed secondary voltage lag behind the primary voltage. Fig. 1 shows no connected load on the secondary of the transformer whose ratio and phase angle are to be determined. However, any desired load may be connected to it and the comparison made in the same way. The load is simply connected to the secondary terminals without disturbing any of the other connections. Tests in which this method was used show a close agreement with the results of an accurate laboratory method.—*Bulletin*, Bureau of Standards, Vol. X, No. 3, 1914.

### Lamps and Lighting

**Arc Lamps and Luminescent Lamps.**—T. PAUSERT.—An article illustrated by diagrams giving brief descriptions from recent French patent specifications of new arc lamps and luminescent lamps.—*La Revue Elec.*, July 17, 1914.

### Generation, Transmission and Distribution

**Lightning and Surge Arresters.**—An article on a new type of arrester of Pizzuti and Ferrari. Arresters arranged to protect an installation are useless if situated in the neighborhood of the nodal point of the pressure wave. To remedy this, Pizzuti and Ferrari have introduced the zig arrester, which has been designed from consideration of the laws by which oscillating disturbances are propagated in circuits. The speed of an oscillatory wave along a circuit may be stated as  $\sqrt{1/(CL)}$ , where  $C$  and  $L$  are the capacity and inductance of the conductor respectively. If the natural impedance has a constant value at every point of the line, the wave



is propagated without deformation or appreciable alteration. When the wave arrives at a point after which a fall of impedance occurs a partial reflection with change of sign and fall of potential takes place; the current phenomena are, however, the reverse of those for potential. If, on the other hand, the wave arrives at a point where a rise of impedance occurs, a partial



FIGS. 2 AND 3—LIGHTNING-ARRESTER CONNECTIONS

reflection without change of sign and a rise of potential takes place, the current phenomena being again the reverse of potential phenomena. The rise or fall of potential is greater the greater the variation of the natural impedance of the line. If the natural impedance of the circuit passes from a very small value to a very high one in consecutive sections, there occurs at the junction a total reflection of the wave. The potential, however, does not change sign at the reflection, but the current changes sign and thus a nodal point is formed. The contrary takes place in the case of passing from a very high natural impedance to a very low one. As, with aerial lines, the product of  $C$  and  $L$  has a nearly constant value, and the surges have a frequency of the order  $10^4$  to  $10^5$ , corresponding to a wave-length of between 0.3 km and 3 km, it is sufficient to give to the protective apparatus capacity and inductance equivalent to 1.5 km of the line. If an apparatus is inserted in series in the line whose capacity and self-induction is equal to that of the part of the line between two successive nodes, all the values of the potential wave are discharged in the apparatus, and any surges will be discharged to earth, if suitable arresters are installed. The zig arrester shown diagrammatically in Fig. 2 consists essentially of a capacity  $AB$ , one part of which is connected to earth, while the other is in series with the line and a self-induction  $BC$ .  $AB$  has a very small natural impedance and  $BC$  a very large one. A surge passing along the transmission line is partially reflected at  $A$  and totally at  $B$ , and at this point the pressure rises above that of the line in consequence of the variation of impedance. If a discharge path is provided at  $B$  the protection of the system is assured; the energy of the surge wave will discharge not only through the lightning arrester at  $B$ , but also through the dielectric of the capacity  $AB$ .  $AB$  and  $BC$  are so proportioned that the time taken by the reflected wave to pass from  $B$  to  $C$  is equal to or greater than that required by the wave to pass from  $B$  to  $A$ , so that before the reflected part of the wave arrives at  $C$  it is discharged by the arrester at  $B$ , the excess voltage having already attained its maximum at  $B$ . In order to facilitate the discharge, several arresters are placed in parallel, and these are connected to earth through a resistance in the usual way. To protect an installation on both sides the arrangement shown in Fig. 3 is adopted, being a further development of Fig. 2. This method is reported to be very effective, not only for very high-frequency disturbances, but also for those of lower value such as might arise from the rapid breaking of a circuit. It can be applied to protect underground cables from surges. The zig arrester has been successfully employed in many important Italian installations and is constructed in four types—for 12,000 volts, 30,000 volts, 50,000 volts and 90,000 volts. It may be mentioned that among the installations in use the Societa Meridionale di Elettricit  has applied them to its 30,000-volt transmissions and is fitting them to its 90,000-volt lines.—*London Elec. Review*, Aug. 14, 1914.

## Traction

*Electric Traction in Spain.*—An illustrated article on the first electric railway in Spain. It runs between Linares and Almeria in the mining district of Santa F . The three-phase traction system is used with two overhead conductors and the rails as the third conductor. At the power station in Santa F  three-phase currents are generated at 5500 volts. The three-phase induction motors on the train have a capacity of 160 hp or 220 hp.—*La Revue Elec.*, July 17, 1914.

## Installations, Systems and Appliances

*Rate for Electrical Energy.*—G. DARRIEUS.—An article on the proposal of Riccardo Arno to charge not only for the real power but also to make a certain charge for the "wattless power." He defines the "complex power" as the sum of the real power plus  $k$  times the wattless power. The coefficient  $k$  may be, for instance, 0.23, which means that the consumer has to pay for wattless power 0.23 times the charge for real power. There is a simple means for measuring in any three-phase circuit the wattless power at the same time as real power if two meters connected according to the two-wattmeter method are employed. They may even be combined in the single instrument. If  $W_1$  and  $W_2$  are readings of the two meters, the total real power is  $W_1 + W_2$ , and the wattless power is  $(W_1 - W_2) \times \sqrt{3}$ , and the complex power as defined above equals  $(1 + k\sqrt{3}) W_1 + (1 - k\sqrt{3}) W_2$ . If  $k$  equals 0.23, we have  $1 + k\sqrt{3} = 1.398$  and  $1 - k\sqrt{3} = 0.602$ .—*La Revue Elec.*, July 17, 1914.

*Great Britain.*—A. H. SEABROOK.—A review of the historical development of electricity supply in Great Britain, the various rates used, the methods employed for popularizing the use of electricity, and the co-operation of central stations with other industries.—*Elek. Zeit.*, July 9, 1914.

## Wires, Wiring and Conduits

*Aluminum Insulated Cables.*—An article discussing the objections usually raised to the use of aluminum for insulated cables. The first objection is on account of expense. Admittedly the insulation and protection of aluminum conductors places a modified aspect on the question of economy, the larger diameter of the aluminum core postulating a relatively larger area to insulate. But the initial saving on the strand, even in the smaller gages, will as a general rule be found to meet this extra expense with a useful balance in hand, while it will be obvious that as the area of the conductor increases the greater does this economy become and the more apparent the advantage in specifying aluminum. It is true that heavily armored high-tension cable will not show aluminum to the same advantage, particularly when the cores are of relatively small cross-section. The second objection is the difficulty of jointing, but great progress has been made in this direction in recent years. The third objection is that its scrap value is low. Provided the cost of producing an aluminum cable be placed upon an equal footing with the copper equivalent, it will be found in practice that the profit gained in the first instance capitalized over the usual life of a cable, say, from twenty to thirty years, will more than meet any difference that may exist in the relative scrap rates of copper and aluminum. If we take into consideration the rating of cables, the advantages of aluminum cables are still more evident. Owing to the increased diameter, the relatively larger surface of radiation afforded by aluminum has been found in practice to permit of heavier currents for a given rise in temperature. Conversely, to carry the same current as a given copper conductor for an equal rise in temperature, the diameter of an aluminum core may be ap-

precisely less than that prescribed by considerations of conductance alone. Where voltage drop is the main question at issue, it is, of course, essential that the relative conductivities of the two metals be taken into consideration, when the required section will be 64 per cent in excess of copper. But where, as in the great majority of cases, the current to be carried is limited by the permissible temperature rise, an average increase of 36 per cent on the section allowed to copper will safely meet the general requirements of the estimator and will provide a more practical definition of an equivalent cable.—*London Electrician*, Aug. 14, 1914.

#### Electrophysics and Magnetism

**Ponderomotive Force Upon Dielectrics.**—R. H. GODDARD.—According to Lorentz's theory of a dielectric, a ponderomotive force must act upon such a body when carrying a displacement current in a magnetic field analogous to the force which is known to act upon a conductor when carrying a conduction current in a magnetic field. An experiment performed by Whitehead to demonstrate the existence of this force has given a negative result, which result has been shown by others to be in agreement with electrical theory. In the present paper the theory of a more general research is developed, which includes the Whitehead experiment as a special case and suggests, further, an experiment by which a positive result may be attained. An apparatus has been designed, on the lines suggested by this theory, whereby the quantities involved in a determination of the force in question may be obtained with a considerable degree of accuracy. An experiment, of a preliminary nature, has shown that the ponderomotive force, upon a piece of hard rubber as dielectric, is of the expected order of magnitude.—*Phys. Rev.*, August, 1914.

#### Electrochemistry and Batteries

**Manufacture of Steel in the Electric Furnace.**—SIGMUND GUGGENHEIM.—An English translation of his recent German paper on the development of the manufacture of steel in electric furnaces in recent years, with a discussion of the reasons why the commercial advances have been relatively slow.—*London Electrician*, Aug. 14, 1914.

#### Units, Measurements and Instruments

**British National Physical Laboratory.**—An abstract of the proposed work of the (British) National Physical Laboratory for the next year. The first instalment relates to the work in the fields of electricity, meteorology, optics and metallurgy and in the engineering department. A summary of the work done with the Lorenz apparatus, current weigher, resistance standards, magnetometer, magnetographs, standard cells, power-factors of condensers, inductance measurements, high-frequency measurements, high-frequency resistance and decrement measurements, effects of strain upon magnetization, magnetic permeability of iron, lapping of telephone cables, photometry, lighting installations, power measurements, heating tests of field coils, direct current and resistance measurements, conductor rails, heating of buried cables, and the electric emissivity of matter at high temperatures, is given.—*London Electrician*, July 3 and 10, 1914.

#### Telegraphy, Telephony and Signals

**Wireless Telegraphy.**—PAUL JANET.—An illustrated article on the system of teaching wireless telegraphy at the High School of Electricity in Paris. Various officers of the French army and navy have been instructed there.—*La Revue Elec.*, July 17, 1914.

#### Miscellaneous

**Electric Photographs of Relief Designs.**—A. PALME.—“Electric photographs” of metal relief designs, such as those on coins, can be obtained with the arrangement of Fig. 4, where *a* is the object to be photographed.

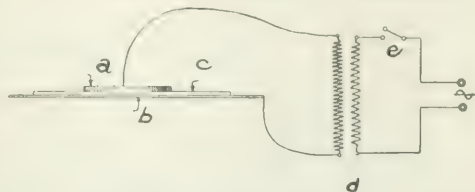


FIG. 4—DIAGRAM SHOWING ARRANGEMENT OF “ELECTRIC PHOTOGRAPH” APPARATUS

At *b* there is a metallic sheet and *c* is an ordinary photographic plate placed on the metal sheet *b* while the object *a* is laid on the emulsion of the photographic plate. The object *a* and the metallic sheet *b* are connected respectively to the terminals of a high-tension transformer. The pressure must be at least 5000 volts. When the switch *e* is closed and quickly opened again and the plate is developed, a negative picture of the object is obtained. The explanation is that between the object *a* and the sheet *b* a brush discharge takes place having associated with it ultra-violet rays which decompose the silver bromide in the photographic plate. The voltage of the transformer must not be so high that sparks are formed. A film cannot be used instead of the photographic plate since the dielectric resistance of the film would be so low that it would be quickly perforated with the formation of an arc.—*Elek. u. Masch.* (Vienna), July 12, 1914.

## Book Review

**FUEL ECONOMY AND CO, RECORDERS.** By A. R. Maujer and Charles H. Bromley. New York: McGraw-Hill Book Company, Inc. 190 pages, 23 illus. Price, \$1.50.

A home-study textbook is most difficult to prepare. To insure success the author must put himself, mentally, in the position of one who knows little of the subject to be treated, and he must foresee and explain away all the difficulties that the reader is sure to encounter. Such a book is written largely for the man whose early education is slight, and hence the language must be simple yet accurate. Again, the author should not try to write a treatise, but should confine himself to those topics on which the reader wishes further information to help him in his daily work. This book has been made up from a series of lessons that appeared in the engineers' study course in *Power*, and is intended as a home-study work. It begins with an explanation of the actions that take place during the combustion of coal and shows how to find the amount of heat developed and the weight of air required. Detailed instructions are given for the proximate analysis of coal. The use of apparatus for taking a flue-gas sample and making the analysis, and the method of finding the excess of air from the results of the analysis, are covered fully and clearly, and a final chapter is added to explain the principle of action of the continuous gas analyzer, or CO<sub>2</sub> recorder. The other chapters treat of draft and its measurement, chimney sizes, boiler horse-power, steam calorimetry, boiler efficiency, use of the heat balance in checking losses, and methods of testing and treating feed water containing impurities.

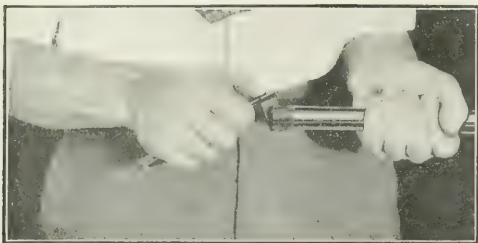


# New Apparatus and Appliances

## An Illustrated Descriptive Record of Recently Developed Manufactured Products of Interest to Electrical Readers

### Thread Protector

Protectors for threads on its enameled pipe are being furnished by the Enameled Metals Company, Pittsburgh, Pa. These protectors are placed on the conduit immediately after the pipe is threaded, and they protect the threads from any injury during the

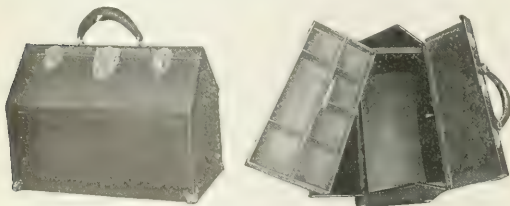


METHOD OF REMOVING THREAD PROTECTOR

processes of manufacture, shipping, handling, carting or placing on the job. Couplings are also protected during manufacture so that they are free from enamel on the inside. The protector can be removed by cutting it with a jack-knife, as shown in the accompanying illustration and peeling it off. The pipe is then ready to be screwed to a coupling.

### Metal Carrying Cases for Electricians' Tools

Metermen, repairmen, wiremen and other electrical workers may be interested in the metal carrying cases or kits for tools illustrated herewith. These kits are made of sheet steel, but are said to be no heavier than leather bags of corresponding size, the average weight being given as between 5 lb. and 7 lb. They are brown in color, being triple-coated with baked enamel. Built to withstand hard usage, they are reinforced throughout and have Corbin locks, brass side-catches, leather-covered handles and iron corner-pieces. They resemble leather



STEEL TOOL KITS

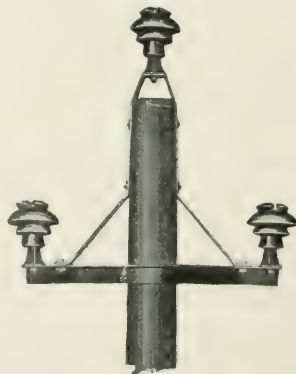
bags in appearance and can be made practically theft-proof, as they cannot be cut open easily. Pointed tools will not pierce the sides or bottom. The sides of the bag are smooth on the outside, no rivets showing. The construction is such that the weight is carried by the body of the bag, with no strain on the lids or hinges.

The tray for small parts is made of aluminum and fiber. These steel kits are made in various sizes by the Kennedy Manufacturing Company, 14 East Jackson Boulevard, Chicago.

### Steel Cross-Arms for Three-Phase Lines

The new angle-iron cross-arm, shown herewith, has on each side steel braces which are continuous and form a ridge-iron over the top of the pole for the third insulator. The cross-arm itself is so shaped as to bring the insulators on a line with the center of the pole, also centering the braces and the top insulator.

To install one of these "Keystone Triangle" cross-arms, as the device is called, it is only necessary to shave off two sides of the pole at the top so that the pole will fit the brace and to bore three holes. The cross-arm proper does not require gaining. All preparation can be very quickly and accurately made by means of a templet where a large number of poles are

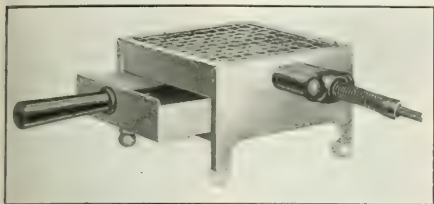


STREET CROSS-ARM FOR TRANSMISSION DELTA

to be erected. On account of the superior bracing qualities of the cross-arm only three  $\frac{3}{4}$ -in. through-bolts are required to secure it firmly to the pole. An important feature of the arm is its great strength, particularly against downward pulls, while the position of the bolts gives the arm exceptional rigidity. The wires are held in different vertical planes, thus decreasing the possibility of a short-circuit in case of the breaking of an upper wire. The maximum height of pole is also made useful since the ridge-iron serves as an extension. Ground-wire supports or bayonets can be attached by means of the two through-bolts which support the upper section of the triangles. The cross-arms are formed of 3-in. by 3-in. by 1-in. angle steel and  $\frac{1}{4}$ -in. by 3-in. flat steel. These arms are designed for three-phase circuits operating at pressures up to 35,000 volts and 50,000 volts, the respective sizes weighing approximately 36 lb. and 49 lb. The Electric Service Supplies Company, Seventeenth and Cambria Streets, Philadelphia, Pa., is the maker.

### Electric Toaster Stove

An electric stove designed for toasting, frying, grilling, etc., is being placed on the market by the Ruten-er Electric Company, Logansport, Ind. Two pieces of toast can be toasted at one time, one piece being placed above the heating element and the other below the grill pan. When frying, the pan is removed

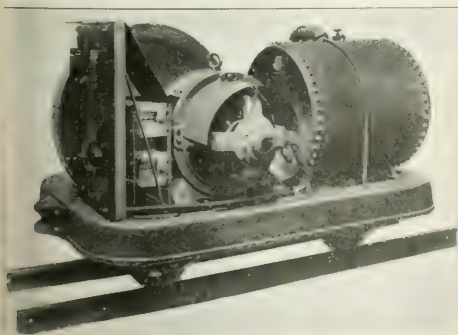


COMBINATION ELECTRIC STOVE

from beneath the coil and placed above on the frame. The body is designed so that the pan covers the entire top surface. The stove is equipped with a grid which fits into the pan. This grid can be adjusted to two heights and is used for grilling. This stove is finished in highly polished nickel.

### A Portable Motor-Operated Compressor

The small motor-driven air compressor illustrated herewith is designed for use in mines, industrial plants, etc., to supply air for rock drills, hammer drills, pneumatic tools, coal-pick machines and post punchers. The apparatus can be mounted on a truck of any desired wheel gauge and comprises a 15-hp Westinghouse motor, an air compressor, a storage tank and a motor-starting reostat. The motor is of the moisture-proof type and will operate successfully, it is claimed, in the wettest portions of the mine. It is designed for either alternating current or direct current. The receiver is made of plate steel and is tested to withstand 100 lb. air pressure. It is equipped with a safety valve, pressure gauge and blow-off or drain cock. The cylinder of the compressor is lubricated by a light-feed air-cylinder

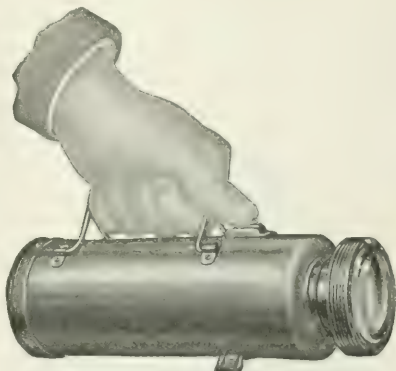


PORTABLE MOTOR-DRIVEN AIR COMPRESSOR

lubricated, while the crank shaft and crosshead are served by the splash system. An unloading device on the air-inlet valves saves energy when the demand for air is less than the output of the machine. This compressor is being manufactured by the Sullivan Machinery Company, Chicago.

### Hand Lantern Accommodating Ordinary Dry Cell

An electric hand lantern designed to accommodate the standard size of dry cell used for doorbell circuits is shown in the accompanying illustration. The battery can be easily inserted by unscrewing the end cap. The incandescent lamp employed in this lantern requires only 0.25 amp and has a rating of about 2.5 cp. A silver-plated reflector and a ground lens concentrate the light rays into a small-angle cone of flux. Inter-mittent or continuous light may be obtained by respectively pushing or sliding a button. With a well-constructed dry cell this lantern will give continuous light for 100 hours. Used intermittently it will operate from six months to a year. The manufacturer declares that a cell no longer fit for ignition purposes can be used in this lantern. It is 9 in. long and 2.875 in. in



HAND LANTERN EQUIPPED WITH BELL-CIRCUIT DRY CELL

diameter and can be furnished in polished nickel-plated brass or rubber-finish steel. The device is being marketed by the Beers Sales Company, Bridgeport, Conn.

### Wireless-Telephone Set

A radio-telephone set which is designed for an over-sea working range of 50 km (31 miles) between ship aeri-als 100 ft. high and having 200-ft. spans is being placed on the market by the Marconi Wireless Telegraph Company, Woolworth Building, New York.

The set comprises a transmitter and receiver, over-all dimensions 22 in. by 18 in. by 17 in. and weight 59 lb.; five cases of dry batteries, over-all dimensions of each case 21 in. by 18 in. by 5.5 in. and weight 70 lb.; one 6-volt, 80-amp-hour storage battery, weight 38 lb.; one switchboard, over-all dimensions 10 in. by 10 in. by 3 in. and weight 5.5 lb., and one receiving battery, over-all dimensions 9.5 in. by 17 in. by 5 in. and weight 20 lb. The set is also equipped with the following accessories and spare parts: two microphone cases and six spare microphone cells, six transmitting valves (double filaments), six receiving valves, one induction coil, one aerial tuning inductance, two pairs high-resistance telephones, one set of six crystals set in cups, connecting plugs and leads, six tuning lamps and small dry batteries for microphone and crystals.

The transmitter consists of a specially constructed valve shunted with condensers and induction coils in such a way that a continuous stream of oscillations is produced. The frequency of these oscillations is controlled by means of variable ebonite condensers. The oscillations are induced into the aerial wire through a



variable coupling, any tuning required being effected by means of the tuning lamp provided. A simple switch is used to change from talking to listening. This switch can be controlled from a distance in case the microphone is not near the set. A low-voltage current is used to heat the filaments of the valves, and for this purpose an 80-amp-hour accumulator is provided.

### Electric Cuspidor Polisher

Apparatus for polishing cuspidors electrically is shown herewith. The cuspidor is held against a rotating disk, which is provided with an automatic centering device, by a plunger supported from an iron brace above. A block turning on ball bearings is attached to the end of the plunger. The disk is belt-driven by a 0.25-hp motor. The outfit is mounted on an oak truck equipped with rubber-tired casters. The same apparatus can also be used for buffing silverware or grinding cutlery; in either case a buffing wheel or a grind-



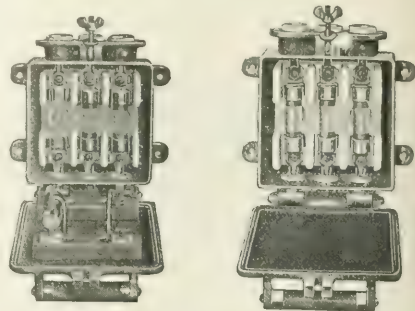
APPARATUS FOR POLISHING CUSPIDORS

ing disk forms an additional part of the equipment. When used as a grinder or a buffer the outfit is stood on end. This apparatus is being placed on the market by the J. I. Holcomb Manufacturing Company, Indianapolis, Ind., and the motor used in its operation is the product of the Robbins & Myers Company, Springfield, Ohio.

### Service Switch and Fuse Box

In Fig. 1 is shown a service switch designed for use both as a cut-out and as a switch. It consists of a set of inclosed fuses mounted in an iron box so that they can be made to swing with the cover and open the circuit or to remain in the fuse clips while the cover is drawn back, as desired. This service switch is so designed that it may be used on the outside of buildings where the wires enter or in cellars where the wires pass in from a subway, providing means whereby in cases of emergency the supply of energy may be cut off from the interior of the building and giving at the same time a main-line switch and cut-out so constructed that the circuit may be disconnected and the box sealed up. In the covers of the box are mounted fuse guides and withdrawal hooks. These hooks grasp the fuses when the levers outside the box are given a quarter turn.

In Fig. 2 is shown a fuse box which is similar to that of the service switch except that the cover is not provided with any mechanism for withdrawing the fuses from the circuit. Both boxes are equipped with rubber gaskets to make them waterproof.



FIGS. 1 AND 2—SERVICE SWITCH AND FUSE BOX

The service switch and fuse box described above are being manufactured by the D & W Fuse Company, Providence, R. I.

### Multi-Point Switch for Electric Ranges

A new snap switch brought out by the Bryant Electric Company, of Bridgeport, Conn., for use with electric ranges and other heating appliances is arranged to be so connected that instead of increasing the number of coils or elements in circuit beginning with "low heat," as has been the general practice heretofore, the new arrangement gives the greatest heat in the first position of the switch. In other words, beginning with the switch in its "off" position, the first twist of the knob throws into circuit all the heating elements controls. The second position cuts the heat down medium, the third to low, and the fourth is the "off" position. In this way the degrees of heat are provided in the order in which they are most frequently desired the heating device is more quickly brought to full operating temperature, and, since the current to be broken



MULTI-POINT SNAP SWITCH FOR HEATING DEVICES

at any step is small, a very much smaller and more compact switch can be used. An indicating dial, showing the position of the switch, is set at an angle of 45 deg. so as to be visible from any position in front of the switch.

# Jobber, Dealer and Contractor

## STOCK-ACCOUNTING METHODS FOR JOBBERS

System of Cards and Tickets Used by New York City Firm Affords Daily Inventory of Stock on Hand

The Northwestern Electric Equipment Company, 30 East Forty-second Street, New York City, which conducts an exclusively wholesale business in electrical supplies, employs a very simple and effective method of

ARTICLE		IDENTIFICATION		CAPATIVE NUMBER		MATERIAL STOCK		ON HAND	
Year	On Hand	Date	On Hand	Ordered	Date	On Hand	Ordered	Date	On Hand
1914	10	10	10	10	10	10	10	10	10

FIG. 1—WAREHOUSE STOCK-RECORD CARD

stock accounting that furnishes a complete inventory at the end of each day. The company fills orders from its warehouse in Brooklyn. No retail stores are maintained and all accounting and other business operations are conducted at the main office in New York.

In general the stock-accounting system consists in keeping records of goods purchased, stock received, material on hand and quantity issued. In order to be able to obtain this information at any time there are employed two sets of cards and three forms of tickets.

### Daily Inventory Card Files

One of the sets of cards is permanently kept in the office, being filed under the name of the material described thereon. When stock is received the office stock clerk adds to the amount already listed on the card, and when stock is issued he deducts from this amount, leaving a balance which shows the stock on hand. These cards therefore furnish a complete daily inventory of the stock by items.

The other set of cards is kept on file most of the time in the warehouse. When a certain line of goods be-

comes depleted, however, the stock card relating to that material is sent to the office, where the purchasing department fills in the spaces marked "X" as requisitions for new stock are made. The cards are then returned to the stock room where the stock clerk fills in spaces marked "q" when the ordered goods are received.

### Purchasing Forms and Direct Delivery Tickets

Requisitions sent to manufacturers for supplying stock either to the warehouse or direct to the customers are

ARTICLE		IDENTIFICATION		CAPATIVE NUMBER		MATERIAL STOCK		ON HAND	
Year	On Hand	Date	On Hand	Ordered	Date	On Hand	Ordered	Date	On Hand
1914	10	10	10	10	10	10	10	10	10

FIG. 3—OFFICE-RECORD CARD GIVING DAILY INVENTORY

made out in triplicate on order forms. The original, indicating the goods to be shipped, the method of transporting them, their destination and the identification mark to be stamped on the shipping case, is sent to the manufacturer. The duplicate copy is kept in an alphabetical file in the office for use in case the other becomes lost, and the third sheet is sent to the receiving department at the warehouse for checking the goods when they arrive. The latter copy, of course, is not sent to the receiving department if the goods are shipped directly to the customer, but is kept on file in the office.

When ordering shipments direct from the manufacturer to the customer the supply company sends a "Form D" ticket (meaning "direct delivery") along with the requisition, to be used as a packing slip. This ticket has about the same form as all of the others used as packing slips.

### Checking Goods Received

As soon as a package is received at the stock room from a manufacturer the clerk looks on the case for the identification number and checks up the goods from the

REMARKS		BILLED	No. B 4411
		INVOICE NO.	BACK ORD. FROM
BILL TO		SHIP TO	
CUSTOMERS ORDER NO.		SHIP VIA	
QUANTITY	DESCRIPTION		

FIG. 2—TRUCK-DELIVERY OR BOY-DELIVERY ORDER FORM—OFFICE COPY

REMARKS		BILLED	No. D 8207
		INVOICE NO.	BACK ORD. FROM
BILL TO		SHIP TO	
CUSTOMERS ORDER NO.		SHIP VIA	
QUANTITY	DESCRIPTION		

FIG. 4—PACKING TICKET FOR DIRECT SHIPMENT FROM MANUFACTURER TO CUSTOMER

corresponding receiver's requisition copy, which is then stamped "Goods received" and signed. The receipt of the goods is then entered on the stock-room card and the receiver's copy of the requisition is sent to the office, where it is filed by order number until the manufacturer's bill is received. Upon receipt of the latter it is

comes depleted, however, the stock card relating to that material is sent to the office, where the purchasing department fills in the spaces marked "X" as requisitions for new stock are made. The cards are then returned to the stock room where the stock clerk fills in spaces marked "q" when the ordered goods are received.



checked with the receiver's ticket and attached thereto. The requisition voucher which has been filed under the manufacturer's name is then stamped "Bill received" as is also the receiver's ticket so that there is no possibility of losing the record that a bill has been re-

FIG. 5—PACKING SLIP FOR TRUCK OR BOY DELIVERY

ceived. The auditing department after receiving a ticket and the attached bill, which has been checked by the purchasing department, forwards a check to the manufacturer for the amount indicated on the latter, and bills the customer by adding a profit to each item.

#### Delivery Forms

Orders which are filled from the warehouse are made on one of two forms of tickets, depending on the method of delivery. Orders on goods to be sent by express or freight are marked "E—F," and on those sent by boy or truck are marked "B."

FIG. 6—BEARER'S RECEIPT FOR GOODS DELIVERED

"E—F" forms are made out in triplicate, the original and first copy being sent to the warehouse. Notations on the methods of shipment and other remarks are made on the original by the stock-room clerk, who returns it to the office files for billing purposes and reference.

The first carbon copy is used as a packing slip and the other copy is kept by the auditing department for checking up the bills sent out each month. When an entire order cannot be delivered at one time a line is drawn through the missing items on the original form. These items are also stamped "Transferred to order No. —," while the corresponding items on the packing slip are stamped "Goods to follow," so that the customer will be informed of the shortage. The original "E—F" form is returned to the office, where a clerk fills out another "E—F" form for the material which is to be shipped later. In the space marked "Back order from" is marked the number of the original order. The number of the second order is stamped in the blank left of the original order following "Transferred to order No. —." The same procedure is followed no matter how many separate shipments are made in filling the original order. The notation on any one of the orders therefore furnishes a clue to finding the original order as well as all of the subsequent tickets used in filling shortages.

"B" forms are made out in quadruplicate, with a similar provision for assembling tickets covering separate deliveries on the original order. All sheets except



FIG. 7—SHELF STOCKROOM IN ELECTRICAL SUPPLY WAREHOUSE, BROOKLYN

one, which is the auditor's copy, are sent to the stock room initially. Notations are made on the original and on the packing slip as described in the foregoing under "E—F" orders. The original is then returned to the office for billing purposes and future reference. The second sheet, called the "bearer's receipt," is given to the person delivering the package, who obtains the consignee's signature on delivery of the goods. The receipted ticket is returned to the office and is kept in the proper files.

The audit copy is used by the clerk in checking up the stock-issuing cards. At the end of the month the copies are filed in alphabetical order and checked with the bills sent to customers to see that no order numbers are missing and to prevent the possibility of any goods being delivered without the consignee being billed therefor.

On the bottom of all packing tickets inclosed with goods sent out from the warehouse is printed, "This material has been carefully counted, checked and packed. Articles claimed short are usually found in the packing material. Do not return material before obtaining permission. Claims must be made at once. Glassware shipped at owner's risk."

# Industrial and Financial News

## Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

**Employees' Quarter-Century Club.**—A club has been organized by employees of the General Electric Company who have served the company for periods of twenty-five years or more. The branch at Schenectady, N. Y., has 150 members, and that at Lynn, Mass., close to 175.

**Industrial Plants.**—In the sixth edition of a book entitled "Work Done," published by Westinghouse, Church, Kerr & Company, New York, some typical examples of the company's operations in connection with industrial and power plants are described. The book is attractively illustrated and contains forty-eight pages.

**Lighting Plant for Cuenca, Ecuador.**—Mr. J. H. Torrens, an engineer for the General Electric Company, has sailed for Ecuador by way of Panama, leaving New York Aug. 28, to install a new electric-lighting plant at Cuenca, which is Ecuador's third largest city. Mr. Torrens expects to be absent in the southern hemisphere at least two years.

**Pumps for City of Toronto.**—A contract was awarded to the Turbine Equipment Company on Aug. 14 by the Toronto (Canada) Board of Control for two 24,000,000-gal. pumps for the main pumping station. The price of one of the units is \$50,400 and of the other \$48,400. These pumps are of the same design as one already installed.

**American Embassies to Make Foreign Patent Payments.**—Americans desiring to take out foreign patents at this time may make arrangements for payment through our embassies abroad, according to an announcement by the Commissioner of Patents. Every possible effort is being made to protect American inventors from losses as a result of the war.

**Electrical Equipment for Railways.**—The Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., has received from the Third Avenue Railway, New York, an order for twenty-five control sets for its low-floor, 24-inch wheel cars. The company has also received an order for 100 sets of control equipment for steel cars from the New York Municipal Railway Corporation.

**Regulator Sales Territory Awarded.**—The Corbett & DeCoursey Company, Columbia Bank Building, Pittsburgh, Pa., announces that it has closed a contract with the Thompson-MacArthur Regulator Company, of Buffalo, N. Y., for the exclusive sale of the Thompson automatic voltage regulator throughout Western Pennsylvania, Ohio, Indiana, Kentucky and West Virginia.

**Convention of Electric-Sign Organization.**—The fifth annual three-day convention of the executives and branch-office managers of the Federal Sign System (Electric), Chicago, was held at the Moraine Hotel, Highland Park, Ill., Aug. 5 to 7. With the exception of the San Francisco branch, each of the twenty-one branch offices of the organization was represented at the convention.

**Automobile Lighting Company Unaffected by War Conditions.**—Messrs. Gray & Davis, Inc., Boston, Mass., manufacturers of automobile lighting and starting outfits, are reported to be increasing their force and adding machinery to their plant, which is being kept in operation day and night. Up to the present it is said that the business of this concern has not suffered in any way on account of the European war.

**Electric Pumping at San Diego.**—The city of San Diego, Cal., has let contracts for two 250-hp motors for the operation of two four-stage centrifugal pumps which will pump water into the city reservoir. Electrical energy will be furnished by the San Diego Consolidated Gas & Electric Company. In addition, about ten 15-hp motors will be required to operate pumps which will lift the water from bored wells to the collecting reservoirs.

**Central-Station Service for Tunnel Builders.**—A contract has been closed between the New York Edison Company and the Flinn-O'Rourke Company, Inc., which is building new tunnels under the East River, for the supply of 10,000 hp of electrical energy for construction purposes. Two substations will be built at the Jeanette Park shaft, in which fourteen 600-hp motors will be installed.

**Chemical Company's Business Good.**—The Roessler & Hasslacher Chemical Company, 100 William Street, New York, is said to be faring well at present, and particularly is its business in acids and battery supplies for electrical companies excellent. The chemical company is expecting no dearth in the supply of raw material in the immediate future because of European unrest. The activities of this company are confined chiefly to the United States.

**Gold-Mining Company Buys Electrical Energy.**—A contract was closed recently by the Arkansas Valley Railway, Light & Power Company, Pueblo, Col., with the Vindicator Consolidated Gold Mining Company, covering 285 hp in motors for the operation of an air compressor. The contract runs for a five-year period and the compressor will be operated sixteen hours a day. The estimated gross revenue from this installation for the period of the contract is \$60,000.

**Pryor Ice & Light Company's Property to Be Sold by Receiver.**—Mr. John R. Cullinane, 903 LaSalle Building, St. Louis, announces that the plant and property of the Pryor (Okla.) Ice & Light Company will be sold at Pryor at 2 p. m. on Sept. 12. Mr. Cullinane, as receiver for the company, has issued a printed report of its business for the year ended Aug. 1, 1914, which shows gross income of \$12,725 and expenses of \$10,577, leaving a balance of \$2,148. The company has a franchise until 1927 and has a street-lighting contract of ten arc lamps.

**Show-Counter Display Card.**—The Economical Lamp Division, National Lamp Works of the General Electric Company, 25 West Broadway, New York, is sending out an attractive display card advertising its so-called "hylo" turn-down lamps. The card is printed in four different colors. Fac-similes of cartons in which the tungsten lamps are packed are shown on one side of the card, and of the carbon lamps on the other. These turn-down lamps are equipped with two filaments. The tungsten lamps take 25 watts "high" and 5 watts "low" or 40 watts "high" and 5 watts "low."

**Paint Prices Soaring.**—A general rise in the prices of paints is noted as a result of the war in Europe. Although its business in paints and varnishes for electrical purposes has recently been very good, the National Paint Company, 100 William Street, New York, is reported to expect a lull in the near future. This condition of the trade will result on account of the scarcity of raw materials coming into this country from foreign lands. The business of the foreign companies affiliated with the National Paint Company in London, Petrograd and Hamburg is reported to be practically at a standstill.

**Bolivia's Supply of Tungsten.**—According to Mr. Frank G. Carpenter, the well-known newspaper correspondent, Bolivia will make a wonderful mineral exhibit at the Panama-Pacific Exposition of next year. One metal that will be shown in great variety, it is declared, is tungsten, which has become so important in incandescent electric lighting. This metal comes from the department of Potosi, which is said to supply the greater portion of the world's consumption. Mr. Carpenter says that the owners of these mines are known as the tungsten kings, and that they control the world's output and fix the prices.



**American Fuses and Wiring Specialties for South America.**—The Chicago Fuse Manufacturing Company does some export business—comparatively small, however, compared to the volume of domestic business. It sends some of its products to South America, particularly to Argentina. Mr. W. W. Merrill, vice-president of the company, in answer to a question from a representative of the *Electrical World*, said that this business has shown some increase in volume of late. It is handled through the New York office of the company. The company has found the Germans its principal competitors in South American countries.

**Because of War Turbine Company Expects Increased Business.**—The Kerr Turbine Company, Wellsville, N. Y., has recently been selling a number of turbines to sugar concerns in Cuba, Ecuador and our own Southern States. On account of the war in Europe and the crippling of the sugar-beet industry in that region as a result, a great demand for sugar at maximum prices is expected. Accordingly the sugar-cane interests in both North America and South America will tend to increase their manufacturing facilities. The business of the Kerr company for the past month is said to have been the best the company has ever had. Most of the recent orders for turbines have been coming from the Middle West.

**Orders for Gas Engines.**—Among recent orders received by the Bruce-Macbeth Engine Company, Cleveland, Ohio, for its multi-cylinder gas engines are the following: Ambridge Water Works, Ambridge, Pa., one 125-hp four-cylinder natural-gas engine; Swarthmore College, Swarthmore, Pa., one 40-hp twin-cylinder artificial-gas engine; Magnolia Petroleum Company, Hodge, Tex., two 150-hp four-cylinder natural-gas engines; Washington University, St. Louis, Mo., one 40-hp artificial-gas engine; Wm. Chisholm & Sons Company, Cleveland, Ohio, one 150-hp natural-gas engine; Jeannette Glass Company, Jeannette, Pa., one 125-hp natural-gas engine; Ohio State Reformatory, Mansfield, Ohio, one 40-hp natural-gas engine; C. F. Jackson Company, Findlay, Ohio, one 90-hp natural-gas engine; Northside Cameraphone Theater, Pittsburgh, Pa., two 70-hp natural-gas engines.

**Activity in the Rubber Industry in Mexico.**—Practically all of the guayule rubber factories in Mexico, it is reported, have resumed operations. Preparations are being made by the Intercontinental Rubber Company to run all its factories, including its large plant at Torreon, on full time. Workmen have also started to cut the guayule shrub on the company's 2,000,000-acre property in the State of Zacatecas. Now that the constitutionalists have cleared Northern Mexico of disturbances, members of the Madero family have returned to their homes and will soon have their guayule manufacturing interests going again. So far as can be learned, none of the five rubber-manufacturing plants owned by the Maderos was destroyed by the warring factions, and all the factories need before resuming operations will be an overhauling. Next to the Intercontinental company, the Maderos are said to be the largest owners of guayule properties in Mexico.

## Corporate and Financial

**Iowa Company Retires Bonds.**—The Sioux City Service Company has retired \$40,000 first and refunding mortgage 5 per cent bonds through the operation of the company's sinking fund.

**New Company's First Dividend.**—The Wisconsin-Minnesota Light & Power Company has declared an initial quarterly dividend of 1½ per cent on the \$1,700,000 of 7 per cent cumulative preferred stock. The dividend is payable on Sept. 1.

**Harwood Electric Company Defers Dividend.**—The Harwood Electric Company of Hazleton, Pa., has deferred payment of the semi-annual dividend on the 6 per cent cumulative preferred stock. A letter to the stockholders says that the action was taken on account of the general financial situation.

**Receiver Appointed for Kansas Company.**—Judge McPherson on Aug. 20 appointed Mr. L. G. Treleven receiver of the Consumers' Light, Heat & Power Company of Topeka, Kan. Mr. Treleven has for years been manager of the company. The action grew out of the suit brought by the Central Trust Company of New York as trustee to foreclose the mortgage for \$1,000,000, the January, 1914, and July, 1914, coupons being in default.

**Cities Service Financial Statements.**—Price, Waterhouse & Company, New York, have made an examination of the books of the Cities Service Company, of New York, from its organization up to and including April 30, 1914, besides making an examination of a substantial portion of the subsidiary companies for the twelve months ended April 30, 1914, the gross earnings of which aggregated about 60 per cent of the total gross earnings. The income account for the year ended April 30, 1914, is as follows: Company's proportion of earnings applicable to common stock of subsidiary companies, \$2,836,932; dividends on preferred stock of subsidiary companies, \$21,221; interest on bonds of subsidiary companies, \$176,607; interest on bills and accounts receivable, \$293,772, totaling \$3,328,532. This, less general and administrative expenses, \$65,879; interest on bills and accounts payable, \$97,598; interest on five-year 7 per cent convertible gold notes, \$246,685; interest on Consolidated Cities Light, Power & Traction Company 5 per cent bonds, \$175,000, or a total of \$585,162, left for profits \$2,743,370. Deducting preferred-stock dividends of \$1,202,242 and common-stock dividends of \$646,329 left a balance transferred to surplus of \$894,799. The company has also issued an earnings statement for the year ended July 31, in which gross earnings are given as \$3,543,737 and expenses as \$97,269, leaving \$3,446,468 as net earnings. Interest on notes amounted to \$320,991, dividends on preferred stock amounted to \$1,422,125, and dividends on common stock amounted to \$702,686, thus leaving \$1,000,666 as net to surplus. A surplus reserve of \$22,184 added to the surplus of \$2,733,534 made the total surplus \$2,755,718. The item "surplus reserve" is new, being in accordance with an order of the board of directors to set aside, starting July 1, 1914, as a reserve fund an amount equal to 10 per cent of the net earnings of the company available to stock, which is to be in lieu of a depreciation fund. This fund is in addition to the usual maintenance charges, which are regularly included in the operating expenses of the company. At a meeting Aug. 26 it was decided that present conditions and outlook do not warrant any immediate action beyond that previously taken with respect to the payment of dividends. Mr. Henry L. Doherty, president of the company, has written the following to the stockholders in regard to the war situation: "Since our last communication various shareholders have written to inquire how the war in Europe can affect the payment of dividends by this company. Public utility properties are required continually to extend their service to meet the natural, growing demands of their communities. Capital for these requirements is provided ordinarily from the surplus earnings and by the sale of new securities. Under existing conditions, when all security markets are closed, the Cities Service Company must be prepared to meet all capital requirements out of the income from its properties. Your directors believe that the measures put into effect strengthen the position of the company and fortify the investment of the stockholders."

### NEW YORK METAL MARKET PRICES

Copper	Aug. 25—			Sept. 1—		
	Bid	Asked		Bid	Asked	
Standard spot*	Selling Prices			Selling Prices		
	£	s	d	£	s	d
London, standard spot*						
Prime Lake	12.50	to 12.75	†	12.50	to 12.75	†
Electrolytic	12.25	to 12.37	1/4	12.25	to 12.35	†
Casting	12.15	to 12.25	†	12.15	to 12.25	†
Copper wire base	13.75	to 14.00		13.75	to 14.00	
Lead		2.90			3.90	
Nickel	40.00	to 45.00		40.00	to 45.00	
Sheet zinc, f.o.b. smelter	7.50	to 8.00			8.50	
Spelter, spot	6.10	to 6.20		6.00	to 6.10	
Aluminum	20.00	to 21.00		19.50	to 20.50	

### \*COPPER EXPORTS

Total tons to Sept. 1.....19,676

\*From daily transactions on the New York Metal Exchange.

†Nominal.

NOTE.—The New York Metal Exchange and the London Metal Exchange have been closed until further notice. No reliable quotations on old metals can be obtained for the present. There is no buying in this market.

## LARGE GAINS IN MIDDLE WEST

### Returns Received from Two-Thirds of Central-Station Industry of Central States Show Increases Despite Business Depression

The returns as received by the *Electrical World* for the June operations of the central-station companies operating in the Central States show for the most part the same healthy state of business that was shown for May. The increase of June, 1914, over June, 1913, was practically the same as that of May, 1914, over May, 1913. Illinois has been left out of the tables owing to incomplete returns.

TABLE I.—COMPARATIVE FIGURES FOR JUNE OPERATIONS OF 72 PER CENT OF THE CENTRAL-STATION INDUSTRY OF THE EAST NORTH CENTRAL STATES OF OHIO, MICHIGAN, INDIANA AND WISCONSIN, ILLINOIS EXCLUDED FOR THE MONTHS OF MAY AND JUNE, 1913 AND 1914

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
May	\$1,969,150	\$1,789,083	10.0	97,914,432	90,161,505	8.5
June	1,845,309	1,664,730	11.0	94,194,607	85,902,045	9.5

The returns which have been received so far from Illinois represent but a small portion of the total industry in that State. However, the returns that did come in showed an increase in income, with one exception, of from 12 per cent to over 30 per cent. The one exception showed a decrease in income of 4 per cent but an increase in output of 4 per cent. It was, however, a small company—its monthly income from the sale of electrical energy being less than \$10,000. One company, the

TABLE II.—COMPARATIVE FIGURES FOR MAY AND JUNE, 1913 AND 1914, SHOWING THE OPERATIONS OF 90 PER CENT OF THE CENTRAL-STATION INDUSTRY OF THE WEST NORTH CENTRAL STATES

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
May	\$778,029	\$633,432	23.0	70,302,296	55,015,511	26.7
June	754,935	610,224	23.6	71,864,644	53,909,090	33.3

largest from which we received returns, a company with a monthly income around the hundred-thousand-dollar mark, showed an increase for June of over \$13,000.

### Northeast Growth from 2 to 20 per Cent

Comparative figures have been received from 72 per cent of the industry in the rest of the East North Central States,

TABLE III.—JUNE OPERATIONS OF CENTRAL-STATION COMPANIES REPRESENTING 36 PER CENT OF THE INDUSTRY IN THE EAST SOUTH CENTRAL STATES

INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
June, 1914	June, 1913	Per Cent Increase	June, 1914	June, 1913	Per Cent Increase
\$246,876	\$235,469	5.0	10,893,631	10,191,363	7.0

namely, Ohio, Michigan, Indiana and Wisconsin. These companies, it will be noticed in Table I, show an exceedingly satisfactory growth both in income and output. The income increase in both May and June, 1914, show an increase of approximately \$160,000 over the corresponding periods in 1913. Also the output for the same periods has increased in the neighborhood of 8,000,000 kw-hr. These returns

cover the industrial section of the Central States. With the June promises of an exceedingly good harvest industry in this group was bound to advance. The large cities, without one exception, showed increases. The smallest increase was an increase of \$350, or 2 per cent, coming from a small company in a large city. The largest increase was \$53,000, or 13.5 per cent. Other companies showed still greater percentage growth, although not as large in bulk. One company with a monthly income from the sale of energy in the neighborhood of \$25,000 showed an increase of approximately 20 per cent.

### Northwestern Group Encouraging

The *Electrical World* has collected returns for May and June from practically the entire central-station industry of the West North Central States. It is interesting to note

TABLE IV.—JUNE OPERATIONS OF CENTRAL-STATION COMPANIES REPRESENTING 66 PER CENT OF THE INDUSTRY IN THE WEST SOUTH CENTRAL STATES

INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
June, 1914	June, 1913	Per Cent Increase	June, 1914	June, 1913	Per Cent Increase
\$574,410	\$499,007	13.0	19,843,957	14,246,882	39.3

that here, as in the East North Central States, the increase is approximately the same, namely, \$145,000 income and 20,000,000 kw-hr. The percentage, however, in the Northwestern group is more than double that in the Northeastern group. With a combined population for its seven states less than the four states above included in the Northeastern group, the Northwestern group represents a region in which it is much more difficult to get business. That it should be growing at the rate of approximately 25 per cent a month in the month having the lightest load of the year is indeed encouraging.

### South Central States' Returns

In the East South Central States only 36 per cent of the industry is reporting, and while the returns now received do not show a large percentage or bulk increase, it is not to be taken as true for the whole region. It may easily be that the remaining 64 per cent would materially raise the percentage increases given in Table III. From the West South Central States two-thirds of the industry sent in figures for June. These companies show an enormous gain in output and a satisfactory gain in income.

### Contributory Conditions

With the exception of Illinois, as has before been noted, the *Electrical World* received returns from 56 per cent of the industry for May and 67 per cent for June. Large percentage increases are to be expected in the Middle West.

TABLE V.—RETURNS FOR MAY AND JUNE OPERATIONS FROM CENTRAL-STATION COMPANIES IN THE CENTRAL STATES (EXCLUDING ILLINOIS)

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
May (56 per cent of industry)	\$3,200,553	\$2,841,685	12.7	202,611,026	162,363,929	24.8
June (66.7 per cent of industry)	3,914,836	3,459,497	13.2	217,920,183	182,406,207	19.4

It is not an old-established industrial territory like the Middle Atlantic States but a new territory devoted largely to agriculture. The market and industry are both young, and therefore rapid growth must be expected until the time shall come when the market is saturated. It will be noticed from the tables that the states showing the greatest percentage increase are the West North Central States. The



companies in those states in the past year have come to recognize the value of up-to-date, wide-awake salesmen. This is particularly true of the larger cities in this group. Some show increases as high as 20 per cent, and many of them show increases of over 15 per cent. The mining industry is continually ordering more electrical machinery. The large harvest has bettered financial conditions and made for a greater number of industrial sales. All of the larger central-station companies are weekly reporting large contracts signed for motor load.

## Business Notes

**The Poole Engineering Company**, Baltimore, Md., was recently reorganized and Mr. S. P. Brady appointed president.

**The Raymond Electric & Manufacturing Company**, of Detroit, Mich., has purchased the entire stock of the former Seidler Miner Electric Company, of Detroit.

**Main Electric Manufacturing Company**, 219 South Beatty Street, Pittsburgh, Pa., announces that it has opened a branch sales office in Delaware, Ohio, with Carl J. Main as manager.

**The Crown Woven Wire Company**.—The factory of the Crown Woven Wire Company has been moved to 201 Fulton Street, New York. This company's plant was recently destroyed in the Salem (Mass.) fire.

**Greenwood Advertising Company**, manufacturer of electric signs, Knoxville, Tenn., announces that it has opened an Eastern office at 510 Sansom Street, Philadelphia, Pa., under the management of F. J. McCormick.

**The Trenaman Electrical Dental Manufacturing Company**, 107 West Twenty-fifth Street, New York, has been formed. Its officers are as follows: President, John V. Trenaman; treasurer, T. F. Diack, and secretary, J. P. Page.

**The Goulds Manufacturing Company**.—A. H. Whiteside, formerly connected with the Sterling Boiler Company, the Westinghouse Electric & Manufacturing Company and the Allis-Chalmers Company, has been appointed vice-president and general sales manager of the Goulds Manufacturing Company, Seneca Falls, N. Y. Mr. Whiteside succeeds Mr. W. E. Davis.

**Elliott and Liberty Companies' Chicago Sales Agency**.—Charles C. Hughes has been appointed district sales manager for the Elliott Company and the Liberty Manufacturing Company in Chicago, with headquarters at 527 Monadnock Building. He succeeds S. A. Bockius, who recently resigned to enter business for himself as manufacturers' agent, in Pittsburgh.

## New Industrial Companies

**The Woolley-James Electric Company**, of Buffalo, N. Y., has been chartered with a capital stock of \$50,000 by J. Hora, Jr.; W. S. James, and L. A. Woolley. The company purposes to act as a commission concern and deal in electrical appliances.

**The Andes Exploration Company**, of New York, N. Y., has been incorporated with a capital stock of \$100,000 by K. A. Siemers, M. McCune and R. Kay, 608 West 113th Street, New York, N. Y. The company intends to do a mining, lumbering and electric construction business.

**The Goshen Stamping & Brass Company**, of Goshen, Ind., has been formed to manufacture electric fixtures and to do a contracting business. Its activities will be mostly confined for the present to southern Michigan and northern Indiana. The officers are Messrs. A. F. Ernest, president; A. H. Schmidt, vice-president, and C. B. Miller, secretary.

**The Minton Safety Equipment Company**, of New York, N. Y., has been incorporated by Grace M. Minton, of Metuchen, N. J.; Charles W. Abrams, 405 Riverside Drive, New York, N. Y., and James D. Abrams, 426 Third Avenue, Lyndhurst, N. Y. The company is capitalized at \$10,000 and purposes to manufacture and deal in safety devices for elevators, etc.

## Trade Publications

**Rubber-Covered Wires**.—A price list of rubber-covered wire is given in a leaflet published by M. B. Austin & Company, Chicago, Ill.

**Tube Cleaners**.—Cleaners for boiler tubes are listed and illustrated in Bulletin No. 40 issued by the Roto Company, Hartford, Conn.

**High-Sensitivity Galvanometer**.—Bulletin No. 228 issued by the Leeds & Northrup Company, Philadelphia, describes a D'Arsonval galvanometer of high sensitivity.

**Mesco Products**.—The Manhattan Electrical Supply Company, 17 Park Place, New York City, has issued a catalog covering all of the products which it manufactures.

**Semi-Fluid Lubricant**.—Lesoyl, a semi-fluid lubricant made by the Lumen Bearing Company, Buffalo, N. Y., is described in a booklet prepared by that organization.

**Push-Button Switch**.—In a leaflet issued by the Bryant Electric Company, Bridgeport, Conn., is described a push-button switch equipped with a molded-insulation cover.

**Electric Elevators**.—In a catalog issued by the American Machine Company, Louisville, Ky., various types of electric elevators manufactured by the company are listed and illustrated.

**Service Switches and Fuse Boxes**.—Circular No. 112 issued by the D & W Fuse Company, Providence, R. I., is descriptive of service switches and fuse boxes for National Code fuses.

**Fuses and Cut-Outs**.—In Catalog No. 15 published by the D & W Fuse Company, Providence, R. I., a complete list of cartridge fuses and cut-outs manufactured by the company is given.

**Lockfast Plugs**.—A plug which may be inserted or removed from a socket by making a single turn is described in a folder issued by the Yost Electric Manufacturing Company, Toledo, Ohio.

**Electric Apparatus**.—Bulletins issued in July by the Cutler-Hammer Manufacturing Company, Milwaukee, describing various types of electrical apparatus, are being sent out under one cover.

**Cement Paint**.—The uses to which flake-white cement paint were put in the Barclay Building, Newark, N. J., are described in a circular issued by William J. Niles, Trenton Avenue, Philadelphia, Pa.

**Water Strainers**.—The Lagonda Manufacturing Company, Springfield, Ohio, has published a twenty-page catalog describing multiple water strainers for power plants and pumping-station intake lines.

**Wooden Poles**.—Methods of felling and preparing poles for telephone, telegraph and transmission-line purpose are given in an attractive booklet recently published by the Western Electric Company, New York.

**Fixtures for Gas-Filled Tungsten Lamps**.—The Benjamin Electric Manufacturing Company, 120 South Sangamon Street, Chicago, Ill., is distributing a bulletin describing its fixtures for gas-filled tungsten lamps.

**Motion-Picture Apparatus**.—In an attractively illustrated twenty-eight-page catalog issued by the Precision Machine Company, Inc., 317 East Thirty-fourth Street, New York, are described a so-called "simplex" projector and accessories.

**Alarm for Escaping Gas**.—In a catalog issued by the Gas Safety Electric Bell Company, Inc., 209 East Nineteenth Street, New York, which is printed in English and Italian, an apparatus for detecting escaping gas is described.

**Flame-Arc Versus Nitrogen-Filled Lamps**.—The Koerting & Mathieson Company, 49 East Twenty-first Street, New York City, has issued a folder comparing the costs of operating its Excellor flame-arc lamps and nitrogen-filled incandescent lamps.

**Triangular Choke Coil**.—A horn-gap lightning arrester consisting of a triangular-shaped choke-coil and cartridge-type resistors mounted as a unit on insulators is described in a circular issued by the Railway & Industrial Engineering Company, Greensburg, Pa.

## Personal Mention

Mr. J. E. Carroll has been appointed manager of the Mauston (Wis.) Electric Service Company.

Mr. Lester E. Flint has succeeded Mr. Henry S. Thompson as treasurer of the Turner Falls (Mass.) Company.

Mr. Harry R. Margetts has been appointed general superintendent of the municipal electric plant at Murray, Utah.

Mr. E. F. Williams has succeeded Mr. P. R. Horry as manager of the Home Electric Company, Guttenberg, Ia.

Mr. H. W. Brubaker has been appointed electrical superintendent of the Edison Electric Company, Lancaster, Pa.

Mr. C. A. Reese has succeeded Mr. C. S. Newman as superintendent of the municipal electric plant at Easton, Pa.

Mr. L. L. Gillett has been made general superintendent of the George Warren Company's electric plant at Muscoda, Wis.

Mr. George R. Sheldon has superseded Mr. Robert Sealy as treasurer of the Wisconsin Edison Company, Milwaukee, Wis.

Mr. P. F. Forsythe has succeeded Mr. M. L. Morrison as superintendent of the municipal electric plant at Holton, Kan.

Mr. W. T. Tucker has been appointed manager of the Mineral Wells (Tex.) Electric System, succeeding Mr. L. M. Levinson.

Mr. Francis Varga has succeeded Mr. G. A. Havens as vice-president and secretary of the Leon (Ia.) Electric Company.

Mr. William Summers has succeeded Mr. C. C. Baltzy as chief engineer of the Sioux Falls (S. D.) Light & Power Company.

Mr. D. W. Blakeslee has been appointed instructor in electrical engineering at the University of Arkansas, Fayetteville, Ark.

Mr. J. W. Cooper has become manager of the Sabinal (Tex.) Water & Ice Company as successor to Mr. C. M. Netherlin.

Mr. E. J. Baum has succeeded Mr. H. J. Ward as local manager of the American Light & Power Company, St. Charles, Mo.

Mr. Edgar Z. Wallower, for the last six years superintendent of the Harrisburg (Pa.) Light & Power Company, has been appointed general manager of the Lockport (N. Y.) Light, Heat & Power Company.

Mr. J. S. Dales has been appointed vice-president of the Interstate Public Service Company and the Franklin (Ind.) Water, Light & Power Company, both of which belong to the Middle West Utilities Company.

Mr. C. M. Kaltwasser, formerly manager of the Lockport (N. Y.) Light, Heat & Power Company, became general manager of the Harrisburg (Pa.) Light & Power Company Sept. 1. As noted above in our columns, Mr. Kaltwasser will be succeeded at Lockport by Mr. Edgar Z. Wallower, formerly operating superintendent at Harrisburg.

Mr. A. A. Trawick has resigned as manager of the Mississippi River Power Company, which operates the great water-power plant at Keokuk, Ia., to become vice-president and general manager of the United Electric Securities Company, of Boston. Mr. Trawick some years ago managed utility properties for the corporation to which he is returning. He came to Keokuk in May, 1911, from Tampa, Fla., where he was manager of the Stone & Webster utility interests.

Mr. James N. Hatch, for eleven years connected with the firm of Sargent & Lundy, engineers, Chicago, has resigned to open an office at 1525 Old Colony Building, Chicago, as a consulting engineer. At first Mr. Hatch will devote particular attention to appraisal and valuation work. He is at present associated with Prof. M. E. Cooley in the appraisal of the properties of the Detroit United Railway Company. Mr. Hatch is a graduate of the University of Michigan and holds the degrees of C. E. and M. E. from that institution. He is a member of the American Society of Civil Engineers, the Western Society of Engineers and the Engineers' Club of Chicago.

Mr. Parker H. Kemble has resigned as manager of the electrical commercial department of the Union Gas & Electric Company, Cincinnati, Ohio, on account of ill health. To secure a complete rest he has planned to take his family for a trip down the Ohio and Mississippi Rivers on a motor-driven houseboat. Mr. Kemble's career is interesting because of his wide experience and training. He was educated at Harvard, at the Technology School in Dresden, Germany, and at the Massachusetts Institute of Technology. Following this theoretical training he received practical experience in marine and mechanical engineering at the shipyards of William Cramp & Sons, Philadelphia. Later he joined the engineering staff of the Boston Elevated Railways Company. When the Windsor Locks Electric Lighting Company, the Enfield Electric Light & Power Company and the Enfield Gas Company were consolidated into the Northern Connecticut Light & Power Company, of Windsor Locks, Conn., Mr. Kemble was engaged to rebuild and operate the combined system. Leaving this company, he went to Brooklyn, N. Y., to become district manager for the Edison Electric Illuminating Company there. Prior to his connection with the company which he has just left he was general sales manager of the Toronto (Ont.) Electric Light Company. Mr. Kemble is a member of numerous engineering societies and served as vice-president of the Canadian Electrical Association in 1912.

Mr. Truman P. Gaylord, whose appointment to be acting vice-president of the Westinghouse Electric & Manufacturing Company was announced in the *Electrical World* of Aug. 29, is the district manager of the Chicago office of the same company.



T. P. GAYLORD

Mr. Gaylord will succeed Mr. H. D. Shute, who has been appointed treasurer of the company. He will remove his office to East Pittsburgh on Sept. 21. Mr. Gaylord, who is a native of Shelby, Mich., is a trained electrical engineer. He was a member of the class of '93 of the University of Michigan, where he took the electrical engineering course. He spent three years at that institution, but did not graduate there, going in 1892 to the electrical department of the World's Columbian Exposition at Chicago, where he was

made engineer of underground construction. Here the young student carried to a successful completion a work that abounded with perplexities and difficulties. At the conclusion of the World's Fair in 1893 Mr. Gaylord entered Armour Institute in Chicago and graduated, receiving the degree of B. S. in E. E. Later he received the full E. E. degree. For several years Mr. Gaylord was associate professor of electrical engineering at Armour, resigning in 1898 to take a position in the testing laboratory of the Chicago Edison Company. A year later, in 1899, Mr. Gaylord entered the Chicago office of the Westinghouse Electric & Manufacturing Company, with which he has been connected ever since. At first a sales engineer and salesman, his promotion was rapid, for, in 1903, he was made manager of the office. During Mr. Gaylord's administration of the Chicago office its business has increased in a very marked degree. The new vice-president is a man with unusual gifts as an executive and one who is universally respected for his ability and high personal character. He is an associate of the American Institute of Electrical Engineers, a member of the Jovian Order, the Electric Club of Chicago and the Union League Club of Chicago. He is married and has one child.

## Obituary

Henry Harbinson Sinclair, pioneer in electric transmission and hydroelectric development in California and vice-president of the Southern California Edison Company, Los Angeles, Cal., died at his home in Pasadena, Cal., Aug. 31, at the age of fifty-seven years.



## Construction

### New England

**ALBANY, MAINE.**—The Edwards Mfg. Co., it is understood, is contemplating the installation of a new electric power plant near the town of Albany, Maine, to operate its cotton-mill and other plants at the west end of the Kennebec chain. The proposed station will be erected just north of the present No. 1 station and will be equipped to develop about 1800 hp.

**MOUNT VERNON, MAINE.**—The local electric-light plant, owned by R. H. Jacobs, was recently destroyed by fire, causing a loss of about \$10,000.

**PRINCETON, MAINE.**—The local electric-lighting plant has been removed to the steam mill of C. F. Eaton for the present.

**WATERVILLE, MAINE.**—The Central Maine Pwr. Co., of Waterville, expects to build a new hydro power station to replace the one injured by fire. This will contain only a small amount of electrical apparatus. The larger part of it will be used as a substation to distribute electricity to the Waterville district and the Waterville, Fairfield & Oakland Railway system. The number of panels for the distribution system has not yet been determined. F. H. Mason is chief engineer.

**WINTHROP, MAINE.**—The Winthrop & Wayne Lt. & Pwr. Co. has contracted with the Central Maine Pwr. Co., Augusta, to furnish electricity to operate its system in both Winthrop and Wayne. The high-tension (33,000 volts) transmission line will be tapped on the Whitten Road. The line to Winthrop will be about 10 miles in length.

**BOSTON, MASS.**—Plans have been announced by Fred S. Gore, commissioner of the General Inventions Department for improvements at Deer Island, which contemplate the construction of a central power station to be connected with the main building by a series of tunnels.

**SOUTH HADLEY FALLS, MASS.**—A commission, consisting of Senator Calvin Coolidge, of Northampton; Chester Main, of Winchester, and W. S. Robinson, of Springfield, has been appointed to appraise the plant of the South Hadley Falls Co. The property is to be purchased by the town and operated as a municipal lighting plant.

**TAUNTON, MASS.**—The State Gas and Electric Light Commission has authorized the transmission lines of the Taunton municipal electric-light plant to be extended to Raynham.

**WATERTOWN, MASS.**—Preparations are being made to install an ornamental street-lighting system on Galen Street between Watertown Square and the Newton line. Mazda lamps of 80 cp. will be used.

**WEYMOUTH, MASS.**—Work has started on the construction of the new power house of the Weymouth Lt. & Pwr. Co. on Jackson Square.

**PAWTUCKET, R. I.**—Preparations are being made by the Broad Street Pwr. Co. for the erection of a new power plant (100 by 65 ft.) at the corner of Broad Street and Railroad Avenue, to cost approximately \$125,000.

### Middle Atlantic

**EAST ROCKAWAY, N. Y.**—Plans are being considered for lighting the streets of the village by electricity.

**ITHACA, N. Y.**—Bids will be received by E. L. Williams, Cornell University, Ithaca, until Sept. 28 for construction, including heating, plumbing and electrical work, of the Drill Hall, Cornell University. Separate bids must be submitted on each division of the work; no combination of bids will be considered. Drawings and specifications may be consulted and plans in forms of proposals obtained at the office of the treasurer of Cornell University, at the Department of Architecture, Capitol, Albany, and at the New York office of the Department of Architecture, Woolworth Building, New York. Copies of plans may be obtained at the Department of Architecture, Albany, upon deposit of \$2.50 and a check for \$10 for each set of heating, plumbing and electrical plans. Lewis F. Filcher, Capitol, Albany, is state architect.

**JAMESTOWN, N. Y.**—The Western New York El. Co., of Jamestown, N. Y., is erecting a three-phase, 25-cycle, 2300-volt, (aluminum wire) transmission line on the poles of the Jamestown, Westfield & Northwestern R. R. Co., which follows the east side of Chautauque Lake. This line will be 20 miles long and will supply electricity for lamps and motors in the towns of

Fluanna, Greenhurst, Maple Springs, Dewittville, Point Chautauque and Hartford, the village of Bemus was wrecked and the plants along the line. F. W. Bullock is superintendent.

**LILLY DALE, N. Y.**—The local electric-light plant was damaged by lightning recently. The generator was wrecked and the town is at present without electrical service.

**MINNETO, N. Y.**—The Minneto-Meridian Shade Cloth Co. has started work on construction of a power house at the Minneto development, about 10,000 hp. The company, it is understood, will utilize about 2,000 hp.

**NEW YORK, N. Y.**—The Flinn-O'Rourke Co., which has the contract for building the new subway tunnels under the East River, has entered into a contract with the New York Edison Co. to furnish 10,000 hp of electrical energy for operation of tunneling equipment. Two power plants are now in construction in which 14 motors of 600 hp each will be installed.

**NEW YORK, N. Y.**—Bids will be received by the Board of Health of the Department of Health, corner of Centre and Mulberry Streets, New York, Sept. 15 for furnishing labor and material required to install and complete, together with all necessary alterations, the electric work in a pavilion on the grounds of the Department of Health, Flushing Avenue. Blank forms and further information may be obtained at the office of the chief clerk of the department.

**OVID, N. Y.**—The water-power plant of the Ovid El. Co. at Touchanock Falls was recently destroyed by fire. The plant, it is understood, will be rebuilt at once. The company furnishes electrical service in Ovid, Mansburg and Interlaken.

**AUBURN, PA.**—The Auburn El. Lt. Ht. & Pwr. Co. has taken over the West Township and the Port Clinton El. Lt. Ht. & Pwr. companies and consolidated them with the Auburn company. D. W. Nagle is secretary and treasurer.

**HARRISBURG, PA.**—Applications have been made to the State Department by H. L. Mitchell, L. C. Lamb and R. M. Evans, of Pittsburgh, for charters for the following electric systems: the Forward El. Co., the Penn Township El. Co., the Adams Township El. Co. and the Cranberry Township El. Co. The companies will supply electric light and power to the towns in the townships for which they are named.

**HAZLETON, PA.**—The Harwood El. Co., of Hazleton, is extending its transmission lines from Danville to Sunbury. These lines will be probably be completed about Oct. 1. A second line is being erected from Berwick to Danville to provide for the increasing demand in that district.

**JOHNSTOWN, PA.**—The Penn El. Ser. Co., a subsidiary of the Citizens' Lt. Ht. & Pwr. Co. of Johnstown, has begun work on the erection of a transmission line from Hooversville to the new town of Cairnbrook, a distance of about 10 miles. The company will furnish electricity for street lighting and other uses as well as for domestic and commercial purposes.

**KITTANNING, PA.**—At an election held Aug. 25 the proposal to issue \$112,000 in bonds for the installation of an electric-light plant and water-works system was carried.

**PHILADELPHIA, PA.**—The contract for the construction of a one-story addition (67 ft. by 88 ft.) to the power house of the Girard estate on Twentieth Street and Oregon Avenue has been awarded to Dock & Co., of Philadelphia.

**PHILADELPHIA, PA.**—The Pike County Lt. & Pwr. Co., which was organized by Philadelphia interests to acquire lighting and power companies in Pennsylvania, has secured options on the Milford Township El. Co., the Milford El. Co. and the Westfall El. Co. The office of the company is in the Land Title Building, Philadelphia.

**PITTSBURGH, PA.**—The contract for installing 35 ornamental lamps standards, carrying a 2000-cp inverted arc lamp, maintaining underground wires, on Oliver Street, has been awarded to the Duquesne Lt. Co. Robert Swan is director of public service.

**PITTSBURGH, PA.**—The West Penn El. Co. has secured a contract for furnishing electricity to several mines on the line of the Montour railroad, which include the McDonald, Bishop, Thompsonville and Hills and the Henderson Coal Co.'s mine at McDonald. At the last mine about 100 miles of wire will be erected and 1100 hp will be supplied. The company recently secured the contract for furnishing power for the Buffalo El. Co.'s Hazel mine, at Cannonsburg.

**ATLANTIC CITY, N. J.**—The Atlantic City El. Co. has been granted a permit to erect a power house, 52 ft. by 102 ft. to cost about \$30,000. It is understood, will soon be asked for.

**BUTLER, N. J.**—Bids will be received by George J. Fritz, borough clerk, until Sept. 14 for the construction of a municipal electric-light plant, including power station, producers, electric equipment, etc. Plans are on file in the office of Runyon & Carey, consulting engineers, 845 Broad Street, Newark, N. J.

**GLOUCESTER, N. J.**—The installation of an electric-light plant in connection with the municipal water-works system is reported to be under consideration.

**LAMBERTVILLE, N. J.**—An order has been issued by Vice-Chancellor Backes directing the sale of the property of the Lambertville Ht. Lt. & Pwr. Co., free from encumbrances, amounting to \$30,000.

**ROSELAND, N. J.**—The Borough Council has instructed George C. Plummer, chairman of the lighting committee, to request the Public Ser. El. Co. of Newark, to extend its transmission lines down Eagle Street Avenue and over Passaic Avenue. Street lamps cannot be placed this year, as the appropriation has been exhausted. Provision will be made for street-lighting next year if the wires are extended.

**VINELAND, N. J.**—Plans are being prepared by the Dept. of Public Ser., State House, Trenton, for a power house for the New Jersey State Home for Feeble-minded Women, to cost about \$30,000.

**BECKLEY, W. VA.**—Tentative arrangements are under way by parties interested in the Beckley Electric Utility, organized by G. C. Hedrick and others, for securing franchises and installing a water-works system and an electric light and power plant at Beckley.

**BUCKHANNON, W. VA.**—The Buckhannon Lt. & Wtr. Co. will install within the next 30 days one 1,000,000-gal. centrifugal pump directly connected to a 80-hp, 2300-volt motor, both manufactured by the Allison-Chalmers Co. The company has completed its new power plant and a complete lighting system. J. G. Mayfield is general manager.

**CAMERON, W. VA.**—Application has been made by H. A. Moody and F. R. Fagan to the Town Council for a franchise to construct and operate an electric-light plant in Cameron.

**WOODSDALE, W. VA.**—The town of Wooddale has awarded the contract for the installation of a new street-lighting system to the Stratford El. Co. The contract calls for 60 lamps. Wooddale has not a post office.

**WEYERS CAVE, VA.**—The Weyer's Cave Lt. & Pwr. Co. expects to start within the next three months 6 miles of electric distributing lines and to purchase material for same. L. E. Long is secretary and manager.

**WASHINGTON, D. C.**—Plans have been prepared by the C. O. Coole & Co., of Pittsburgh, Pa., for the construction of a power plant, refrigerating plant, boiler house and gas-producer plant, to be erected at First and M Streets, near Chapin-Sacks Mfg. Co., to cost about \$300,000.

**WASHINGTON, D. C.**—Plans have been prepared by Walter C. Allen, electrical engineer of the District of Columbia, for improvements in the lighting system on Pennsylvania Avenue southeast from the Capitol grounds to Anacostia Bridge, and in the area bounded by First and Seventh Streets and Pennsylvania and New York Streets. The plan calls for replacing the arc lamps now in use with electric incandescent lamps.

**WASHINGTON, D. C.**—Bids will be received at the Bureau of Supplies and Accounts, United States Department of Commerce, until Sept. 22 for furnishing the various navy yards and naval stations the following supplies: Washington, D. C. Schedule 725—1500 ft. of No. 12 electric in diameter 18 ft. long; Brooklyn, N. Y. Schedule 7271—3000 ft. four-conductor interior-communication cable, 225,000 ft. double, plain, flexible, insulated conductor, 1400 key sockets for No. 12 wire, 300 fiber-lined, keyless sockets (3/4-in. cap), 9500 ft. 60,000 circ. mil. galvanized, soft-steel, leaded and armored twin-conductor wire. Schedule 7252—320 spools of No. 12 steering wire, rubber-insulated lighting and power wire, for 600 volts or less. Schedules 7257 and 7271—11,000 ft. galvanized steel, 300 fiber-lined, armored, interior-communication cable. Newport, R. I. Schedule 7237—Two bucket turbine cutting machines, length over all 6 ft., width 35 in. Norfolk, Va. Schedule 7239—Two 3 1/2-in. steering engines for steam steering only. Charleston, S. C. Schedule 7262—3100 lb. cold and soft-rolled sheathing copper. Brooklyn, N. Y. Schedule 7244—2400 lb. continuous electric line printing machine to print tracings 42 in. wide. Washington, D. C. Schedule 7249—miscellaneous switch points, frogs and ground ladders, miscellaneous steel rails and angle bars.

RIDGEWAY, IA.—The town of Ridgeway is reported, has voted to install a municipal electric-lighting system.



**SHENANDOAH, IA.**—The Council has decided to call an election to submit to the voters the proposal to issue bonds for the installation of a municipal electric-light plant. The cost of the system is estimated at \$400,000.

**SIoux CITY, IA.**—At an election held Aug. 19 in South Sioux City the proposal to install a municipal electric-light plant, to cost \$10,000, was carried.

**BUTLER, MO.**—The City Council is contemplating extensions and improvements to the municipal electric-light plant and water-works system. Harper & Stiles, of Kansas City, Mo., are engineers.

**KANSAS CITY, MO.**—The Cowgill Garage & L. Co., of Kansas City, is preparing to build an electric-light plant, garage and opera house in Kansas City.

**PILOT GROVE, MO.**—The Zahringier El. Lt. & Pwr. Co., it is reported, is contemplating the installation of an electric-light and power plant in Pilot Grove.

**ST. LOUIS, MO.**—The Improvement Association of Jennings and Woodland, towns northwest of St. Louis, are considering the question of installing electric street-lighting systems in their towns.

**LAKE PRESTON, S. D.**—The Lake Preston Milling Co. recently installed a steam engine and generator and also erected a transmission line to De Smet, a distance of 10 miles. The company expects to be ready to furnish electricity in De Smet about Oct. 1. G. J. Ostroot is secretary and manager.

**WESSINGTON SPRINGS, S. D.**—At a special election held recently the proposal to issue \$20,000 in bonds for the construction of a municipal electric-light plant was carried.

**DE WITT, NEB.**—Plans are being considered by the Council for the installation of a municipal electric-light plant to cost about \$15,000.

**EWING, NEB.**—The Council is considering calling an election to submit to the voters the proposal to issue \$15,000 in bonds for the installation of a municipal electric-light plant.

**UEHLING, NEB.**—Bids will be received until Sept. 8 by the city of Uehling for the construction of a municipal electric-light plant, city hall, etc. Plans may be obtained from V. L. Hollister, of Lincoln, Neb., consulting engineer, or from H. F. Meyer, village clerk, Uehling.

**BUCKLIN, KAN.**—At an election held recently the proposal to issue \$16,000 in bonds for the purpose of taking over the plant of the Bucklin El. Lt. & Pwr. Co. was carried.

**KANSAS CITY, KAN.**—At an election held Aug. 25 the city commissioners were authorized to issue \$650,000 in bonds for improvements to the municipal electric-light plant and water-works system. Of the proceeds \$450,000 will be used for the lighting plant.

## Southern States

**HIGH POINT, N. C.**—The North Carolina Pub. Ser. Co., of High Point, is planning to install an ornamental street-lighting system in the business district, consisting of 60 standards carrying five (60-watt) lamp clusters maintained by underground wires. The standards will be furnished by the Union Fdy. Co., of Anniston, Ala.

**APOKA, FLA.**—An application has been made to the Town Council by M. T. Anderson for a franchise to install an electric-light plant and water-works system.

**JACKSONVILLE, FLA.**—The Arlington Wtr. & El. Co. recently incorporated with a capital stock of \$100,000, is preparing to erect an electric-lighting system and to lay water mains in the Arlington Heights section. J. F. Zetsche is president.

**LEESBURG, FLA.**—Within the next two months the Leesburg Ice Co. expects to erect an addition to its power house and to install a 200-hp Skinner engine, a 125-kw general Electric generator and switchboard panel and a 20-gal. motor-driven centrifugal pump; also to extend its transmission lines and add several transformers and motors. Contracts have been placed for all equipment. C. L. H. is president.

**FRIENDSHIP, TENN.**—We are informed that the Business Men's League, as a corporation, is not interested in the installation of an electric-light plant or water-works system. A committee was appointed by the league to confer with the Town Council and recommend these improvements. The town will not be able to take up the matter at the present time. Reported in last issue that the Business Men's League was preparing to install an electric-light plant and water-works system. W. C. James is secretary of the league.

**COLUMBIA, ALA.**—The Columbia Pwr. Co., recently organized, with a capital stock of \$200,000, is planning to build an electric plant on the Chattahoochee River in Columbia. R. D. Crawford, of Dothan, is interested in the company.

**JACKSON, MISS.**—The property of the Capital Lt. & Pwr. Co., of Jackson, was purchased at public sale by R. L. Benson, of Chicago, Ill., holder of \$31,000 in bonds for \$5,000, subject to confirmation of the referee in bankruptcy.

**CORNING, ARK.**—The local electric-light plant owned by George A. Rooser, was recently destroyed. A stock company, it is reported, is being organized to rebuild the plant.

**MALVERN, ARK.**—A large power plant to be operated by steam from the Arkansas Land & Lumber Co. sawmill is being erected by the Arkansas Pwr. Co. in Malvern. The company is also erecting a transmission line from here to Arkadelphia to supply electricity in that place.

**BATON ROUGE, LA.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Sept. 21 for alterations in the plans for the proposed power plant, in the United States post office at Baton Rouge, La. For details see proposal columns.

**MCALISTER, OKLA.**—At a special election held Aug. 25 the proposal to grant the Southwest Cities Utilities Co. a franchise was carried.

**CLARKSVILLE, TEX.**—The City Council has entered into a contract with the Clarksville Lt. Co. for lighting the streets of the city. The contract provides for 50 lamps to be erected throughout the city. The city has been without street-lighting service for several years.

**GONZALES, TEX.**—The Gonzales Wtr. Pwr. Co. has awarded the contract for construction of a concrete dam (hollow type), 165 ft. long and 38 ft. wide, with 14-ft. height in the Guadalupe River to H. C. Brown, of Houston, to cost about \$20,000. The plans provide for the development of about 1000 hp of electrical power for transmission.

**HOUSTON, TEX.**—Plans and specifications have been prepared for the erection of a new building for the Western El. Co. to be erected at Commerce and Jackson Streets, to cost about \$70,000.

**NACOGDOCHES, TEX.**—Within the next two months the City Light and Power Department expects to rebuild all of its transmission lines (work now under way) and to purchase 10 transformers; also to purchase a new next 30 days one 150-hp horizontal, tubular boiler (125 lb. to 150 lb. pressure). D. L. Thomas is secretary and treasurer.

**PAMPA, TEX.**—Preparations are being made by W. R. Beydler for the installation of an electric-lighting plant in Pampa. The contract for which, it is understood, has been awarded to the Nunn El. Co., of Amarillo.

**RUNGE, TEX.**—The city of Runge is contemplating the installation of an electric-light plant and water-works system.

**TEXAS CITY, TEX.**—The Texas City El. Lt. & Wtr. Co. is contemplating an extension of about 3 miles to its street-railway system in Texas City between now and Jan. 1, 1915.

## Pacific States

**CENTRALIA, WASH.**—The Independent El. Co., recently organized, has petitioned the County Commissioners for a franchise to construct and operate electric transmission lines on certain roads in Lewis County.

**PORT ANGELES, WASH.**—The Olympic Pwr. Co., of Port Angeles, expects to place a synchronous condenser in its Bremerton substation. Thomas T. Aldwell is president and general manager.

**SPOKANE, WASH.**—Plans are being considered for the installation of electric lights on Sprague Avenue through the business district.

**SPOKANE, WASH.**—The City Council has passed an ordinance providing for installing and maintaining a new ornamental street-lighting system on First Avenue, between Bernard and Cedar Streets, for a period of ten years. It also appropriated \$25,000 for automobile equipment for the street division of the Department of Public Works.

**HOOD RIVER, ORE.**—Water rights have been granted to August Guignard on the Hood River. The water rights are being held by Mr. Guignard in trust for the Farmers' Irrigation Co., a co-operative stock company of fruitgrowers, until arrangements can be made to issue bonds and build the plant. Present plans call for the construction of a concrete dam across the river with an ultimate development of

2000 hp. About 20 miles of overhead-line material, it is estimated, will be required. F. A. Mathan, of Hood River, is engineer in charge.

**JUNCTION CITY, ORE.**—Farmers in this section have petitioned the Oregon Pwr. Co., of Eugene, to extend its transmission lines into the farm-hp section of this city. F. M. Hildreth is local manager.

**OREGON CITY, ORE.**—The Clackamas County Court has granted the Portland Ry. & Lt. & Pwr. Co., of Portland, a franchise to erect and maintain an electric transmission line from Estacada to River Mill.

**SUMMERVILLE, ORE.**—The Klees El. Co., of Summerville, is extending its transmission lines over the northern part of Union County to supply electricity for lamps and motors to farmers in that district.

**SALMON, IDAHO.**—The Salmon River Lt. & Pwr. Co., recently incorporated, is planning to build a hydroelectric power plant at Salmon. The equipment will include one 1000-hp waterwheel (30 ft. head), one waterwheel governor, one 1000-kva, 60-cycle, alternating-current generator, with switchboard complete, and three 350-kva, 3600-volt transformers. The company will provide for one substation and 12 miles of overhead line. E. Riggs is general manager.

**ST. ANTHONY, IDAHO.**—Improvements involving an expenditure of about \$100,000, it is reported, will be made to the plant of the Plant of the Pwr. & Lt. Co. This work is being done in connection with a series of improvements to be made by the company in the development of the valley adjacent to St. Anthony.

**ST. ANTHONY, IDAHO.**—The Mesa Pwr. Co., recently incorporated with a capital stock of \$500,000, has announced that it proposes to develop the water-power of the north fork of the Snake River near St. Anthony. The power plant will be situated in the vicinity of Henry's Ford. The headquarters of the company will be in St. Anthony. Max Heber, Frank Kerr and Harry Kroyer are among the incorporators.

**CORINNE, UTAH.**—The installation of a small electric-light plant in connection with the water-works system to furnish electricity to light the city is under consideration by the city officials. Bids, it is understood, will soon be called for wiring the town, buildings, etc.

**PLASANT GROVE, UTAH.**—The installation of a municipal electric-light plant in Pleasant Grove is under consideration.

**HARLEM, MONT.**—The City Council has granted R. J. Moore, of Glasgow, a franchise to construct and operate an electric light and power plant in Harlem.

**LEWISTOWN, MONT.**—The Polmar El. Co. recently incorporated, proposes to construct an electric plant near here and furnish electricity in this city and in Fergus County. Roy R. Polson, of Lewistown, is interested in the company.

**GRAND JUNCTION, COL.**—At the September election the proposal to establish a municipal electric plant will be submitted to the voters. If municipal ownership is adopted, two large hydroelectric plants will be involved in the project. One site now in view would cost from \$200,000 to \$350,000 to develop.

**JOHNSTOWN, COL.**—W. C. Sterne, president of the Fort Lupton Lt. & Pwr. Co., of Fort Lupton, has been granted a franchise to supply electricity in Johnstown.

**LITTLETON, COL.**—The Arapahoe El. Lt. & Pwr. Co., of Littleton, is replacing arc lamps with 100-watt tungsten lamps and also installing an ornamental street-lighting system on Main Street. O. F. Nats is superintendent.

**TRINIDAD, COL.**—Within the next six months the Trinidad El. Trans. Ry. & Gas Co. expects to erect 60 miles of transmission lines.

**FALLON, NEV.**—The Nevada Valleys Pwr. Co. has applied to the Board of Commissioners of Churchill County for a franchise to erect and maintain electric transmission lines over certain highways in the county.

**WINNEMUCCA, NEV.**—The Nevada Valleys Pwr. Co. has applied to the County Commissioners of Humboldt County for a franchise to erect and maintain electric transmission lines throughout Humboldt County. The head office of the company is in Reno. Edson F. Adams is president of the company, and F. J. Early is secretary.

## Canada

**CALGARY, ALTA.**—R. A. Brown, City Hall, Calgary, city electrician, will have charge of the proposed improvements to the municipal electric-light plant.

**LONDON, ONT.**—Plans are being prepared by H. J. Glaubitz, general manager of the Hydro-Electric system of the city of London, for the installation of two waterwheels, turbine pumps and synchronous motors and other accessories at the Springbank pumping station. This machinery will not be installed until next spring.

**NIAGARA FALLS, ONT.**—Plans are being prepared by the Hydro-Electric Power Commission of Ontario for the construction of a large generating station at Queenston to utilize the waste waters of the Welland ship canal and 6000 cu. ft. of water of the Niagara River, not allotted by the Canadian authorities. The plant will be situated about 200 yards south of the Queenston Bridge and will have a generating capacity of 250,000 hp. The canal will be tapped at Port Robinson. Another transmission station will be erected at the top of the bank near Queenston Heights. The bulk of the energy will be transmitted to the Hydro distributing plant at Falls View. A new building at a plant at the Whirlpool has been abandoned.

**MONTREAL, QUE.**—Surveys are being made by the Board of Commissioners for

the installation of 200 lamp standards, for which it is understood that tenders will be called in the immediate future.

### Miscellaneous

**CORDOVA, ALASKA.**—The Council has granted Harry H. Knox a franchise to construct and operate an electric-light plant in Cordova.

**PANAMA.**—Bids will be received at the office of the general purchasing officer, the Panama Canal, Washington, D. C., until Sept. 14 for furnishing motor buses. General information relating to the bids may be obtained at the above office. Major F. C. Boers is general purchasing officer.

**SAN JUAN, P. R.**—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Oct. 10, for construction of radio building and chief operator's quarters, plans and specifications for which may be obtained on application to the bureau.

### New Incorporations

**HANOVER, IND.**—The Hanover Lt. & Pwr. Co. has been incorporated with a capital stock of \$2,500 to supply electricity for lamps and motors. The directors are James C. Reed, P. Sample and I. A. Reed.

**NEW YORK, N. Y.**—The Northern New York Pwr. Co., of New York, has been incorporated with a capital stock of \$500,000 by D. P. Ayars, of Wilkes-Barre, Pa., G. H. Hies, of Toronto, Can., and W. R. Hies, of New York, N. Y. The company purports to supply electricity for lamps, heaters and motors.

**SIDNEY, OHIO.**—The Sidney El. Co. has been chartered with a capital stock of \$10,000 by Charles F. Chapman, Edward W. Kelsey, Jr., H. W. Isenberg, B. Boggs and M. E. Nye.

**RIVERSIDE, WASH.**—The Mutual El. Lt. & Pwr. Co. has been incorporated by O. R. McKinney, A. Benson, George Richter, Charles Gray and Leonard A. Westbo, Puyallup, Wash.

## Directory of Electrical Associations

**ALABAMA LIGHT AND TRACTION ASSOCIATION.** Secretary, H. O. Hanson, Mobile Gas Co., Mobile, Ala.

**AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.** Permanent secretary, L. O. Howard, Smithsonian Institution, Washington, D. C.

**AMERICAN ELECTRIC RAILWAY ACCOUNTANTS' ASSOCIATION.** Secretary-treasurer, E. H. Burritt, 29 West 39th St., New York.

**AMERICAN ELECTRIC RAILWAY ASSOCIATION.** Secretary, E. H. Burritt, 29 West 39th St., New York. Annual convention, Atlantic City, N. J., Oct. 12-16.

**AMERICAN ELECTRIC RAILWAY ENGINEERING ASSOCIATION.** Secretary, E. H. Burritt, 29 West 39th St., New York. Annual convention, Atlantic City, N. J., Oct. 12-16.

**AMERICAN ELECTROCHEMICAL SOCIETY.** Secretary, Prof. J. W. Richards, Lehigh University, South Bethlehem, Pa. Fall meeting, Niagara Falls, N. Y., Oct. 1-3.

**AMERICAN ELECTRO-THERAPEUTIC ASSOCIATION.** Secretary, Dr. J. Willard Travell, 27 East 11th St., New York.

**AMERICAN INSTITUTE OF CONSULTING ENGINEERS.** Secretary, Eugene W. Stern, 101 Park Ave., New York City.

**AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.** Secretary, F. L. Hutchinson, 33 West 39th St., New York. Board of directors meets monthly. Sections and branches in the principal electrical centers throughout the country.

**AMERICAN PHYSICAL SOCIETY.** Secretary, Prof. A. D. Cole, Ohio State University, Columbus, Ohio.

**AMERICAN SOCIETY OF REFRIGERATING ENGINEERS.** Secretary, William H. Ross, 154 Nassau St., New York City.

**AMERICAN SOCIETY FOR TESTING MATERIALS.** Secretary-treasurer, Edgar M. Morgan, University of Pennsylvania, Philadelphia.

**AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS.** Secretary, Edwin A. Scott, 29 West 39th St., New York.

**AMERICAN WATER WORKS ASSOCIATION.** Secretary, J. M. Diven, 47 State St., Troy, N. Y.

**ARKANSAS ASSOCIATION OF PUBLIC UTILITY OPERATORS.** Secretary, W. J. Tharp, Little Rock, Ark.

**ASSOCIATION OF EDISON ILLUMINATING COMPANIES.** Secretary, Geo. C. Holberton, Pacific Gas & Electric Co., San Francisco, Cal. Annual meeting, Sept. 14, Greenbrier Hotel, White Sulphur Springs, W. Va.

**ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS.** Secretary, W. T. Snyder, McKeesport, Pa. Annual convention, Cleveland, Ohio, Sept. 14-19.

**ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.** Secretary-treasurer, Jos. A. Andreati, Chicago & Northwestern Railway, Chicago.

**ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.** Secretary, P. W. Drew, 112 West Adams St., Chicago.

**CALIFORNIA ELECTRICAL CONTRACTORS' ASSOCIATION.** Secretary, W. S. Hanbridge, 1408 Merchants' National Bank Building, Los Angeles, Cal.

**CANADIAN ELECTRICAL ASSOCIATION.** Affiliated with N. E. L. A. Secretary-treasurer,

Allan Sullivan, 610 Confederation Life Bldg., Toronto, Can.

**COLORADO ELECTRIC CLUB.** Secretary, C. F. Oehlmann, Meets every Thursday at Albany Hotel, Denver, Col.

**COLORADO ELECTRIC LIGHT, POWER AND RAILWAY ASSOCIATION.** Secretary-treasurer, T. F. Kennedy, 900 15th St., Denver, Col.

**COMMERCIAL SECTION, N. E. L. A.** Secretary, J. F. Becker, 1170 Broadway, N. Y.

**EASTERN NEW YORK SECTION, N. E. L. A.** Secretary, C. S. Van Dyck, Schenectady, N. Y.

**ELECTRIC CLUB OF CHICAGO.** Secretary, Fred M. Rosselev, Monadnock Block, Chicago. Meets every Thursday noon at Hotel Sherman.

**ELECTRICAL CONTRACTORS' ASSOCIATION OF GREATER BOSTON.** Secretary, R. S. Hale, 39 Boylston St., Boston.

**ELECTRICAL CONTRACTORS' ASSOCIATION OF MASSACHUSETTS.** Secretary, H. D. Temple, 30 Foster St., Worcester, Mass.

**ELECTRICAL CONTRACTORS' ASSOCIATION OF NEW YORK STATE.** Secretary, Geo. W. Russell, Jr., 25 West 42d St., New York.

**ELECTRICAL CONTRACTORS' ASSOCIATION OF THE CITY OF CHICAGO.** Secretary, M. N. Blumenthal, 175 West Washington St., Chicago. Meets at noon on the second and fourth Wednesday of each month at 424 South Wabash Ave.

**ELECTRICAL CONTRACTORS' ASSOCIATION OF STATE OF MISSOURI.** Secretary, A. J. Burns, 318 West Tenth St., Kansas City, Mo.

**ELECTRICAL CONTRACTORS' ASSOCIATION OF WISCONSIN.** Secretary, Albert Petermann, 626 Lloyd St., Milwaukee, Wis.

**ELECTRICAL CREDIT ASSOCIATION OF CHICAGO.** Secretary, Frederic P. Vose, 1343 Marquette Building, Chicago.

**ELECTRICAL CREDIT ASSOCIATION OF PHILADELPHIA.** Secretary, John W. Crum, 1324 Land Title Building, Philadelphia, Pa.

**ELECTRICAL SALESMEN'S ASSOCIATION.** Secretary, Francis Raymond, 125 Michigan Ave., Chicago, Ill.

**ELECTRIC SUPPLY JOBBERS' ASSOCIATION.** General secretary, Franklin Overbach, 411 South Clinton St., Chicago, Ill. Quarterly meeting, Niagara Falls, Can., Sept. 9-11.

**ELECTRICAL TRADES ASSOCIATION OF CANADA.** Secretary, William R. Stavelay, Royal Insurance Building, Montreal, Can.

**ELECTRICAL TRADES ASSOCIATION OF THE PACIFIC COAST.** Secretary, Albert H. Elliott, Harding Building, 34 Ellis St., San Francisco, Cal. Meeting, San Francisco, second Thursday of each month.

**ELECTRIC VEHICLE ASSOCIATION OF AMERICA.** Executive secretary, A. Jackson Marshall, 23 West 39th St., N. Y. Sections in New York, New England, Chicago, Philadelphia, Washington and Los Angeles. Annual convention, Philadelphia, Oct. 19-21.

**EMPIRE STATE GAS AND ELECTRIC ASSOCIATION.** Secretary, Charles H. B. Chapin 29 West 39th St., New York.

**FARADAY ELECTRICAL ASSOCIATION.** Secretary, W. J. Collins, 1129 Masonic Temple, Chicago. Meets at noon on the first and third Wednesday of each month at Planters' Hotel.

**FRANKLIN INSTITUTE.** Secretary, Dr. R. B. Owens, Philadelphia, Pa.

**GAS, ELECTRIC AND STREET RAILWAY ASSOCIATION OF OKLAHOMA.** Secretary-treasurer, Prof. H. V. Bozell, Norman, Okla.

**GEORGIA ELECTRICAL CONTRACTORS' ASSOCIATION.** Secretary, J. M. Clayton, Atlanta, Ga.

**HYDROELECTRIC SECTION, N. E. L. A.** Secretary, S. A. Sewall, 29 West 39th St., N. Y.

**ILLINOIS STATE ELECTRICAL ASSOCIATION.** Secretary, H. E. Chubbuck, Peoria, Ill.

**ILLUMINATING ENGINEERING SOCIETY.** General secretary, J. D. Israel, Engineering Societies Building, 29 West 39th St., New York. Sections in New York, New England, Philadelphia, Chicago and Pittsburgh. Annual meeting, Cleveland, Ohio, Sept. 21, 1914.

**INDEPENDENT ELECTRICAL CONTRACTORS' ASSOCIATION OF GREATER NEW YORK.** Secretary, A. Newburger, 1153 Myrtle Ave., Brooklyn, N. Y.

**INDEPENDENT TELEPHONE ASSOCIATION OF AMERICA.** Secretary, W. S. Vivian, Grand Rapids, Mich.

**INDIANA ELECTRIC LIGHT ASSOCIATION.** Secretary, Thomas Donahue, Lafayette, Ind.

**INDIANA STATE ELECTRICAL CONTRACTORS' ASSOCIATION.** Secretary, George Skilman, Indianapolis, Ind.

**INSTITUTE OF OPERATING ENGINEERS.** Secretary, L. Houmiller, 29 West 39th St., New York.

**INSTITUTE OF RADIO ENGINEERS.** Secretary, E. J. Simon, 71 Broadway, New York.

**INTERNAL COMBUSTION ENGINEERS' CONGRESS.** Secretary-treasurer, Charles Kratsch, 416 West Indiana St., Chicago. Meeting second Friday of each month at Lewis Institute.

**INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS.** Secretary, C. R. George, Houston, Tex. Annual meeting, Atlantic City, N. J., Sept. 15-18.

**INTERNATIONAL ELECTRICAL CONGRESS.** Secretary-treasurer, Preston S. Millar, 80th St. and East End Ave., New York. Congress, San Francisco, Sept. 13-18, 1915.

**INTERNATIONAL ENGINEERING CONGRESS.** Secretary-treasurer, W. A. Cattell, Foxcroft Building, San Francisco, Cal. Congress, San Francisco, September, 1915.

**INTERNATIONAL ELECTROTECHNICAL COMMISSION.** (International body representing various national electrical engineering societies contributing to its support.) General secretary, C. le Maistre, 28 Victoria St., Westminster, London, S. W., England. Meeting at San Francisco, Sept. 9-11, 1915.

**IOWA ELECTRICAL ASSOCIATION.** Affiliated with N. E. L. A. Secretary, W. H. Thomson, Des Moines, Ia.

**IOWA ELECTRICAL CONTRACTORS' ASSOCIATION.** Secretary, M. T. Humphrey, Waterloo, Ia.

**IOWA STREET AND INTERURBAN RAILWAY ASSOCIATION.** Secretary, H. E. Weeks, Davenport, Ia.

**JOVIAN ORDER.** Jupiter (president), W. N. Matthews, St. Louis, Mo.; Mercury (secretary), E. C. Bennett, Syndicate Trust Building, St. Louis, Mo. Annual congress, St. Louis, Mo., Oct. 14-16.



KANSAS GAS, WATER, ELECTRIC LIGHT AND STREET RAILWAY ASSOCIATION. Secretary-treasurer, Ivor Thomas, 237 South Main St., Waterville, Me.

LOUISIANA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, J. J. Ziegler, 227 Bourbon St. Meeting every Wednesday, Audubon Building, New Orleans.

MAINE ELECTRIC ASSOCIATION. Secretary-treasurer, Walter S. Wyman, Waterville, Me.

MICHIGAN ELECTRIC ASSOCIATION. Affiliated with N. E. L. A. Secretary, Herbert Silvester, 15 Washington Boulevard, Detroit, Mich.

MINNESOTA ELECTRIC ASSOCIATION. Secretary-treasurer, F. A. Otto, St. Paul Gas Light Company, St. Paul, Minn.

MISSISSIPPI ELECTRIC ASSOCIATION. Affiliated with the National Electric Light Association. Secretary-treasurer, H. F. Wheeler, Hattiesburg, Miss. Next annual meeting, Hattiesburg, April 12-14, 1915.

MISSOURI ELECTRIC, GAS, STREET RAILWAY AND WATER WORKS ASSOCIATION. Secretary-treasurer, F. D. Beardslee, Union Electric Light & Power Co., St. Louis.

NEVADA ELECTRIC AND HEATING ASSOCIATION. Secretary, J. B. Magers, Madison, Ind.

NATIONAL ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary-treasurer, Wm. L. Smith, Concord, Mass.

NATIONAL ELECTRICAL HEATING ASSOCIATION. Secretary, D. L. Gaskill, Greenville, Ohio.

NATIONAL ELECTRIC LIGHT ASSOCIATION. Executive secretary, T. C. Martin, Engineering Societies Building, 33 West 39th St., New York.

NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION OF THE UNITED STATES. Secretary, George H. Duffield, 41 Martin Building, Utica, N. Y.

NATIONAL ELECTRICAL CREDIT ASSOCIATION. Secretary, Frederic P. Vose, 1343

Marquette Building, Chicago.

NATIONAL FIRE PROTECTION ASSOCIATION. Secretary of electrical committee, Ralph S. Smith, 141 Milk St., Boston, Mass. Open meeting, New York, March, 1915.

NATIONAL INDEPENDENT TELEPHONE ASSOCIATION. Secretary-treasurer, J. B. Earle, Waco, Tex.

NEBRASKA SECTION, N. E. L. A. Secretary-treasurer, S. J. Bell, David City, Neb.

NEW ENGLAND ELECTRICAL CREDIT ASSOCIATION. Secretary, Alton F. Tupper, 60 State St., Boston, Mass.

NEW ENGLAND SECTION, ELECTRIC VEHICLE ASSOCIATION OF AMERICA. Secretary, L. L. Edgar, 39 Boylston St., Boston, Mass.

NEW ENGLAND STREET RAILWAY CLUB. Secretary, H. A. Faulkner, 12 Pearl St., Boston, Mass. Meets last Thursday of each month.

NEW ENGLAND SECTION, N. E. L. A. Secretary, Miss O. E. Bursiel, 149 Tremont St., Boston, Mass.

NEW ORLEANS ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, S. J. Stewart, 212 Canal St., New Orleans, La. Meetings, second and fourth Tuesday of each month.

NEW YORK ELECTRIC RAILWAY ASSOCIATION. Secretary, Charles C. Dietz, 239 West 39th St., New York.

NEW YORK ELECTRICAL CREDIT ASSOCIATION. Affiliated with the National Electrical Credit Association. Secretary, Franz Neilson, 50 Wall St., New York.

NEW YORK ELECTRICAL SOCIETY. Secretary, G. H. Guy, 33 West 39th St., New York.

NORTHWEST SECTION, N. E. L. A. Secretary, N. W. Brackett, Pioneer Building, Seattle, Wash.

NORTHERN WHITE CEDAR ASSOCIATION.

Secretary, R. N. Boucher, 743 Lumber Exchange, Minneapolis, Minn.

OHIO ELECTRIC LIGHT ASSOCIATION. Secretary, D. L. Gaskill, Greenville, Ohio.

OHIO SOCIETY OF MECHANICAL, ELECTRICAL AND STEAM ENGINEERS. Secretary, Ivor F. E. Sanborn, Ohio State University, Columbus, Ohio.

OREGON ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, F. C. Green, 291 East Morrison St., Portland, Ore.

PENNSYLVANIA ELECTRICAL ASSOCIATION (State Section N. E. L. A.). Secretary-treasurer, S. C. Pohe, Bloomsburg, Pa. Annual meeting, Eagle's Mere, Pa., Sept. 8-11.

RAILWAY SIGNAL ASSOCIATION. Secretary-treasurer, C. E. Rosenberg, Times Building, Bethlehem, Pa.

SOCIETY FOR ELECTRICAL DEVELOPMENT. Inc. General manager, J. M. Wakeman, 29 West 39th St., New York.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION. Secretary, Dean F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.

SOUTHEASTERN SECTION, N. E. L. A. Secretary-treasurer, Geo. H. Wygant, Tampa, Fla.

SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Secretary, H. S. Cooper, 405 Slaughter Building, Dallas, Tex.

VERMONT ELECTRICAL ASSOCIATION. Secretary-treasurer, A. B. Marsden, Manchester, Vt.

WESTERN ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary, W. S. Boyd, 76 West Monroe St., Chicago, Ill.

WESTERN SOCIETY OF ENGINEERS, ELECTRICAL SECTION. Secretary, J. H. Warder, 1737 Broadway, Chicago.

WISCONSIN ELECTRICAL ASSOCIATION. Secretary, George Allison, 1410 First National Bank Bldg., Milwaukee, Wis.

## Weekly Record of Electrical Patents

### UNITED STATES PATENTS ISSUED AUG. 25, 1914.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York, N. Y.]

1,108,145. ELECTROPLATING APPARATUS: John T. Daniels, Newark, N. J. App. filed May 10, 1913. Automatic dipping machine.

1,108,147. TELEGRAPHY: P. B. Delany, South Orange, N. J. App. filed Jan. 18, 1909. Chemical tape receiver.

1,108,148. TELEGRAPHY: P. B. Delany, South Orange, N. J. App. filed Jan. 18, 1909. Automatic chemical dot-and-dash recording.

1,108,149. ELECTRO-PNEUMATIC BRAKE-VALVE: E. H. Dewson, New York, N. Y. App. filed Oct. 9, 1908. With manually operable handles.

1,108,155. CONNECTOR: C. E. Godley, Detroit, Mich. App. filed March 9, 1914. For electric head-lamps, etc.

1,108,156. MOISTURE-PROOF TELEPHONE SET: C. E. Hague, Rochester, N. Y. App. filed May 25, 1910. Polarized ringer.

1,108,150. ELECTRICAL DISPLAY DEVICE: H. A. Kunitz, New York, Pa. App. filed May 19, 1911. Rotatable light tubes.

1,108,194. COIN-CONTROLLED AUTOMATIC TELEPHONE-EXCHANGE SYSTEM: W. W. Leach, Chicago, Ill. App. filed Nov. 1, 1906. Combination calling and called line.

1,108,195. TROLLEY: W. M. Learned, Los Angeles, Cal. App. filed April 21, 1913. Double wheels.

1,108,235. METHOD OF TREATING ALLOY-STEEL SCRAP: P. P. Reese and E. L. Diehl, Munnhall, Pa. App. filed Feb. 7, 1911. Electric heat treatment.

1,108,253. SYSTEM OF REMOTE CONTROL: W. M. Scott, Philadelphia, Pa. App. filed March 8, 1907. Circuit-breaker.

1,108,254. SYSTEM OF REMOTE CONTROL: W. M. Scott, Philadelphia, Pa. App. filed Oct. 7, 1907. Motor-controlled.

1,108,259. FITTING FOR ELECTRICAL CONDUITS: K. Sixma, Brooklyn, N. Y. App. filed Sept. 3, 1913. Sectional body.

1,108,305. TELEPHONE SIGNAL APPARATUS: D. D. Wright, San Francisco, Cal. App. filed Nov. 27, 1912. Automatic code work.

1,108,320. ELECTRIC-CURRENT-CONTROLLING APPARATUS: A. E. Burden, Indianapolis, Ind. App. filed May 10, 1913. Cumulative windings.

1,108,350. ELECTRIC CONDUCTOR: F. Färber,

Dortmund, Germany. App. filed Dec. 2, 1913. For safety lamps, etc.

1,108,359. ELECTRIC SWITCH: M. Guett, Hartford, Conn. App. filed Jan. 2, 1913. Panelboard push-button.

1,108,383. TELEPHONE EXCHANGE SYSTEM: F. R. McBERTY, New Rochelle, N. Y. App. filed Dec. 4, 1909. Test circuit selector.

1,108,394. TROLLEY GUARD: R. L. Queen, Millville, N. J. App. filed July 10, 1913. Hinged sides.

1,108,400. ELECTRIC TEST METER: G. A. Scheffer, Indianapolis, Ind. App. filed Oct. 21, 1910. Controllable resistance.

1,108,410. ELECTROPLATING APPARATUS: E. R. Stone, New Britain, Conn. App. filed Dec. 9, 1913. Vat and dipping carrier.

1,108,435. MOTOR CONTROLLER: A. J. Horst, White Plains, N. Y. App. filed May 4, 1908. Adjustable speed controller.

1,108,442. MAGNETO ARMATURE: D. R. Hughes, New York, N. Y. App. filed May 10, 1912. Two-part non-magnetic casing.

1,108,455. LIGHTING FIXTURE: G. A. Macbeth, Pittsburgh, Pa. App. filed Feb. 15, 1913. Canopy and shade-holder.

1,108,470. ELECTRO-PNEUMATIC PRESSURE CONTROL: E. K. Parker, Santa Barbara, Cal. App. filed Aug. 12, 1912. Locking valve.

1,108,482. TELEPHONE SYSTEM: C. S. Winston, Chicago, Ill. App. filed Sept. 9, 1912. Selector switch.

1,108,516. RATCHET MECHANISM FOR ELECTRIC SWITCHES: J. G. Peterson, Jersey City, N. J. App. filed March 30, 1914. Base construction.

1,108,529. TELEGRAPH SYSTEM: C. R. Underhill, Providence, R. I. App. filed Aug. 25, 1904. Receiving instrument. Forty-six claims.

1,108,545. TELEGRAPH APPARATUS: G. P. Blessing, Seattle, Wash. App. filed Aug. 38, 1903. Relay with locking arm.

1,108,547. SOCKET SHELL: T. A. C. Both, Malden, Mass. App. filed Aug. 7, 1912. Insulating lining.

1,108,552, 1,108,553 and 1,108,554. TOASTERS: L. G. Copeland, Flint, Mich. App. filed June 13 and Dec. 13, 1913. Electric grid resistance and frame constructions.

1,108,563. MOTOR CONTROLLER: C. T. Evans, Milwaukee, Wis. App. filed May 14, 1910. Electroresponsive protective means.

1,108,568. DYNAMO-ELECTRIC MACHINE: V. A. Fynn, St. Louis, Mo. App. filed June

15, 1912. Windings on slotted members.

1,108,584. TRAIN-CONTROLLING MECHANISM: F. T. Jones, Baltimore, Md. App. filed Jan. 12, 1912. Block system with insulated track section.

1,108,605. AUTOMATIC SECTIONALIZING SWITCH: J. E. Motony, Schenectady, N. Y. App. filed Sept. 11, 1909. Locking toggle.

1,108,641. OPERATING MEANS FOR AN ELECTRIC-LAMP SWITCH: A. J. Tizley, New York, N. Y. App. filed May 25, 1914. Rotating sleeve.

1,108,674. TERMINAL CONNECTOR FOR SPARK PLUGS: C. W. Beck, Rockville Center, N. Y. App. filed Aug. 15, 1910. Inclosing sleeve.

1,108,677. LAMP-SOCKET CASING: R. B. Benjamin, Chicago, Ill. App. filed March 1, 1912. Interlock.

1,108,679. SUSPENSION FITTINGS: R. B. Benjamin, Chicago, Ill. App. filed April 1, 1913. For conduit-system wiring.

1,108,686. ELECTRO-THERAPEUTIC FLUID ELECTROLYSIS: H. Bonis, Listowel, Canada. Porous terminal.

1,108,739. ELECTRICAL IGNITING DEVICE FOR INTERNAL COMBUSTION ENGINE: E. Gassmann, Brooklyn, N. Y. App. filed Aug. 6, 1913. Regulating device.

1,108,745. SYSTEM OF PHASE TRANSFORMATION: F. C. Green, Pittsfield, Mass. App. filed Nov. 21, 1911. Three-phase delta and Y connection.

1,108,746. MEANS FOR PREVENTING CONDENSATION OF MOISTURE IN TRANSFORMER TANKS: F. C. Green, Pittsfield, Mass. App. filed Nov. 2, 1913. Electrically heated fluid submersion.

1,108,750. COMBINED ALARM AND ELECTRIC-LIGHT SWITCH: J. G. Harrison, Goldfield, Cal. App. filed March 26, 1912. For window and door contact.

1,108,753. FIRE ALARM: F. Herbeck, Athol, Mass. App. filed April 7, 1913. Annunciator construction.

1,108,782. ELECTRIC SIGNALING DEVICE FOR ELEVATORS: F. S. Payne, Boston, Mass. App. filed Oct. 17, 1904. (Forty-three claims.)

1,108,847. RINGER AND SECRET SERVICE DEVICE: P. G. and C. A. Neff, Davey, Neb. App. filed June 2, 1909. Telephone system.

1,108,872. MAGNETO-GENERATOR: R. G. Kinsler, Detroit, Mich. App. filed March 8, 1913. For ignition systems, etc.

# Electrical World

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## National Foreign Trade Council

The National Foreign Trade Council was formed at an opportune moment. In the year when there was the most need for the work that it could do it came into being. It is designed to act in behalf of manufacturers on the large questions of policy in reference to export trade. Its sphere of usefulness is like that of both a public policy committee and a promotive organization, although it has nothing to do with detail matters of selling. The extent of its membership, comprising thirty-five representatives of large corporations, is significant of its purpose. It is not intended to supplant any existing organizations but to work with them for the progress of all policies, legislative and otherwise, that make for better export trade. Bankers and many elements of the manufacturing industries of the country, including the electrical industry, have representation in the council, so that its labors touch a wide range of activities. The council, through Mr. James A. Farrell, its president, and various other members, has tried to persuade the Washington authorities to act so as to encourage foreign trade, and by so doing it has done a valuable service for all American industries. It is too much to expect that any organization can build up an export business for companies which have long been neglectful of possibilities in that direction, but it can do a great deal to produce wholesome conditions that will help the growth to follow lines of permanent strength and profit. The fortunate circumstance, of which all business interests have the benefit, is that this new influence was formed to make itself felt in this year of revelation and promise for export trade.

## Gas and Oil Engines as Auxiliaries

A paper by Mr. Reginald Traut-schold in the current issue will bear careful reading. It is directed toward that always insistent problem which confronts the central-station operator of how to deal with his peak-load conditions. The gas engineer has an immense advantage over the electric man in the indefinite amount of cheap storage of output at his command. Many a central-station manager has looked lovingly and enviously at the towering holder of his competitor. Mr. Traut-schold discusses the possible advantage resulting from combining gas or oil engines with an ordinary steam plant, the latter being worked for the steady load and the former held available for meeting the requirements of the peak. Of course, there are conditions of fuel supply which would throw the balance of economy in favor of one or the other, but the point of the author's contention is that there are conditions under

which combination may yield a more economical result than would be possible with either prime mover used separately. The same problem arises in case natural gas is available or a producer-gas plant auxiliary can be used. The whole matter turns on the economy of internal-combustion engines in operation for this purpose, as compared with that of steam units held in reserve to an extent which allows the load to be carried during the peak either by adding units or by forcing to the utmost those already in use. Ordinarily, under reasonably good fuel conditions, most engineers would prefer to use a homogeneous steam plant. Mr. Traut-schold's figures show that there are cases in which combination plants may present advantages from one standpoint or another. One of the most important features of the internal-combustion engine is the extreme quickness with which it can be put into service, a feature which may in some instances greatly outweigh even a greater cost of operation than with steam. Such an instance may not infrequently be found in the case of a stand-by plant for the use of a transmission system where the reserve may be called on at very short notice and for such brief periods as make the total fuel cost insignificant. Although internal-combustion engines have not been favorites for electric service in this country, yet a few plants have been successful enough to keep the question alive, and internal-combustion engines in the rôle of auxiliaries have certain advantages that are well worth considering.

## Recuperative Power of the Industry

The views of electrical business men which are being published in the *Electrical World* are characteristic of the common sense in the industry. Though humanitarian feelings are outraged, we have to think of business matters and prospects. It is not to be expected that the industry will regard the effects of the war with unbridled enthusiasm. It is to be expected that the best judgment and intelligence will be brought to bear in analysis of commercial causes and effects to the end that all the good possible may be extracted from circumstances. It is not a time when we need to resort to those fate-defying mottoes which are used occasionally to bolster up tired spirits, such as "Be an optimist" or "Wear a smile." It is possible at one and the same time to refrain from being a rampant optimist and to keep far from pessimism. There are many signs of favor for this fair land. A most important influence is our wonderful recuperative power after shock. One of our best traditions is that this country always pulls itself together rapidly and that even a serious setback



only delays a little the time of restored activity. In his diagnosis a physician always allows for the recuperative power of the patient. If we make the same allowance for the wonderful innate forces that have displayed themselves in the past, we shall find good reason for sober, sane hope and confidence. Constructive elements are at work to overcome destruction. This restless, pushing, aggressive population will find a way. The late J. P. Morgan is quoted as having said that the men who bet against the future of the United States would lose. That is still true.

### The Production of Powerful Magnetic Fields

In the various branches of scientific research included within the bounteous scope of physics and chemistry the need for powerful and long-sustained experimental magnetic fields becomes more plainly realized. Some of the inquiries which are being conducted into the realm of subatomic structure involve magnetic fields as laboratory implements. Moreover, the investigators declare that they cannot utilize ordinary fields to any advantage. Dynamo engineers have to provide extensive magnetic fields in their machines, with densities of about 10 kilogausses, and these engineers properly consider that a cubic foot of total air-field magnetized to such a density constitutes a creditable magnetic achievement. Occasionally, and for special purposes, a dynamo designer will introduce fields of, say, 20 kilogausses in steel, but the magnetic metals develop so high a reluctance at such densities that there ceases to be any advantage in securing them on a larger scale. Nevertheless, the physicists and physical chemists refuse to be contented with these magnetic results and calmly ask for densities of 50 and even 100 kilogausses. Under such demands the dynamo engineer has to admit that the article requested is not listed in his catalogs.

The *Revue Générale des Sciences* of July 15 and 30 contains an article by Prof. A. Cotton on the means necessary for producing very powerful magnetic fields in the laboratory. The University of Paris has become interested in an electromagnet of great power and had set aside a noteworthy *ante-bellum* appropriation for experimentation under the auspices of the French Academy of Sciences. The author discusses the types of electromagnet considered most suitable for the purpose and the amount of expense involved. It is, of course, admitted that the very best iron or steel becomes magnetically saturated in the neighborhood of 20 kilogausses, but to the magnetizing flux density there is no known upper limit. That is, iron cores may be used to contribute to the final flux density as far as they will go, but the field will have to depend upon the magnetizing force over and above the saturation limits.

The conclusions reached in the article is that fields of 100 kilogausses can be produced in a volume of, say, half a cubic centimeter if money enough is available. By designing the iron frame of the magnet carefully, making it large enough, and applying ampere-turns enough at the right places the gausses can be produced.

A salient difficulty is in the cooling of the winding, because the power absorbed in the magnetizing coil runs to hundreds of kilowatts, and thousands are even considered in some designs. The discharge and removal of this large amount of power becomes a great task, even for water-cooled hollow copper wire. Moreover, it is considered that the energy absorbed and dissipated during several hours of experimentation may be so great, when 100-kilogauss fields have to be sustained, that the apparatus might have to be set up in or near to an electric substation.

It is to be feared that the recent military explosion in Europe will defer these interesting but ambitious magnetic projects. The same collapse for the present attends, alas! innumerable scientific and engineering projects. Tests upon an actually constructed powerful electromagnet, of the Weiss type, made at Paris, showed a field of 50 kilogausses produced between the tips of conical pole pieces, with a consumption of some 200,000 ampere-turns and 25 kw. The magnet is provided with two large cylindrical water-cooled hollow-tube coils.

### Inductive Interferences

The report of the joint committee on inductive interference to the Railroad Commission of the State of California, an abstract of which appeared in our issue dated Sept. 5, is a document representing the results of a very large amount of experimental research on the part of the committee and containing very important suggestions for the constructing engineer. The committee itself consisted of experts representing electric railroad, telephone, telegraph and transmission interests, besides the railroad commission itself. Its particular office was to investigate the inductive disturbance from parallelism between the various circuits considered and to recommend to the railroad commission a suitable scheme for minimizing the difficulties which were found to exist. Inductive disturbances between transmission and telephone lines are, of course, entirely commonplace, and since the very beginning of three-phase transmission in this country it has been customary to transpose the lines in order to equalize as far as possible induction on neighboring circuits. Unfortunately, quantitative experiments on induction under the conditions found in actual practice are extremely difficult to make, and very little has been accomplished in this important direction. It is to be hoped that the California committee will continue its investigations to an extent that will enable constructors to avoid the difficulties with the minimum possible trouble.

The main facts brought out by the investigation carried on by the joint committee, to a certain extent already familiar to engineers, are very clearly set forth in the report. The two fundamental facts regarding interference with communication circuits, whether telephonic or telegraphic, are, first, that the trouble is due to the residual, unbalanced components in the transmission circuit, and, second, that it is due chiefly,

and in most cases wholly, to the harmonics of the fundamental frequency. At sixty cycles per second the fundamental is of too low pitch either to affect very strongly the telephone receivers or to interfere very much with conversation, when it becomes evident at all. Anyone listening over a circuit on which inductive interference of a sixty-cycle current exists will at once realize that the pitch of the note heard is far higher than that corresponding to the fundamental, which indeed is often difficult to hear at all, and that the hum as heard is not a pure tone of any kind, evidently containing harmonics of pitch far above the fundamental. As is well known to engineers, the harmonics in an alternating-current circuit are of odd order, the third, fifth, seventh and so on, the even harmonics being for practical purposes suppressed. The experiments of the committee show that on actual transmission systems harmonics up to the thirty-fifth are observable; those from the third to the eleventh are generally the ones of conspicuous magnitude, particularly the third.

The ordinary telephonic frequencies indicate that harmonics from the fifth up, say, to the fifteenth are those most likely to be troublesome. With a properly transposed system the total effect of a balanced three-phase circuit should be very trifling, but any lack of balance leaves a residual component which, in virtue of its harmonics, may cause serious trouble. Protection, therefore, should be based on reducing the residual effects to the lowest possible point and minimizing the harmonics by carefully spiraling the lines and using apparatus giving as pure a fundamental wave and as trivial harmonics as possible. The latter precaution is desirable for many reasons, since a high harmonic of considerable magnitude is very likely to produce unpleasant resonant effects. It would be rather interesting to know in this connection whether the circuit on which the committee found a twenty-third harmonic of 1380 cycles per second was particularly liable to what is euphemistically called "static." By inference the proposed rules, which may call for transposition at as short intervals as one-sixth of a mile in extreme cases, indicate that a good deal more care should be exercised in transposition than has sometimes been the case.

Many of the early three-phase lines were spiraled with a comparatively sharp twist. In later systems use has sometimes been made of much longer spirals. It looks very much as if the committee had found the earlier plan to be the better. It certainly is more likely to give uniform lengths of inducing wire symmetrically related to the parallel circuit. Communication circuits properly transposed tend further to decrease the trouble. It is quite apparent from the report that a large part of the inductive trouble arises not from inefficient transposition but from other causes, such as badly unbalanced loads, grounds, unbalanced star connections, and in general from operative conditions which disturb the symmetry of the inducing system. Here again the requirements which prevent inductive disturbances are also conducive to more accurate regulation and involve less likelihood of difficulties

associated with resonance and surging. In other words, the more accurately symmetrical throughout the three-phase circuit can be made the better on the whole will be its own service from every point of view and the less trouble will be found from induction. In view of common transmission practice some of the requirements seem somewhat burdensome. In particular, switching requirements and other provisions against transitory unbalancing are needlessly severe and if carried out will work hardship. It should be quite enough if the regular running conditions are so established as to give a minimum of inductance. The work of the committee has been excellent in its thoroughness as far as it has gone, and the program laid out for the future gives good hope of clearing up once and for all the troublesome problems now under discussion.

### Artificial Illumination and Vision

Prof. F. K. Richtmyer's speculations regarding the effect of artificial illumination on vision, appearing in this issue, will help again to call attention to that most puzzling of phenomena, the apparent difference between natural and artificial lighting in its effect on the eye. He argues that some of the trouble may be attributed to an unwonted state of adaptation of the eye, which in artificial light is neither fully light-adapted nor fully dark-adapted. His special hypothesis connecting this with the migration of pigment is hardly in accordance with views of most physiologists, since the pigment is by many believed to be connected in some way with the sensitization of the rods and cones, and it is a fact that the sensibility to light energy of the dark-adapted eye is hundreds of times greater than in the case of the light-adapted eye. This aside, however, the hypothesis of the existence in artificial light of a condition of adaptation which is abnormal is worth considering as one portion at least of the complex cause which may act to produce trouble under artificial light.

The author points out that primeval man was exposed to many hours of night with dark adaptation and many hours of daylight with light adaptation, the intervening periods being relatively short. However, we have sometimes asked ourselves a question which may be worth considering. Is it not possible that a large factor in the eye strain alleged to be due to artificial illumination may be chargeable to the mere fact that the modern eye instead of being used moderately for twelve hours a day is worked intensively eighteen hours? There were few reports of trouble from artificial illumination up to the very recent time in which night has been to no inconsiderable extent turned into day, despite the fact that early artificial illumination was generally bad, insufficient in quantity and improper in direction. Five or six hours of artificial lighting superimposed on an eye which has already done its day's work may reasonably be expected to be not without fatiguing effects. At all events, studies like the one before us are of interest in serving to direct attention to a rather puzzling condition of affairs in a way to help alleviate the troublesome condition.



# The News of the Week

## Activities and Events in the Electrical Field— Reports of Meetings—Commission Findings, Etc.

### Objects of the Supply Jobbers' Association

The objects of the Electrical Supply Jobbers' Association as a body were explained in detail for the benefit of manufacturers and jobbers by Judge T. M. Debevoise, counsel of the association, at the regular quarterly meeting of that body held in the Clifton Hotel, Niagara Falls, Canada, on Wednesday, Thursday and Friday of this week. Owing to misconceptions, occasioned perhaps by meetings behind closed doors, as to the exact functions of the jobbers' association, manufacturers were invited to the session on Wednesday afternoon for the express purpose of acquainting them with the aims and purposes of the association.

As outlined by Judge Debevoise, the sole purpose of the Electrical Supply Jobbers' Association is the education of its members in economical handling and distribution of electrical merchandise and the interchange of experiences bearing on jobbing problems. If the jobber cannot offer the manufacturer a cheaper means of distributing his wares than by selling them directly, he cannot justify his existence, and the jobbers' association is useless. The association welcomes to its ranks all jobbers. It does not encourage, nor does it want, electrical contractors as members, because the electrical contractor is the legitimate customer of the jobber. The association publishes a catalog of electrical merchandise which is open to every manufacturer of electrical supplies, provided he bears the expense of printing and inserting his sheets in the catalog. This work is done at actual cost.

No inquiries are made as to the methods used by the manufacturer in marketing his product or the profits possible for jobbers. The association as a body does not restrict its members in their dealings with manufacturers nor does it attempt to influence manufacturers in their dealings with jobbers not members.

It was pointed out that a manufacturer in marketing his goods has two ways open to him. One is to sell through the jobber and the other is to sell directly to the ultimate consumer. The members of the Electrical Supply Jobbers' Association are scattered all over the country, and it is but natural for a manufacturer, if he chooses to sell through the jobbing trade, to select, among others, members of the Electrical Supply Jobbers' Association. It was admitted that there are good jobbers who are not members of the organization. In his dealings with the jobbers, however, the manufacturer is not dealing with the jobbers' association, as that body has no dealings with manufacturers. The trouble is that because a manufacturer is unable to sell his goods to a jobber he accuses the jobbers' association of conspiracy in restraint of trade, whereas the association as such has had nothing whatsoever to do with the matter. Its members are free to purchase when and where they please. Prices are never discussed in the meetings nor is any attempt made to influence purchases.

Routine matters were taken up at the other sessions, held on Wednesday and Thursday and on Friday morning, when the meeting adjourned. The next meeting of the association will be held at Birmingham, Ala., in November or December, 1914.

### Funds for Los Angeles Power Bureau

As the Los Angeles Aqueduct Power Bureau is in need of funds with which to continue its appraisements and preliminary construction work, it has been proposed that \$3,500 per month be appropriated from the general fund until power bonds can be sold to carry on the hydroelectric development project. It has also been recommended that \$50,000 additional be provided, at the rate of \$6,000 per month, to permit the construction of tunnels in San Francisco County. The tunnels are necessary to insure a sufficient supply of water for the expected needs of the summer of 1915. The City Council has not definitely promised to provide the money, but has adopted resolutions which indicate that some way will be found to raise the money. The subject has been referred to the finance committee.

### Boston Street-Lighting Order Vetoed

Mayor Curley of Boston has vetoed an order of the City Council serving notice upon the Edison Electric Illuminating Company of the termination of the existing street-lighting contract. The Mayor calls attention to the fact that the approval of the order would make necessary the payment of \$103.54 per lamp for the next year, and intimates that under the existing contract it was the duty of the former Mayor, in the twelve months prior to April, 1913, to request the Gas and Electric Light Commission to fix a lower price if the city was dissatisfied with the present terms. The Mayor lately made a courageous stand on behalf of a new contract proposed by the company under the terms of which the city would save materially over the present cost of street illumination. The Council refused to accept the contract, largely through the political influence of the labor organizations of the city. The Mayor purposes to discuss the question with the board and then to have a conference with the company before taking action.

### Empire State Association on Municipal Competition

The Empire State Gas and Electric Association, through Mr. James T. Hutchings, the president, and Mr. C. H. B. Chapin, the secretary, has submitted to the New York Public Service Commission, Second District, a discussion of questions arising from the application of the village of Bath for a certificate of authority to construct an electrical plant. The association quotes from decisions of leading commissions on the subject of competition against existing plants. It states that while there is practically unanimity among regulating bodies in the acceptance of the theory of regulation in place of competition, there are some differences as to the extent to which the theory should be applied. It mentions the acknowledged fact that duplication of investment is an economic waste injurious in the long run to the public which it is one of the duties of commissions to protect. It holds that a commission as well as a company is responsible for the adequacy of the service in any community and the reasonableness of the rates charged, and

that the commission may not shirk this obligation on account of the difficulties of the situation. While steps are being taken in all parts of the country to conserve natural resources, often at great expense, it appears illogical and prejudicial to the public welfare to compel or even permit the waste of artificial resources already created. The association believes that it is the duty of the commission to utilize every means at its disposal to prevent the economic waste consequent upon duplication of investment and facilities in the public service.

A hearing in the case was held by Commissioner Emmet of the commission at Albany on Sept. 9. Members of the executive committee of the Empire State, Gas and Electric Association appeared.

### Cleveland I. E. S. Convention Program

On page 367 of the issue of the *Electrical World* dated Aug. 22 and on page 456 of the issue for Sept. 5 appeared lists of the papers to be presented at the eighth annual convention of the Illuminating Engineering Society to be held at the Hollenden Hotel, Cleveland, Ohio, from Sept. 21 to 26, 1914.

On Monday, Sept. 21, at 10:30 a. m., will be held the opening business session, during which Mr. C. O. Bond will deliver the presidential address. In the afternoon, beginning at 2 o'clock, the first technical session will be held. Additional technical sessions are scheduled for Tuesday morning, Thursday morning and Thursday evening. There will be a lecture session on Tuesday evening, commercial sessions on Wednesday morning and Wednesday afternoon, and laboratory sessions on Wednesday morning and Wednesday afternoon. Thus during both the morning and the afternoon of Wednesday commercial and laboratory sessions will be conducted simultaneously.

The entertainment features include a formal reception and ball at the Hollenden Hotel Monday evening, a popular lecture at the Chamber of Commerce Building Tuesday evening, a banquet at the Hollenden Hotel Wednesday evening, and a trip to Nela Park Thursday afternoon and evening. Additional entertainment features arranged for the ladies attending the convention include afternoon tea at the Hollenden Hotel on Monday, a trip to women's clothing factories Tuesday afternoon, and luncheon and bridge at a country club Wednesday afternoon.

### Vermont Electrical Association

The annual meeting of the Vermont Electrical Association will be held on Sept. 18 and 19, 1914, at Brattleboro, Vt. On the evening of the first day there will be an informal reception at the Brooks House, with a banquet at 7:30 o'clock, to be followed by brief addresses by the president of the association, Mr. Walter H. Vorce, St. Albans, and the president of the local board of trade. At 9:30 p. m. the two-reel motion picture, "Selling Electric Vehicles," of the Electric Vehicle Association of America will be shown at Island Park Pavilion, after which a dance will be held. On Sept. 18 there will be a business meeting at 9 a. m., at which a paper will be read by Mr. C. W. Betcher, General Electric Company, Harrison, N. J., on the nitrogen-filled tungsten lamp. At 11 o'clock the party will leave the Brooks House in automobiles furnished through the courtesy of the Brattleboro Board of Trade and will visit the Vernon hydroelectric station of the Connecticut River Power Company, an 18,000-kw plant supplying energy for the territory between Keene, N. H., and

Providence, R. I., and interconnected with the Deerfield Valley system of the New England Power Company. The convention will close with a clam bake at Spofford Lake. Mr. A. B. Marsden, Manchester, Vt., is secretary and treasurer.

### Indiana Electric Light Association Convention

At the annual convention of the Indiana Electric Light Association, to be held at the Hotel Severin, Indianapolis, Sept. 23 and 24, the following papers and addresses will be presented: Address of the president, Mr. Thomas F. English, Muncie; accounting session in charge of Mr. Fred L. Dennis, South Bend; "Valuation for Rate-Making Purposes," by the Hon. Halford Ericson, Madison, Wis.; address by Judge Thomas C. Duncan, chairman of the Indiana Public Service Commission; "Commercial High-Tension Outdoor Substations," by Mr. H. W. Young, Delta-Star Electric Company; "Profitable Methods of Obtaining Old-House Lighting Business," by Mr. A. T. Holbrook, Excess Indicator Company; "Street-Lighting Fixtures and Regulating Equipment for Nitrogen-Filled Tungsten Lamps," by Mr. W. P. Hurley, Westinghouse Electric & Manufacturing Company; "Lightning Protection," by Mr. V. E. Goodwin, General Electric Company; "Public Policy of Utilities," by Mr. G. E. Gaskill, Greenville, Ohio; "The Newer Tungsten Lamps and Their Applications," by Mr. J. R. Colville, National Lamp Works of the General Electric Company.

The annual banquet and dance of the association will be held on the evening of Sept. 24. Mr. Thomas Donohue, Lafayette, is secretary of the association.

### Association of Iron and Steel Electrical Engineers

At the eighth annual meeting of the Association of Iron & Steel Electrical Engineers, to be held at the Hotel Statler, Cleveland, Ohio, from Sept. 14 to 19, the following papers are scheduled for presentation: "Underground Transmission in a Steel Plant," by Mr. F. D. Egan; "Underground Cables and Accessories," by Mr. J. C. Bowman; "Application of Auxiliary Apparatus in Iron and Steel Mills," by Mr. Stewart C. Coey; "Magnetic Control Characteristics," by Mr. H. F. Stratton; "Alternating-Current and Direct-Current Magnetic Control for Auxiliary Motors," by Mr. W. O. Lum; "Some Electrical Problems Practically Considered," by Mr. B. G. Lamme; "The Control of Induction Motors for Rolling Mill Drive," by Messrs. Wilfred Sykes and G. E. Stoltz; "Transformer Construction for Steel Mills," by Mr. G. A. Waters; "The Apprenticeship System as Applied to Steel Mills," by Mr. B. W. Gilson; "A Synchronous Condenser Installation for Power-Factor Correction and Voltage Regulation," by Mr. W. O. Oschmann; "Watt-hour and Ampere-hour Meters and Their Applications in Steel Mills," by Mr. R. C. Lanphier; "Switchboard and Switching for Steel Mills," by Mr. Saul Lavine; "Organized Safety," by Mr. L. R. Palmer; "Statistical Data of Electrical Application in the Iron and Steel Industry in the United States," by Mr. R. Tschentscher; "Condensers and Their Auxiliaries," by Mr. R. N. Ehrnhart; "Silent-Chain Power Transmission," by Mr. F. L. Morse, and "The Flaming-Arc Lamp in the Iron and Steel Industry," by Mr. Allen T. Baldwin.

On Wednesday, Sept. 16, at the afternoon session, there will be a discussion of the suggested co-operation between the American Institute of Electrical Engineers and the Association of Iron and Steel Electrical Engineers, with a view of possible amalgamation.



### Convention of New England Section, N. E. L. A.

The sixth annual convention of the New England Section of the National Electric Light Association was held at the New Mathewson Hotel, Narragansett Pier, R. I., on Sept. 2-4, with a total registration of 400. The meeting opened on the evening of Sept. 2 with an informal reception by the officers of the section, followed by a smoker in the music room of the hotel and dancing at the Casino. The entertainment program included sea bathing, automobile trips for the ladies, golf and tennis at the Point Judith Country Club. A polo match was held at the club on the afternoon of Sept. 4, and the convention closed with a banquet at the New Mathewson on Friday evening.

At the opening session President C. C. Wells introduced Lieut.-Gov. Roswell B. Burchard of Rhode Island, who welcomed the convention in a speech which included an eloquent tribute to the aims and accomplishments of the electrical profession. The report of the treasurer, Mr. R. W. Rollins, showed a cash balance of \$337.08, and the report of the secretary, Miss O. A. Bursiel, showed that there are now 897 members in the New England Section, eighty-six of whom have been added since Jan. 1. A plan was announced by which the secretary will be available during the coming winter for lectures before women's clubs and other organizations of this kind in the interest of a wider knowledge of the possibilities of electricity in the home. The president's address emphasized the value of association membership to the small company.

#### Old-House Wiring and Special Campaigns

Mr. E. C. Kimball, of the Boston Edison company, presented the paper on old-house wiring and special wiring campaigns, of which an abstract was printed in last week's issue of the *Electrical World*.

In the discussion on this paper Mr. C. H. Stevens, Lynn, Mass., emphasized the value of a definite proposal to the prospective customer for house wiring, stating the exact cost at the first interview and offering the benefits of the instalment plan of payment. Mr. J. E. Spike, Cambridge, Mass., said that one salesman now devotes his entire time to house wiring. The company's relations with the contractors are good and the latter have done much to convince prospective customers of the desirability of increasing their installations. In five months a local campaign resulted in ninety-five contracts totaling \$6,070. The company's proposition is the installation of a three-lamp parlor chandelier or cluster, a two-lamp shower fixture for the dining-room, a cellar outlet with switch control, and four other outlets as desired by the customer, for \$47.50. The company retains \$5 of this for advertising purposes and the contractor gets the rest. By giving tungsten lamps and pull-chain sockets the company has comparatively little difficulty in meeting competition in the form of lower prices by contractors who submit special bids on their own account. For every contract secured by a contractor which totals more than \$47.50 the company allows the contractor an extra \$3.25. The company's connected load in appliances increased from 169.5 kw to 351 kw in the past year.

Mr. Edward Mandeville, Worcester, Mass., pointed out that in three years his company had displaced 2000 gas "arc lamps" by its policy of loaning fixtures. Gas piping is being omitted in many new stores, and on Sept. 1 the company started a campaign for wiring small fruit stores, groceries, candy establishments, etc., which often have a transient career and the proprietors of which are therefore little disposed to invest in wiring. Such stores are wired free by contractors compensated by the company on the basis of a rental charge of 10 cents per lamp per month, the contract being for two

years. If the customer moves meanwhile, the installation becomes a part of the store structure. Sketches of such stores, with outlet locations, are posted regularly at the company's office, and the lowest bidder gets the contract. The address of the establishment is not given until the contract is awarded. Mr. R. M. Buttner, Worcester, pointed out that many houses are being wired at present by journeymen on day work. When local contractors figure on the house-wiring installations they receive twenty-four hours to prepare their bids, and the successful bidder holds a conference with the company and checks the local conditions before beginning work. Of 500 old houses wired, the connected load secured was 7626 50-watt equivalents, yielding an income of \$7,500 per year.

Mr. W. K. Bradbury, Franklin, Mass., spoke of securing twenty contracts per month for house wiring during the past two years and outlined the campaign of his company. A valuable feature of such work is the installation of a service plug outlet which can be used without unscrewing the lamps. Mr. H. J. Pettengill, Jr., Woonsocket, R. I., said that although 75 per cent of the residences are close to the mains, only 15 per cent of these are using electric service, or  $11\frac{1}{4}$  per cent of all in the community. Mr. Hibner said that a house-wiring survey in Portland, Maine, showed that in 9000 houses 5000 were using either gas or oil. An electric-sign campaign giving the consumer three years in which to pay for the installation is about to be started. Mr. B. H. Gardner, Waterbury, Conn., questioned the wisdom of lending store fixtures. He said that only 0.5 per cent of the instalment payments on house-wiring installations were allowed to lapse. Mr. Schwabe cited the success of a plan by which the tenant pays 50 cents more rent per month, the landlord contracting for the wiring of the installation on the basis of paying the company 10 per cent cash and the balance in twelve monthly payments. Mr. G. H. Allen, Hartford, Conn., said that local contractors will now wire an old residence of almost any kind at from \$2.25 to \$3.25 per outlet. For six years the company has loaned fixtures for commercial service, but it has now set 100 watts per lamp as the minimum of such installations and tries whenever possible to standardize on 250-watt lamps.

#### Relation of Meter Maintenance to Revenue

The importance of accurate meter service was emphasized in a paper by Mr. G. F. Atwater, United Electric Light & Water Company, New Britain, Conn. The author touched upon the influence upon meter accuracy of friction, change of power-factor, alterations in frequency, overloads, light loads and short-circuits, and pointed out that a much larger percentage of meters in service are affected by conditions tending to make them run slow than by those tending to speed them up above normal. To obtain the average percentage of accuracy of a meter operating under variable load, the author gave the following rule:

Multiply the result of the test at normal load by three and add to this the result of the test at one-tenth capacity and full capacity of the meter, and divide the result by five. The quotient will be the average percentage of accuracy. The normal load is generally taken for residences as 25 per cent of the total installation and for general store lighting as 60 per cent. The average percentage of accuracy varies with time. For lighting loads the author recommended the installation of meters which are nearly fully loaded when operating normally. Meters are now built which will stand from 200 to 300 per cent overload for a limited time. The cost of meter testing and adjustment will generally be more than overcome by the saving in revenue resulting from increased accuracy of registration. The

maintenance of accuracy in station voltmeters is an important matter and costs comparatively little in proportion to the benefits. A station voltmeter reading 1 per cent high and not detected, thereby causing the voltage at the center of distribution to fall 1 per cent under the rated voltage of the lamps, means that the central station loses 1.5 per cent in revenue and the customers 3.5 per cent of the light to which they are entitled. Meter departments should be composed of careful, experienced men, the policy of organizing such an important division by putting meter readers of limited experience upon it being anything but desirable.

#### Discussion

Mr. C. T. Taylor, of the Edison Electric Illuminating Company of Boston, advised testing each new meter, paying special attention to gears and mechanical details liable to derangement during transportation. Direct-current meters, which are subject to the influence of external magnetic fields, should receive a special accuracy test two or three weeks after installation. Meters of the large-capacity, single-phase type should be tested yearly, and the meters in large department stores quarterly. Suburban companies cannot be expected to test meters as often as city central stations. Mr. C. A. Dean, Cambridge, Mass., said that 70 per cent of his customers are equipped with 5-amp meters. He discountenanced returning actual money to customers in case of inaccuracies on account of the adverse impression thus given as to the meter. Mr. H. W. Brown, General Electric Company, said that the making of tests of meters on light, normal and heavy loads to obtain average accuracy figures represents largely a waste of time. Mr. F. B. Hall, Providence, R. I., pointed out the deleterious effects of short-circuits on meter accuracy and advised looking out for wall vibration as a means of impairment. The Providence company tests large department-store meters every two weeks. Usually the company's meters are tested at 10 per cent and 100 per cent load, the average cost being 40 cents per direct-current meter and 35 cents per alternating-current meter. Of 10,000 meters tested, the company found an accuracy of 99.5 per cent, the loss in revenue corresponding to \$2,500 per year. Mr. F. W. Prince, Hartford, Conn., said that his company tests 10,000 induction meters once in two years, 2000 commutator-type meters once in nine months, and the largest meters once in every two weeks.

Abstracts of other papers and discussions will appear in a later issue.

#### The Banquet

At the banquet the program included an address by Mr. L. D. Gibbs, president-elect of the New England Section, upon the modern newspaper, and one by Mr. T. C. Martin, New York, executive secretary of the N. E. L. A. The former speaker discussed the problems of the present-day press, showing a keen appreciation of their difficulties and the limitations of the modern daily, with the object of giving his hearers a better understanding of the work of these molders of public opinion. Mr. Martin spoke of the work of the national organization, touching upon the "Salesman's Handbook" and the "Handbook on Overhead Line Construction," which have been issued at an expense of \$12,000. He spoke in an optimistic vein regarding the future of the central-station industry, saying that its high diversity-factor appears to safeguard it against the more serious results of the present European war. With reference to the electrical industry as a whole, Mr. Martin said that of \$250,000,000 a year produced in electrical goods not over 10 per cent goes abroad. The opportunities for developing export trade are very large and, if seized, are

likely to lead to an increase in production which will ultimately result in lower supply and equipment costs for American central stations.

#### Officers

The following officers were elected for the ensuing year: President, Mr. L. D. Gibbs, Boston, Mass.; vice-president, Mr. W. S. Wyman, Augusta, Maine; treasurer, Mr. R. W. Rollins, Worcester, Mass.; secretary, Miss O. A. Bursile, Boston, Mass.; executive committee, Messrs. C. A. Mixer, Maine; R. D. Smith, New Hampshire; E. P. Powell, Massachusetts; E. A. Barrows, Rhode Island, and B. H. Gardner, Connecticut.

#### The President-Elect

Mr. L. D. Gibbs as superintendent of advertising of the Boston Edison Company has developed in a masterly fashion what might be called the psychological side of central-station practice. He is an original worker of great personal magnetism and has made a success of numerous projects relating to the application of high-grade publicity. Mr. Gibbs was born in St. John's, Mich. After receiving a high-school education and working in Denver, Col., he returned to St. John's and for three years was occupied in printing and country



PRESIDENT-ELECT L. D. GIBBS

newspaper work. He then entered Oberlin College and was graduated in 1898 while on the staff of the Springfield (Mass.) *Republican*. He went to Washington as private secretary to Congressman F. H. Gillett, of the Second Massachusetts District, also serving as Washington correspondent of the Springfield *Republican* and later as assistant in the same work for the Boston *Transcript*. In the presidential campaign of 1904 he was in charge of Republican publicity in suburban dailies and weeklies. Mr. Gibbs joined the staff of the Edison Electric Illuminating Company of Boston in 1906 and was made superintendent of advertising in 1910.

Mr. Gibbs is third vice-president of the National Electric Light Association, has served on the membership committee and was vice-chairman of the committee on merchandising and advertising of the Commercial Section last year. He has been secretary of the New England Section of the Illuminating Engineering Society and of the Electric Vehicle Club of Boston, and is an associate member of the American Institute of Electrical Engineers and a member of the Engineers' Club of Boston and other organizations. His home is at Newton, Mass.



### Colorado Electric Association at Glenwood Springs

The twelfth annual convention of the Colorado Electric Light, Power and Railway Association was held at Glenwood Springs, Col., on Sept. 3, 4 and 5.

The entertainment features included an automobile ride for the ladies on Thursday afternoon, with dancing in the evening in the ballroom of the Hotel Colorado. The large outdoor swimming pool, which receives its supply of water from the hot mineral springs, furnished amusement on Friday. Later a beefsteak fry was held at the picnic grove, followed by dancing. On Saturday among the contests held were races by the ladies on land and in the water, followed by a baseball game between the central-station men and the manufacturers and by dancing later in the evening.

The meeting was called to order on Thursday by the president, Mr. W. C. Sterne, vice-president and general manager of the Summit County Power Company. Mr. Thomas F. Kennedy of Denver, secretary of the association, was absent, and Mr. F. P. Safford acted in his stead. Mayor Charles D. Barnes of Glenwood Springs delivered an address of welcome, using a number of electrical terms in a humorous manner that delighted the convention, and ended by delivering up the "keys" to the circuits of the city.

In a paper on "The Relation Between Incandescent Lamp Voltage and Resulting Revenue and Service" Mr. R. Arnold Lewis showed that the use of proper lamps and voltage results in building a good load and in improving the lighting service and also the revenue.

#### Lamp Ratings and Renewals

Mr. J. F. Dostal, general manager of the Colorado Springs, Light, Heat & Power Company, stated that tungsten lamps are so popular that he cannot give away the carbon-filament type. Mr. H. S. Russell, of the Denver Gas & Electric Light Company, said that his company uses lamps the ratings of which are equal to the voltage of the circuits on which they are used. He added that the lamps did not hold up to their rated life on over-voltages, and hence the company could not afford to operate at increased voltages because complaints cost it more than would be obtained from increased revenue. Mr. L. P. Hammond, of the Colorado Power Company, stated that his company allows its customers a small amount toward the renewal of tungsten lamps. To reduce the renewals the company operates at a pressure below the rated voltage of the lamp.

#### Flat Rate Versus Meter Charge

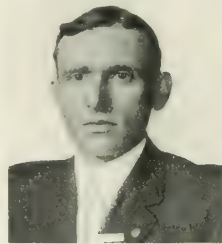
Mr. Hammond expressed himself as being in favor of a flat rate when serving customers who use only two or three lamps, the wiring in such cases being connected from house to house and the fuses installed outdoors. This arrangement makes it unnecessary to require a meter deposit and makes it more convenient to connect additional consumers without considerable expense. He added that he preferred the over-hour use of lamps to investments in and repairs on meters, because the only additional expense with long-hour use is for a little more water to drive the hydroelectric equipment or for more fuel where a steam plant is used. Mr. Dostal stated that there was more excuse for flat rates ten years ago when meters cost \$15 than there is at present with the cost of meters at \$6. His experience has been that the three-lamp customers use heating appliances in the daytime, therefore he prefers the use of meters with a minimum monthly charge of \$1.50. Mr. Dostal declared that sockets can now be obtained which will not allow the removal of lamps before they are burned out, thereby preventing the use of heating appliances on sockets not intended for that purpose.

Mr. W. F. Raber, manager of the Arkansas Valley Railway, Light, Heat & Power Company, Pueblo, Col., stated that many customers can be obtained on the flat-rate basis who cannot be secured when billed on actual energy consumption. He added that overtime use of electricity on the flat-rate system can be prevented by installing time switches.

During the discussion on "question box" topics Mr. H. U. Wallace stated that his company employs steel-wire transmission lines with 350-ft. spans for supplying energy to irrigation pumping installations. Using 35-ft. poles and No. 4 wire, the steel-circuit lines cost only \$425 per mile, or only one-half what copper lines do.

#### Flame-Arc and Nitrogen-Filled Lamps

Mr. B. H. Durbin, of the Bryan-Marsh Works of the General Electric Company, discussed the characteristics of 1000-watt nitrogen-filled lamps. He pointed out that one 1000-watt lamp will bring in revenue about equal to that obtained from three residences supplied with electric service. These high-rated lamps are especially adapted to color matching and photographing, as



PRESIDENT-ELECT W. F. RABER

the illumination produced by them approaches that of daylight.

Mr. L. C. S. Wood, of the Westinghouse Electric & Manufacturing Company, presented the advantages of flame-arc lamps. He called attention to the fact that this type of illuminant has been developed as much as high-rated tungsten lamps, adding that a maximum of 2000 cp is developed with a consumption of only 445 watts. The cost of energy for flame-arc lamps and the expense of maintaining them is relatively low compared with the corresponding expenses required for nitrogen-filled lamps. Flame-arc lamps are especially adapted to the lighting of railway yards, docks and factories.

Abstracts of other papers and discussions will appear in a later issue.

#### Committee Reports and Election of Officers

Saturday morning was devoted to the reports of committees and to the election of officers. Mr. W. F. Raber, Pueblo, Col., was elected president, and Mr. John J. Cooper, Central City, Col., was made vice-president. The president-elect has been vice-president and general manager of the Arkansas Valley Railway, Light & Power Company, Pueblo, Col., since June, 1911. Prior to that time he was general manager of the Mansfield (Ohio) Electric Railway, Light & Power Company for three years.

# Prospects for Domestic and Foreign Business

Analyses of the Situation by Keen Observers Show Many Elements of Encouragement for the Industry

## VIEWS OF MR. GANO DUNN ON BUSINESS

### Economic Effects of Destruction of Capital Offset to Some Extent by Greatly Increased Exports

Mr. Gano Dunn, president of the J. G. White Engineering Corporation, who was in Europe at the time war was declared, has given, at the request of the *Electrical World*, a statement of his views in regard to the effect of the conflict upon business conditions in this country. It is as follows:

"First—An enormous amount of the world's capital has already been destroyed and more will be destroyed, consequently construction enterprises and new projects of all kinds which flourish on surplus capital seeking investment will be severely checked for a long time.

"Second—Further destruction of capital due to the continuation of the war will probably be greater if the allies are defeated than if Germany is defeated, since the capital of Great Britain, France, Belgium and Russia is much greater than that of Germany and Austria, and it is probable that the former nations would go far toward exhausting their greater joint resources before accepting defeat. The financial and industrial effects of the war, therefore, are involved to a considerable extent in the result of the fighting.

### Capital for Small Home Enterprises

"Third—There will probably be greatly increased exports from the United States of foodstuffs and manufactures which will mitigate and to some extent offset the tremendous capital losses in the United States resulting from the destruction of security values and the contraction of credits. There will probably be a general increase in interest rates and also probably a certain amount of American capital available for smaller construction enterprises that are near enough home to be locally known and bring out the resources of the very small investor.

"Fourth—South America will suffer not only through lack of European capital, which has been the principal source of supply for the development of her new enterprises and the extension of her commerce, but also severely through reduced capacity of Europe to take and pay for South American exports. American and Canadian markets will inevitably be benefited by the demand for such South American imports as Europe cannot supply. While these South American purchases will be of much benefit on account of the business they represent, they will be of more value because of the new channels of trade they will open up and the new connections they will establish. Their immediate value should not be overestimated, however, in view of the reduced buying power South American countries will experience from the reduction of their usual exports to Europe.

"Fifth—Any forecast at this time can be presented only as an offhand opinion, since the consequences of the great struggle will so fundamentally affect American international commerce, finance and industry that no one can see clearly the adjustments that must follow."

### High Cost of Exchange and Coal

Mr. Dunn has spent much time abroad in the study of business and engineering conditions. When Austria declared war on Serbia he endeavored to reach home, but

on account of the interruption of railroad communication he was unable to get to Paris and returned to Italy, going to Florence and then to Genoa. Owing to the suspension of payments on letters of credit, Mr. Dunn in common with other Americans experienced many discomforts. By going early in the morning before office hours to one of the banks and awaiting opening, before the full force of the financial disturbance was appreciated, he was able to get a little gold on his letter of credit by paying a premium of 15 per cent. Later he had to pay as high as 40 per cent premium to secure cash on travelers' checks. With several other prominent Americans, Mr. Dunn was able to be of service to American refugees, of whom there were a large number stranded without funds and suffering in Italy. Dock Commissioner R. A. C. Smith of New York, President Nicholas Murray Butler of Columbia University, Mr. Frederick W. Vanderbilt and Mr. Dunn constituted a committee of guarantors which enabled the chartering by Consul-General Jones in Genoa and the subsequent sailing in the face of many difficulties of the steamship *Principe di Udine*, of the Lloyd Sabaudo Line, which was the first refugee ship to get out of Italy. A sudden rise in the price of coal to nearly \$20 a ton, and increased costs and complications of all kinds, made the voyage of the ship cost \$115,000 in gold, which was between \$30,000 and \$40,000 more than was collected from the passengers.

## DR. WHEELER ON EFFECT OF THE WAR

Believes that Depression Will Be Largely, Though Not Fully, Offset by Gains

Dr. Schuyler S. Wheeler, past-president of the American Institute of Electrical Engineers and president of the Crocker-Wheeler Company, Ampere, N. J., was asked to give his opinion to the *Electrical World* on the probable results of the European war upon the electrical industry of this country.

Dr. Wheeler, in complying with this request, expressed his conclusions as follows: "It is my opinion that the cessation of imports which has been brought about by the war will have no important bad effects upon our industry, because, unlike most others, it uses exceedingly little foreign material. I believe, further, that all industries, even those that have used much imported material, can adjust themselves to the use of domestic material without serious consequences, except possibly in a few cases. Aside from the reduction of business in this country due to the cessation of exports, I believe that a good deal of the dullness about which there is so much discussion is due to anticipated slight increases in the cost of the finished product, but this increased cost will be disregarded when the available supply is used up and need increases the pressure. There will be a considerable dullness of business for a time owing to the natural conservatism of all owners of industries, which holds them back until they have ascertained the exact status of their product under the new conditions in which cost changes, even though very slight, are for the moment considered important. The depression and loss due to the war will, of course, be largely, though I believe not fully, offset by the gains in business that will come to us. In the long run the cost of war falls to some extent upon everybody."



## MANUFACTURERS ON BUSINESS OUTLOOK

### Many Different Points of View Show Promise and Reasonable Confidence

The *Electrical World* has asked manufacturers to express their opinions concerning the effect of the war on business. A number of replies have been received and some are published herewith. Others will be published in later issues.

#### Great Strength of This Country

Mr. James I. Ayer, Simplex Electric Heating Company, Cambridge, Mass.: "We have of imported material used in quantity that is important a full year's supply now on hand. Our exports to England continue but will doubtless stop. Our exports to Europe while of interest are not large. Domestic trade has held well with us to date and is ahead of the corresponding period for 1913. The outlook is difficult because of no previous experience with like conditions. It is obvious that the check to business in many directions already experienced will affect all to some extent. On the other hand, with the passing of the shock of the first experience of this extraordinary war our clearing vision is showing the great strength of this rich country. The solid character of established business, our great crops, our ability to manufacture for all markets, and what is vital, the soundness of our banking conditions (this last shown by our now going to the help of South America with branch banks and exchange of bank credits), all point to satisfactory conditions ahead. We will not have a boom, but there will be no encouragement to 'General Depression.'"

#### Business Holding Up Remarkably Well

Mr. Charles Blizard, third vice-president of the Electric Storage Battery Company, Philadelphia, Pa.: "The storage-battery industry is not so dependent upon imported raw material as are many other lines of manufacture. We believe that the war will not prevent us from getting such material from abroad as we require in our process. The unsettled condition of domestic markets for raw materials dictates caution in current purchases, but it is our opinion that prices will soon steady themselves. Our business is holding up remarkably well. We have had many inquiries from foreign countries which would probably not have come to us under normal conditions, and we judge from these invitations that the war will enable us to find new customers in new fields. Under existing circumstances we are satisfied with our current business and are optimistic as to the future."

#### Eventual Increased Export Trade

Mr. G. P. Miller, treasurer Bridgeport Brass Company, Bridgeport, Conn.: "The European war has not as yet had very much effect on our business. Eventually it will probably result in an increased export business, judging from the inquiries which we are now receiving. Fortunately, we are not greatly dependent upon European raw materials, although this has affected some of the concerns from which we buy supplies, particularly the crucible makers. We look for an increased business just as soon as the financial situation is relieved."

#### Middle West Encouraged

Mr. Claude L. Matthews, of W. N. Matthews & Bro., Inc., St. Louis, Mo.: "We feel optimistic over the situation so far as it relates to the general business outlook immediately before us. The difficulty arising from the obligations of this country held in Europe will be cleared gradually by the banking interests. We do not look for any immediate results in the development of a large volume of South American trade. The export business

depends to so great an extent on the result of the war that until peace is declared it will be difficult to get it on a normal basis. South American countries have been financed so largely by Europe that a long time will be required for them to reach a normal condition again. Some immediate demands, however, from South America will have to be supplied by American manufacturers. In the Middle West crops have been so good generally that people are encouraged to expect satisfactory business conditions. The only cloud arises from the cotton situation. On account of the financial situation it is likely that new construction will be largely discontinued for a time. Our business has not fallen off so much as we expected it would. We are undertaking a comprehensive advertising campaign and expect to go ahead with it."

#### Unusual Demand for Electrical Machinery

Mr. J. F. Hemenway, treasurer Smith & Hemenway Company, New York: "The great European war will undoubtedly make an unusual demand on the manufacturers of electrical machinery and tools in the United States from Central and South America as well as other countries of the world. That such will be the result must be apparent from the fact that the warring nations have been forced to discontinue manufacturing, and even after the close of the war will be badly disorganized for months following. The questions of arrangements for shipping, terms for credit and other details must be settled to the satisfaction of the foreign customers, and doubtless this can be done through the branches of our banks that are now being arranged, notably by the National City Bank of New York City. Our business will undoubtedly be increased and we are procuring goods with a view to supplying the trade as far as possible and giving prompt delivery. We have not been dependent upon European countries to any extent, and therefore do not need to look for substitutes. The cost of production will undoubtedly be increased owing to the increase in the cost of metals and other materials, and possibly a little later in labor. However, as to that, no one can foresee or foretell to what extent the cost of manufacturing may be increased by the results of the conflict now raging."

## ELECTRICAL INDUSTRY IN ENGLAND

### Summary from a London Electrical Engineer Shows that Every Effort Is Being Made to Solve Industrial Problems

BY HAYDN HARRISON

It has been said that England is a nation of shopkeepers. This may have been intended to apply to the internal industry of the country, but those who have studied the official returns relating to imports and exports could not fail to realize that it applies very largely to the business of the nation as a whole.

There is no doubt that the electrical appliances manufactured in England are barely sufficient to meet her own requirements, whereas large quantities have been exported to meet her foreign trade.

The effect of the war has been to cut off the market from which England obtained the surplus she was unable to produce, and also to isolate for the time being the market where she obtained certain raw materials.

#### Orders Pouring Into Factories

The result of this has been that orders are pouring into the factories of electrical machinery and appliances, not only for home requirements but also for export, and in very few cases does one hear of shortage of work. It is true that this demand has come

at what appeared to be the end of a boom; therefore the factories are in a good position to meet it, except for certain difficulties which naturally arise in a country which has not only had to take her share in the war but is also so adjacent to the seat of war as to have to make provisions for dealing with the refugees and wounded of the friendly nations who are fighting by her side.

The standard of quality of electrical plant, etc., manufactured in Germany was sufficiently high to warrant considerable business with this country, and as proof that this existed it is only necessary to turn up last month's trading in electrical goods. The United Kingdom exported to Germany less than £13,000 value in electrical appliances and purchased from Germany more than £160,000 value of similar goods. It is obvious, therefore, that as most of these goods were required for home use, though of course some of them were exported, English factories must considerably increase their output to meet the deficiency in supplies hitherto obtained from Germany. Every effort is, therefore, being made by the electrical industry of this country to cope with the situation, both by increasing our own production and by obtaining the assistance of other friendly nations.

As regards increasing our own output, it is true that England is not the seat of war; nevertheless, tens of thousands of Englishmen are already in the fighting line and hundreds of thousands are being mobilized. This means that nearly all our factories and works are short-handed and are finding it difficult to compete with the demand put upon them even in normal times. Added to this difficulty is still another, namely, that many of our factories have relied to an appreciable extent on obtaining certain materials and parts from the Continent, especially Sweden, Belgium, Germany and Austria.

#### Reliance on Continental Materials

Many of these materials, such as certain qualities of iron, steel, porcelain and glass, though to be obtained in England, have not formed a specialty of production, and therefore cannot for the present be produced in the same quantities or at the same price as it has hitherto been possible to obtain them from the Continent. Some of these materials are so essential to the electrical industry that eventually the production of them must create important industries in this country; for example, the lighting side of the electrical industry relies largely on incandescent lamps, yet as far as the writer is aware there are only two incandescent lamp factories in the country which manufacture their own bulbs. The other factories, which are very numerous, have hitherto relied on supplies from the Continent.

Again, as regards arc lighting, there is only one factory of arc-lamp carbons in England, the hitherto large demand having been obtained from Germany, France or Italy.

#### No Sign of Check

Many will think that the demand for electrical machinery and appliances would receive a check, but there is no sign of this, nor is there indication that any reduction is likely to occur. Electricity supply undertakings in this country are largely in the hands of municipalities which are receiving every encouragement from the government to carry on progressive policies, in order to employ as much casual labor as possible. Again, the export market to our colonies is demanding deliveries as usual, and fortunately our navy has proved itself equal to keeping the high seas open to commerce not only with the colonies but also with the friendly nations that are not adjacent to the seat of war.

Many of the German houses which had branches in England to facilitate the sale of these goods in this

country have already closed their doors; others are being kept open to clear such stocks as they may have had, or, should they have been financed with British capital, to factor such goods as they may be able to procure. But there is naturally a prejudice against such houses, which will last for a long time.

#### Field for Enterprise

Fortunately, all this means that our own factories which can supply this much increased demand are working night and day, but many others which are short-handed and short of materials cannot hope to do their share. Could there be a better field for enterprise than this country presents at the moment? It cannot be a temporary demand, as it must be many years, even if the day ever does come, before Germany at any rate can regain her position in the commercial world.

There is another side of the question—money. By money is meant credit, at least so far as commerce is concerned. The financial credit of England has been amply proved by the fact that the bank rate even at the present moment, with a moratorium in existence, is as low as 5 per cent, but that does not actually affect the case where wages are under consideration. The result of a moratorium is to upset financial routine, which in an industry employing labor on a large scale has a serious effect. It is, therefore, to be hoped that the banks in this country, to which the government has given every assistance, will do their share in helping the employers to tide over the period of suspense, in which case the trouble due to non-employment, so greatly feared in time of war, will be largely reduced. In fact, it is difficult to conceive such an anomalous position as is otherwise likely to arise, namely, that of factories full of orders turning away hands for financial reasons.

As might be expected with war so suddenly declared, panic took place among the old class of Englishmen, who, taking no notice of the affairs of the world, have been content to live in a little world of their own. Many have prophesied that such sense of security must eventually result in decadence. It is, therefore, quite conceivable that war, terrible as it is, will eventually work for good, though, like most medicines, it is unpleasant to take.

Those who have witnessed the way in which electrical engineers of all classes have volunteered for active service and the enthusiasm with which our men have vacated the laboratory, the workshop and the offices to take their places in the army cannot fail to realize that as an industry we have learned the importance of action, and it is to be trusted that this lesson will result in greater activity, not only now but also when peace has been declared, which all sincerely hope will not be long delayed.

#### Lost Electrical Opportunities

As regards the future, the electrical industry over here has already begun to realize the value of lost opportunities and to prepare for the great opportunities of the future. It is everywhere realized that patience and reasonable sacrifices for the present are essential, and it is gratifying to note that America will benefit probably more than any other country. German exports to the British Empire to the value of, approximately, £100,000,000 per annum will have to be supplied from elsewhere. The share which England will get should eventually be increased. Nevertheless, every electrical engineer over here would be pleased to see America benefit to a large extent and to feel that, when peace comes, we shall be sharing the electrical industry of the world with those who have always been in the vanguard of this great industry, namely, our American cousins.



## PUBLIC SERVICE COMMISSION NEWS

## Maryland Commission

The Maryland Public Service Commission, following the advice of Acting Chief Engineer Edwards, has advised the Town Council of Elkton that an electric voltage of 6600 is not dangerous when the wire construction is of good materials, put up with good workmanship, and when adequate attention has been paid to location of other lines and crossings.

## California Commission

The Railroad Commission has rendered a decision denying the application of the Pacific Gas & Electric Company for a rehearing in the case brought against it by the town of Antioch.

## Wisconsin Commission

The Wisconsin commission has laid down the standards for telephone service in a set of twelve rules just issued. Sixty days is prescribed as sufficient time in which to comply with the new rules. Some of the rules are mentioned below:

Equipment and lines shall be so constructed and maintained as to eliminate all cross-talk and noise which unreasonably interferes with the transmission of messages for ordinary distances. The number of subscribers on any one line shall not be greater than that consistent with adequate service. Each utility furnishing service alone or jointly shall provide at least one line for through traffic on routes along which few or no subscribers' instruments are installed. Traffic studies shall be made to demonstrate to the commission that sufficient equipment is in use and that an adequate operating force is employed. At exchanges serving 500 or more subscribers 94 per cent of the calls shall be answered within ten seconds or less. At all other regular exchanges 90 per cent of the calls should be answered within ten seconds or less. At all exchanges operated in connection with other work slower service may be adequate.

## Indiana Commission

The hearings on the petitions to revise rates of all the Indianapolis lighting and heating companies have been started before the Public Service Commission of Indiana. The first testimony related to the Merchants' Heat & Light Company, which has acquired the People's Light & Heat Company. Mr. Byron T. Gifford, chief engineer of the American Public Utility Company, gave the detailed exceptions of the Merchants' company to the appraisal of the property by representatives of the Indiana commission. The plant valuations of the company and the State follow: State valuation, replacement value \$2,814,088, present value \$2,349,792; company valuation, replacement value \$3,937,000, present value \$3,198,540.

Mr. Harry O. Garman, chief engineer of the commission, testified as to the methods he used in arriving at his valuation of the property of the Merchants' and People's companies. The largest differences between the appraisals were found in the transmission system of the Merchants' company.

The city of Indianapolis, which recently made a contract to light the city for the next ten years with the Merchants' company at rates below those charged by the Indianapolis Light & Heat Company during the last ten years, is represented in the hearing.

## Ohio Commission

An order has been issued requiring every public utility in the State to file with the commission before Jan. 1 the certified valuation of all of its property which was requested some time ago.

## Current News Notes

**TONS FOR THE INDUSTRIES BUT NOT ONE LUMP FOR THE RANGE.**—No coal is used in the households of Beirut, Syria, although coal, by tonnage, was the most important import of the city during the past year. The coal is all consumed by the railroads, and the electric-light, railway and gas companies.

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**TELEPHONE ORDER SYSTEM.**—In the note on the convention of Edison sales managers published in the Aug. 29 issue it was stated that a paper on a telephone order system was presented by Mr. R. H. Wright, of Cleveland. This was an error, the paper which covered the new telephone order system on the contract department of the Commonwealth Edison Company of Chicago having been prepared by Mr. H. Wright, chief clerk of the contract department of the latter company.

\* \* \*

**SPECIAL TRAIN TO EDISON ILLUMINATING COMPANIES' CONVENTION.**—Following the usual practice, a special train will be run from New York City, Sept. 13, to White Sulphur Springs, W. Va., where the convention of the Association of Edison Illuminating Companies will be held Sept. 15 to 17. The train will leave the Pennsylvania station, New York City, at 5.08 o'clock Sunday afternoon, Philadelphia at 7.36 p. m., Baltimore at 9.55 p. m., and Washington at 11.10 p. m., arriving at White Sulphur Springs Monday morning.

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## SOCIETY MEETINGS

**OHIO COMMERCIAL MEN TO MEET AT TOLEDO.**—The committee on new-business co-operation of the Ohio Electric Light Association will meet at the Elks' Club, Toledo, Sept. 17. Men connected with the sales departments of Ohio electric-service companies are cordially invited to attend. Mr. T. F. Kelly, Dayton Power & Light Company, Dayton, Ohio, is chairman of the committee.

\* \* \*

**JOVIAN ACTIVITY IN INDIANAPOLIS.**—During the week of the Indiana State Fair, Sept. 7-12, at the metropolis of the State, "Made in Indianapolis" signs were conspicuous in down-town stores. The Indianapolis Jovian League took an active part in furthering this movement. On Jovian Day, Sept. 15, the Indianapolis members of the order plan a street parade, to be headed, it is hoped, by Governor Ralston and Mayor Bell, who are Jovians. Mr. Thomas A. Wynne is Jovian statesman in Indianapolis. Officers of the local league are: President, Mr. Fred H. Cheney; secretary, Mr. Norman A. Perry.

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**MEETING OF THE MUNICIPAL ELECTRICIANS.**—The nineteenth annual convention of the International Association of Municipal Electricians will be held at Atlantic City, N. J., Sept. 15 to Sept. 18. The Hotel Isleworth will be official headquarters. Information will be presented on electrical affairs for municipalities by prominent municipal electricians of the United States and Canada. Connected with the convention will be an exhibition of electrical apparatus of interest to municipalities. A report will be presented by the committee appointed at last year's convention "to investigate and report upon regulation for high-voltage overhead circuits in cities, including methods of construction." The membership of this committee is: Dr. C. P. Steinmetz, chairman, and Messrs. Clayton W. Pike, Philadelphia; Howard Joslyn, Seattle; A. L. Pierce, Wallingford, Conn., and R. A. Smith, Norfolk, Va.

## A New England Transmission System

**Water-power and steam stations of Burlington (Vt.) Light & Power Company at Winooski, supplying electric service to Burlington, Richmond and the Barre-Montpelier district**

**A**N interesting development of generating facilities and the inauguration of a high-tension tie-line service have been accomplished by the Burlington (Vt.) Light & Power Company at Winooski, about 3 miles east of the principal city served by the system. The original generating station at Winooski is situated between the rocky walls of a gorge in

13,000 volts to the town of Richmond, Vt., and at 33,000 volts to the Barre-Montpelier district, the latter being occupied by the Consolidated Lighting Company, which purchases energy from the Burlington company on a day-load basis. Transmission lines about 47 and 13 miles long respectively have been built to the Barre district and to Richmond, and a number of features of the Winooski installation illustrate a skilful development of the facilities afforded in the face of natural obstacles apparent in the accompanying photographs. At Essex Junction, 8 miles from Burlington, a reinforced-concrete dam is now under construction upon the Winooski River in connection with a new hydroelectric development which the company expects to complete in the near future, the present plan contemplating the installation of four 1500-kw generating units operating under a 65-ft. head. The dam will establish a reservoir about 0.5 mile wide and 3 miles long, and a portion of the developed electricity is to be transmitted to Barre, the remainder supplying the existing system of the Burlington company. The Essex Junction plant is to be built, with the dam, from the plans of Mr. J. J. Kennedy, consulting engineer, New York.

### Description of Winooski Plants

Energy is generated at 2300 volts in the Winooski hydroelectric and steam plants, the transformers for the Barre and Richmond service being installed in a former oil room, with concrete walls, ceiling and floor, situated in the lower portion of the old station. The transformer room is 28 ft. long, 16 ft. wide and 11 ft. deep, and, as shown in Fig. 3, each unit is installed in a 7-ft. by 7-ft. compartment with a concrete wall 8 in. thick



FIG. 1—EXTERIOR OF AUXILIARY TURBINE PLANT OF THE BURLINGTON LIGHT & POWER COMPANY

Winooski River, the end walls of the station being formed by the rocks bordering the stream, while the upstream wall of the building acts as a section of the dam or forebay retaining wall. In this station are three 500-kw, 2300-volt, three-phase, sixty-cycle General Electric revolving-field generators, the field coils being mounted on a common horizontal shaft sectionalized by clutches and belt-driven by four waterwheels, three of which are Platt Iron Works turbines, the fourth being a Hercules turbine. The wheels operate under a head of 30 ft. and two Lombard governors are provided for the plant.

Last summer a reinforced-concrete dam, 30 ft. high between the island termination of the power house and the eastern shore of the stream, superseded an old crib and stone dam formerly utilized. An auxiliary steam-turbine plant of 1000-kva rating has been built on the west bank of the river and a transformer installation made in connection with the transmission of energy at



FIG. 2—HIGH-TENSION LINES CROSSING WINOOSKI RIVER AND RAILROAD

between each pair of transformers. The 2300-volt connections are made at the top through taps from junction boxes connected by conduit with the station bus through overhead runs across the generator room. High-tension connections are made between transformers through insulating bushings carried through the walls as shown, and leads to the high-tension oil



switches, which are mounted on the floor above with the lightning arresters (Fig. 4), are carried upward through floor openings by short runs of bare copper. The Richmond service is handled by a 500-kva, three-phase General Electric transformer mounted on wheels,

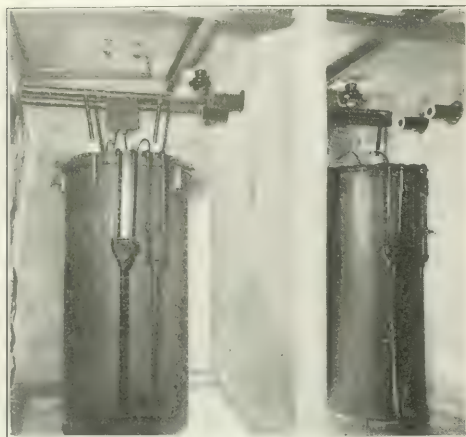


FIG. 3—TRANSFORMER COMPARTMENTS BUILT IN FORMER OIL ROOM OF OLD STATION

and the Barre line is fed by three Westinghouse single-phase transformers rated at 400 kva each. All transformers are water-cooled either by the local municipal service or by the river water, according to the cleanliness of the latter.

At the rear of the main switchboard, on a concrete gallery in the generating room of the hydroelectric station, connections are made as shown in Fig. 6 from the station bus through disconnecting switches and 2300-volt oil circuit-breakers to the leads of the Richmond and Barre transformers, a panel for controlling the Winooski street-lighting service being mounted at

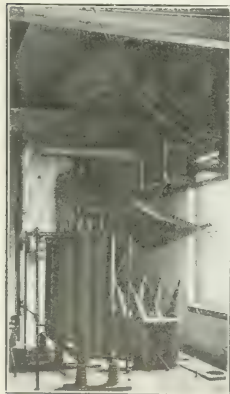


FIG. 4—LIGHTNING ARRESTERS AND OIL SWITCHES



FIG. 5—ROOF BUSHINGS AND LINE-SUPPORTING STRUCTURE

the right. A clearance of about 3 ft. exists at the rear of the switchboard, which contains thirteen panels, the last two being for the control of the transformers and outgoing lines. The latter are carried upward from the high-tension oil switches to choke coils mounted

under the ceiling of the switch room and thence through roof bushings (Fig. 5) to the top of the station, where a steel structure cares for the dead-ending of the outgoing lines and their necessary changes in direction in leaving the station. Each panel for outgoing high-tension line control contains a watt-hour meter, three ammeters, time-limit relay governing the operation of line switches, power-factor indicator, switch control buttons and pilot lamps.

#### Transmission Line to Barre

The Barre line is of No. 2-0 copper, the Richmond line being of No. 0 section. The former connects with the Consolidated Lighting Company's system near the Bolton Falls station of the latter. Throughout the run the line is of the pole type, 35-ft. cedar being used except near the Winooski plant, where the lines cross the river gorge and Central Vermont Railroad by spans attached to steel structures and towers by strain insulators of the three-disk type. Fig. 2 is a view of these spans. The two lines are carried across the tailrace in a span of about 100 ft. They then cross the river in a 400-ft. span, terminating at a steel tower of the latticed type from which

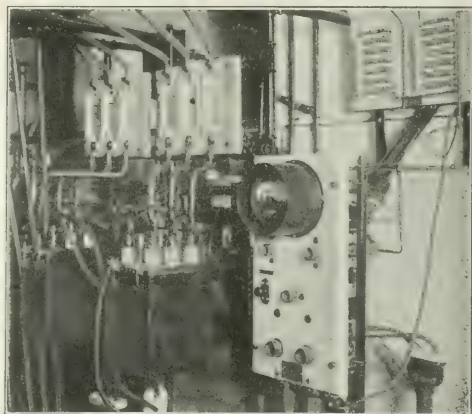


FIG. 6—CONNECTIONS FROM 23,000-VOLT BUS TO TRANSFORMER LEADS

the span of about 70 ft. across the railroad is started. The intermediate structure on the island is about 18 ft. high and 18 ft. wide, of the A-frame type with heavy diagonal bracing, the phase wires being spaced about 3 ft. apart. The towers are about 36 ft. high and are 30 in. square at the bottom, being anchored into 4-ft. by 4-ft. by 10-ft. concrete foundations by four 1.5-in. bolts in each case. The bottom angles are of 3-in. by 3-in. by  $\frac{3}{8}$ -in. steel plate, and a ground wire is carried at the top of the tower and pole line. On the latter section the phase wires are supported by pin-type insulators with a 36-in. equilateral triangular spacing. The usual span is 125 ft.

#### Auxiliary Steam Station

The auxiliary steam plant is housed in a brick and concrete building 90 ft. long by 50 ft. wide, and the boiler equipment consists of the two 350-hp Stirling outfits having 343  $\frac{3}{4}$ -in. tubes each, hand-fired, and provided with a Cochrane feed-water heater and two 9-in. by 5 $\frac{1}{4}$ -in. by 10-in. Worthington feed pumps. Coal is delivered to a storage yard outside the station by cars on a railroad siding. From each boiler an 8-in. steam line delivers into a 14-in. header, from which a 6-in. pipe leads to the turbine, which is a

Westinghouse equipment operating at 3600 r.p.m. and discharging by a 36-in. exhaust pipe into a Westinghouse jet condenser on the face of the cliff outside the station, as shown in the exterior view (Fig. 1). The feed-pump exhaust is discharged in the usual manner into the heater. A 15-in. atmospheric exhaust pipe with automatic valve operating in case of the failure of the vacuum is installed in the turbine room with the usual roof exhaust head. Injection water for the condenser is forced into condenser head by a 40-hp motor-driven centrifugal pump installed in a pump house at the base of the cliff. The motor is a 220-volt Westinghouse induction outfit, running at 675 r.p.m., and the pump house is a 20-ft. by 15-ft. concrete structure 14 ft. deep. It is connected with the condenser by a 7-in. pipe 50 ft. long. A 25-kw turbine-driven exciter and a steam-driven Westinghouse air pump connected with the condenser by a 5-in. pipe are installed in the turbine room, which is illustrated in Fig. 7. At present the turbo-generator, which is a three-phase, 2300-volt machine, is connected with the switchboard in the hydroelectric plant by short cables run on poles, but a set of exposed ducts illustrated in Fig. 5 has been installed between the hydroelectric and steam stations for this purpose.

#### Handling the Outgoing High-Tension Lines

Fig. 8 illustrates the method of handling the outgoing 2300-volt lines and arc-lighting circuits at the Winooski



FIG. 7—INTERIOR OF AUXILIARY STEAM PLANT AT WINOOSKI

plant. As the station is at the bottom of the gorge, the roof is considerably below the surrounding highway grades and the outgoing lines leave at an angle of about 30 deg. with the horizontal. Each wire is therefore dead-ended on a double set of strain insulators attached to a channel-iron cross-arm about 6 ft. long, carried at the end of a steel frame about 15 ft. high, the frame being anchored into the roof by concrete piers and cross-braced longitudinally as shown. The principal members are 6-in. by 6-in. by 0.5-in. angles. The lines leaving the station building are carried up to the frame in conduit, and jumpers run from conduit outlets to the wires on the outside of the strain insulators complete the connection and provide drip loops.

The Winooski-Barre line is kept open at both ends during the night, the load being picked up at Burlington at 7 a. m. The switches at the Burlington end are opened from noon to 1 p. m., and the afternoon service extends from 1 p. m. to 4 o'clock. The line is left alive for lightning-arrester charging at Winooski until 5 p. m., when it is open-circuited until 6 o'clock the following morning. The closing of the switches at Winooski at the latter time energizes the line for arrester charging at the Barre end. The load taken by the Consolidated Lighting Company varies from 500 kw to 1000 kw and consists in large degree of power service in the granite quarries and stone sheds of the

Barre-Montpelier district. It is usually unnecessary to operate the auxiliary steam plant at Winooski outside the summer period of low water extending from about July 15 to Sept. 1. Even in this period daily service is not required from the steam-turbine installation.

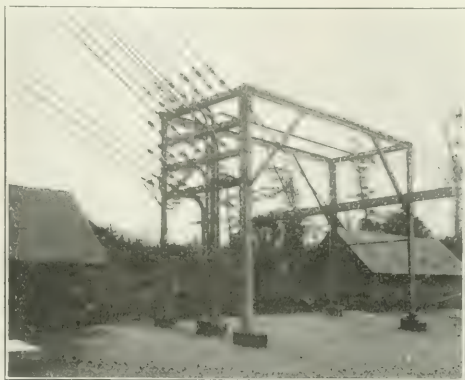


FIG. 8—ROOF FRAME AND OUTLETS OF LOCAL CIRCUITS FROM WINOOSKI

#### Central-Station Fixture Display

An attractive fixture display is a feature of the Burlington company's office building. A view of this is shown in Fig. 9. Two connecting rooms, 25 ft. long over all and 12 ft. wide, are situated at the rear of the general offices, one room being finished in robin's-egg blue and the other in dark weathered fumed oak. About 100 outlets are provided for fixture display in horizontal rows of 1-in. aluminum-coated pipes placed 18 in. apart on centers and 10 ft. above the floor, the wiring being run to the fixtures through these pipes from a fuse box placed near the floor in one of the inner walls. Ordinary T's in the pipes suffice for the fixture outlets. A center table, shelves and easy chairs add to the attractiveness of the room and facilitate the display of portable fixtures for desk and table service.

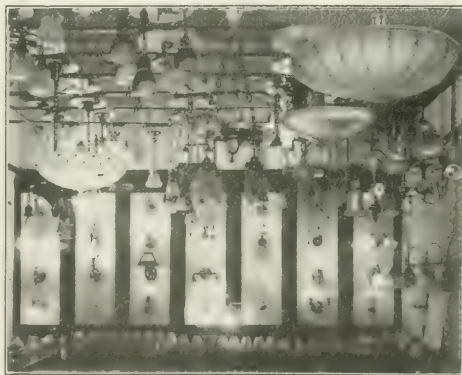


FIG. 9—FIXTURE DISPLAY OF THE BURLINGTON LIGHT & POWER COMPANY

In the illustration are shown seven wall panels with four outlets each, which are convenient in exhibiting brackets of various types. Switches controlled by pendant cords are installed in various conduit lines to permit convenient subdivision of fixture circuits.



## Economy in Handling Peak Loads

**Selection of prime-mover units for best operating results under various conditions of station load and available fuel supply. By Reginald Trautschold**

**I**N operating a power house economically and efficiently one of the greatest handicaps to be overcome, if not the greatest, is the periodic demand for unusually heavy output. Particularly is this true in a power plant furnishing energy for electric lighting and motor service or in the power house of an electric-traction enterprise. Investigations of such plants show that by far the greater number are called upon to operate for six hours out of every twenty-four at fully 50 per cent higher efficiency than is required to carry the mean load. Such plants must and do depend upon storage-battery reserve to care for the high peaks or particularly heavy service, but this practice is not altogether economical, as shown by the fact that the generating units are driven at the full capacity of the plant only during the hours of heaviest demand for energy, the reserve equipment, whether constituted of independent units or represented by increased driving of certain generators, being pressed into service for only a few hours each day, notwithstanding the steadying influence of the storage batteries.

### Steam Operation Versus Internal-Combustion Engines

Whether a steam plant or one operating with internal-combustion engines is the more economical is a question on which advocates of the two types of energy producers do not agree, nor is it the object of this article to express any opinion. Precedence, the high degree of perfection to which steam-operated units have arrived, and the belief (a disputed point) that high-grade steam engines and turbines are more reliable than the best in-

of 1000 kw, the average service load and the duty of charging the storage batteries, and calling upon the 500-kw reserve for six hours per day to care for the heavy demand, as is typical of the average electric-lighting or electric-traction generating station, efficient equipment is tabulated in Table I. The average yearly fixed charges for such a plant are also given in the same table, with conservative figures for the "operating charge"—labor, attendance, oil, waste, supplies, etc. The fuel requirements per day are 75,000 lb. The total yearly cost of operation of such a plant, exclusive only of real-estate value and burden, with coal at various prices, is given in Table II. From this latter table the average cost of operating such a plant is seen to be \$79,650, a record that is bettered, of course, in some exceptionally well-operated plants of similar size, but one that may be safely accepted as a fair average.

TABLE II—TOTAL COST OF OPERATION, 1500-KW STEAM STATION

Coal per Ton	Total Cost of Energy per Year
\$2.00	\$59,110.00
3.00	72,798.00
4.00	86,494.00
5.00	100,182.00
Average	\$79,650.00

Many plants very similar to the one considered are situated in districts where natural gas is readily obtainable, but where for various reasons, such as liability of interruption of the natural-gas supply, the use of coal as the plant fuel is found more advisable. In such localities it is frequently possible, though rarely done, to utilize the natural gas for fuel to run a gas engine in place of the reserve Corliss engine that is operative only during heavy-service hours. These heavy-service hours are usually pretty well known, but, nevertheless, some time is invariably required to place in operation the boilers that have not been in operation, or have been operated below capacity, during the hours of lesser load, so that the storage batteries must care for the increased demands for energy during the time occupied in putting the reserve steam unit into operation and while it is picking up its load. This dependence is not conducive to maximum economy.

### Some Gas-Engine Advantages

A gas engine, on the other hand, can be started up quickly and can carry its full load almost instantly—certainly very much more rapidly than a steam engine can be pressed into service. Hence, in a plant using gas-engine reserve, the dependence on the storage batteries during a marked increase in demand for energy would be greatly reduced, and during hours of light service no stand-by losses from consumption of fuel would be entailed. Tables III and IV give the fixed charges, operating charge and the yearly average cost of operation of a plant in which a 550-kw natural-gas

TABLE I—FIXED CHARGES, STEAM PLANT, 1500-KW STATION

Building, foundations, chimneys, etc. (item A).....	\$28,000.00
Equipment:	
Two 550-kw Corliss engine-generator sets with boilers, all accessories and auxiliaries.....	90,000.00
One 450-kw exhaust-steam turbine with generator, condenser and auxiliaries.....	23,000.00
Total cost of plant .....	\$141,000.00
Yearly fixed burden (item B).....	\$22,560.00
(In estimating item B depreciation has been taken at 5 per cent, repairs at 2 per cent, interest at 6 per cent and insurance at 1.5 per cent of the total cost, and taxes at 2 per cent of three-fourths cost.)	
Operating charge:	Per Year
Attendance (\$20 per day).....	\$7,300.00
Oil, waste, supplies, etc.....	1,875.00
Operating charge (item C).....	\$9,175.00
Fixed burden (item B).....	22,560.00
Fixed charges 1500-kw steam plant.....	\$31,735.00

ternal-combustion engines, necessitate the consideration of the average power house as a steam plant. For such a plant the most economical machines unquestionably would be high-pressure Corliss engines and low-pressure steam turbines directly connected to electric generators. Considering a plant of 1000 kw with 500-kw reserve, a 1500-kw plant carrying a constant mean load

engine, etc., is substituted for the 550-kw Corliss engine, etc., the reserve unit. The fuel requirements for such a plant are 8760 tons of coal and 14,600 cu. ft. of gas per year. Taking the price of both the coal and the natural gas at conservative values, the average yearly cost of operating such a combination plant should be in the neighborhood of \$64,855, a saving of \$14,795 over the all-steam power plant.

A plant operating entirely on natural gas would natu-

TABLE III—FIXED CHARGES, STEAM AND NATURAL-GAS PLANT, 1500-KW STATION

Building, etc. (item A).....	\$28,000.00
Equipment:	
One 550-kw Corliss engine-generator set with boilers, all accessories and auxiliaries.....	45,000.00
One 450-kw exhaust-steam turbine with generator, condenser and auxiliaries.....	23,000.00
One 550-kw gas-engine-generator set with auxiliaries.....	33,000.00
Total cost of plant.....	\$129,000.00
Yearly fixed burden (item D).....	\$20,640.00
Operating charge assumed to be the same as in the case of all steam.....	
Operating charge (item C).....	\$9,175.00
Fixed burden (item D).....	20,640.00
Fixed charges 1500-kw steam and natural-gas plant....	\$29,815.00

rally show even a greater saving, but if any interruption or curtailment of supply should occur such a plant would be, temporarily at least, practically valueless. A combination plant, on the other hand, might not be affected at all by a curtailment of the natural-gas supply, the available supply of gas being sufficient to care for the limited gas-engine service required. A complete cessation of the supply would, of course, be embarrassing, but even under such conditions the plant could still furnish power in adequate quantities for at least eighteen hours per day, and during the six hours of heaviest load 66⅔ per cent of the power required would be furnished with no change from ordinary operating conditions, and this could probably be augmented to the full amount by forcing the steam equipment beyond its normal capacity, additional storage-battery equipment being possibly advisable.

#### Points Concerning Combination Plants

A combination natural-gas and steam plant is possible only in quite limited sections of the country, however, the auxiliary fuel not being obtainable in all

TABLE IV—TOTAL COST OF OPERATION, 1500-KW STEAM AND NATURAL-GAS STATION

Yearly Plant Charge	Cost of Coal, per Ton	Fuel for Steam, Equipment	Nat. Gas, per 1000 Cu. Ft., Cents	Fuel for Reserve, Equipment
\$29,815.00	\$2.00	\$17,520.00	2.00	\$2,920.00
	3.00	26,280.00	3.00	3,580.00
	4.00	35,040.00	4.00	4,240.00
	5.00	43,800.00	5.00	4,900.00
Average.....		\$30,600.00		\$3,480.00
Total cost of operation—average.....				\$64,855.00

localities. Crude oil and fuel oil, on the other hand, can be transported practically anywhere, and, even with such oil commanding a price of 5 cents or 6 cents per gallon, oil engines may be employed to advantage as the reserve units in almost any power house of the class under consideration.

Tables V and VI show the average fixed charges,

operating charge and yearly cost of energy production in a plant using the two fuels, coal and oil. The fuel requirements in this case are 8700 tons of coal and 120,450 gal. of fuel oil. With coal at the average price and oil fuel at the excessive price of 5 cents per gal., a plant in which the 550-kw reserve unit is an oil engine or engines would cost about \$10,923 per year less to operate than one in which the reserve unit was an effi-

TABLE V—FIXED CHARGES, STEAM AND OIL-ENGINE PLANT, 1500-KW STATION

Building, etc. (item A).....	\$28,000.00
Equipment:	
One 550-kw Corliss engine-generator set with boilers, all accessories and auxiliaries.....	45,000.00
One 450-kw exhaust-steam turbine with generator, condenser and auxiliaries.....	23,000.00
One 550-kw oil-engine-generator set with all accessories and auxiliaries.....	47,000.00
Total cost of plant.....	\$143,000.00
Yearly fixed burden (item E).....	\$22,870.00
Operating charge assumed to be the same as in the case of the all-steam plant.....	
Operating charge (item C).....	\$9,175.00
Fixed burden (item E).....	22,870.00
Fixed charges 1500-kw steam and oil-engine plant....	\$32,045.00

cient steam engine of the Corliss type; with oil fuel at 6 cents per gal., the saving would be about \$9,717. A similar all-oil-engine plant (see Table VII) operating on oil fuel at 5 cents per gal. would show an expense of \$10,763 per year over that of the all-steam plant, an excess that would be quickly increased should the price of oil fuel advance. With oil fuel at 6 cents per gal., a price that has been reached in many localities and which may be expected to be current again, the cost of producing energy, though still considerably in favor of a combined steam and oil plant, would be \$21,617 more annually than in the case of all-steam power operating on coal at the average price. In fact, an all-oil-engine plant would not compete with an all-steam plant, operating on coal at \$3.50 per ton, unless the price of oil fuel was as low as 4 cents per gal., at which figure the balance in favor of the oil plant would be only \$73 per year. The combination plant has still also another advantage over the straight oil plant, overcoming or discounting one of the main drawbacks to the latter type of plant;

TABLE VI—TOTAL COST OF OPERATION, 1500-KW STEAM AND OIL-ENGINE STATION

Yearly Plant Charge	Cost of Coal, per Ton	Fuel for Steam, Equipment	Cost of Oil, Fuel per 1000, Cents	Fuel for Reserve, Equipment
\$32,045.00	\$2.00	\$17,520.00	2.00	\$2,409.00
	3.00	26,280.00	3.00	3,014.00
	4.00	35,040.00	4.00	3,619.00
	5.00	43,800.00	5.00	4,224.00
Average.....		\$30,600.00	5.00	\$3,022.00
Total cost of operation—average.....				\$68,727.00
Total cost of operation—average, if oil fuel at 6 cents.....				\$69,033.00

namely, the wide fluctuations in the price of oil fuel that seem bound to occur. Invariably oil may be purchased at a reduced price during some period and judicious buying then is, therefore, easier than when the larger supply for the complete fuel requirements of the plant has to be cared for. Oil does not deteriorate in storage.



### Data on Gas Producers and Engines

Installations of gas producers and gas engines to care for the reserve requirements of a plant subject to periods when heavy demands for energy must be met are of particular interest, as the producer equipment is here subject to the least advantageous conditions. For this reason producer-gas installations should receive

TABLE VII—TOTAL COST OF OPERATION, 1500-KW OIL-ENGINE STATION

Building, etc. (item A).....	\$28,000.00
Equipment (complete).....	141,000.00
<b>Total cost of plant.....</b>	<b>\$169,000.00</b>
Yearly fixed burden.....	\$27,040.00
Operating charge (item C).....	9,175.00
Fixed charges 1500-kw oil-engine plant.....	\$36,215.00
<b>Fuel Requirements:</b>	
Oil at 4 cents per gal.....	\$43,362.00
Oil at 5 cents per gal.....	54,195.00
Oil at 6 cents per gal.....	65,052.00
<b>Total cost of operation:</b>	
Oil at 4 cents per gal.....	\$79,577.00
Oil at 5 cents per gal.....	90,413.00
Oil at 6 cents per gal.....	101,267.00

great impetus toward more general adoption if they prove efficient under such trying conditions. Of course, the advocates of that method of energy production claim that it is as reliable as any steam generating apparatus, and if plants in which the producers are called into service only occasionally can show efficiency (as recent installations are doing) the internal-combustion engine operating on producer gas should eventually supplant the steam equipment in many plants. Assuming the same conditions as in the previous comparisons, the internal-combustion-engine equipment for taking care of the reserve power and the Corliss engine low-pressure steam-turbine equipment for the average load and charging the storage batteries, and taking into account the fuel losses of the producer during stand-by hours, the losses when blowing the producer, etc., Tables VIII and IX give conservative data for a consideration of the economic value of such a combination plant of the size under consideration and subject to similar service requirements. The cost of equipment is consider-

TABLE VIII—FIXED CHARGES, STEAM AND PRODUCER-GAS PLANT, 1500-KW STATION

Building, etc. (item A).....	\$28,000.00
Equipment:	
One 350-kw Corliss engine-generator set with boilers, all accessories and auxiliaries.....	45,000.00
One 450-kw exhaust-steam turbine-generator set with condenser and auxiliaries.....	23,000.00
One 550-kw producer-gas engine generator set with complete gas generating equipment, etc.....	50,000.00
<b>Total cost of plant.....</b>	<b>\$146,000.00</b>
Yearly fixed burden (item F).....	\$23,360.00
Operating charge assumed to be the same as in the case of the all-steam plant.	
Operating charge (item C).....	\$9,175.00
Fixed burden (item F).....	23,360.00
Fixed charges 1500-kw steam and producer-gas plant..	\$32,535.00

ably more, as in the case where oil engines are employed for the heavy loads, than in the case where all generating units are driven by steam. The fuel requirements are 9670 tons of coal per year. The average yearly cost of operation of a plant of this character, assuming that the gas producer is operated on the same kind and grade of coal as the steam generators, would be

about \$66,528, a saving of \$13,122 over that of the all-steam-power plant. The gas producer could probably be operated, however, on fuel that averaged as much as \$1 a ton less than the fuel required for the steam boilers, and in such event the possible saving represented by the combination plant would be about \$14,074. An all-producer-gas-engine plant would cost considerably

TABLE IX—TOTAL COST OF OPERATION, 1500-KW STEAM AND PRODUCER-GAS STATION

Yearly Plant Charge	Cost of Coal per Ton	Fuel for Steam Equipment	Cost of Coal per Ton	Fuel for Producer
\$32,535.00	\$2.00	\$17,520.00	\$1.00	\$953.00
	3.00	26,280.00	2.00	1,905.00
	4.00	35,040.00	3.00	2,857.00
	5.00	43,800.00	4.00	3,810.00
Total cost of operation—average—one grade coal.....				\$66,528.00
Total cost of operation—average—two grades coal.....				65,576.00

more to install than any other type of plant that has been considered, but even with this handicap, authentic records of the cost of operation, etc., indicate that a producer-gas plant of the size under consideration and operated under similar conditions would be most economical, particularly if the cheaper fuel was utilized. Such a plant (see Table X) would cost only about \$59,083 per year to operate—\$20,567 less than the efficient all-steam-power plant, a saving of over 25 per cent.

### Flexibility of Equipment Desirable

Internal-combustion engines for the reserve equipment of plants which are subject to greatly varying degrees of load have considerable value, as has been shown. In the case of natural-gas engines this is to be expected, and the wisdom of the installation of such plants depends entirely upon the reliability of the natural-gas supply. If the supply is certain at all times of the year and is ample, the steam or partly steam-power house is not an economic one. When using oil engines for reserve, an interesting situation arises: namely, that it is economical to use such reserve units even when a plant operated entirely on such engines would be uneconomical as compared with a straight steam plant. With a combination steam plant and gas producer reserve the comparative merits can be reliably ascertained. If the advantages are in favor of the producer plant, as the behavior of modern producers is

TABLE X—TOTAL COST OF OPERATION, 1500-KW PRODUCER GAS PLANT

Building, etc. (item A).....	\$28,000.00
Equipment (complete).....	150,000.00
<b>Total cost of plant.....</b>	<b>\$178,000.00</b>
Yearly fixed burden.....	\$28,479.00
Operating charge (item C).....	9,175.00
Fixed charges 1500-kw producer gas plant.....	\$37,654.00
Fuel charge—average.....	21,429.00
<b>Total cost of operation—average.....</b>	<b>\$59,083.00</b>

plants of such size would indicate, the plant can easily be so remodeled as eventually to operate only on producer gas. That is, provision can readily be made for the adoption of gas engines and producers when the equipment of the plant has to be increased and the substitution of the gas equipment for steam equipment whenever the latter must be replaced.

# Artificial Illumination and Its Effect on Vision

Direct adaptation of retinal rods and cones for daylight and for after-dark seeing—Fatigue from artificial illuminants: Will a few more centuries immunize our eyes against it? By F. K. Richtmyer

THE deleterious effects of artificial illumination upon the eyes has long been recognized. At least as early as 1847 experiments were made to study the effect of radiation on eye media. Since that time the ever-increasing annual output of papers on the subject seems to point to a recognition of the fact that coincident with the increase in efficiency and intensity of modern artificial light sources has come an increasing amount of eye strain and kindred maladies, some of them vague and indefinite, but none the less serious, for they seem to indicate a pathological condition little, if at all, understood.

Perhaps the most natural place in which to seek an explanation of this baffling defect in our artificial illumination is in some property or peculiarity of the illumination itself. But experiments performed with systems of illumination which imitate daylight in every way possible, except as to intensity and spectral energy distribution, seem to result in the same eye strain. Quite recently Luckiesh and others have raised the question that eye strain may, in some manner, be caused by the relatively large proportion of infra-red contained in the spectrum of our artificial sources. Assuming that the coefficients of absorption of eye media are similar to those of water (for the longer waves at least; they are known to be different for ultra-violet), Luckiesh<sup>1</sup> computes that a large part of the energy from artificial sources is absorbed by the cornea, although no inconsiderable part reaches the retina. This same conclusion has been reached, qualitatively at least, by Vogt,<sup>2</sup> who showed experimentally that the infra-red energy reaching the retina from artificial sources is many times that represented by the rays within the visible spectrum.

## Difficulties in the Way of Explanation

Promising as this suggestion may seem, there are three serious obstacles in its way: (1) It is difficult to correlate it with the fact that, in at least the large majority of cases, it is the ultra-violet and the shorter visible rays which are photo-chemically and photo-physiologically active, and we should not therefore expect the infra-red to cause changes of this character. (2) The simple absorption of heat from the light of artificial sources can hardly be, of itself, the cause of our defects in vision, since, on account of the much greater intensities encountered in daylight conditions, the total amount of heat produced in the eye media is of at least the same order of magnitude for the two kinds of illumination. (3) Neglecting errors of refraction, much of our eye trouble seems to be due to pathological disturbances of the retina, which, in the normal eye, receives per lumen only three or four times as much energy-flow from artificial as from daylight illumination. To be more specific, if we accept the data given by Luckiesh for the absorption of energy in the various eye media, we can easily compute how much of the incident energy (power) per lumen reaches the retina from the several sources considered. These

data are shown in the accompanying table, and graphically in the appended curve.

From the last column of the table it is seen that the ratio of the energy received on the retina from a 4-watt-per-candle-power carbon lamp is only about six times ( $0.047 \div 0.008$ ) that received from a black body at 5000 deg. C., and for a tungsten lamp only about three times. Taking into account the much greater intensities of daylight, it is seen that the difference in the amount of energy received on the retina is not so great as might at first thought be expected. Apparently heat production cannot be held accountable for retinal disturbances.

And yet the suggestion that eye trouble may be caused by the more refrangible waves of artificial sources seems to meet with the very obvious objection that our artificial sources are far weaker in ultra-violet, both in relative and in absolute measure, than is daylight, under which we can work with a maximum of comfort and efficiency, and which causes little or no eye strain.

But is it logical to expect that the difference in efficiency of our visual apparatus with daylight and with artificial sources must be due to some physical difference in the two illuminations produced thereby? Should we not also look to some difference in the receptive condition of the eye? When we find any deleterious effect on the human organism due to the peculiar exactions of civilization we are usually reminded that the *sum-mum bonum* of existence will be obtained only by a "back to nature" movement. Accordingly are we not justified in raising the question, In what way do modern systems of illumination require our eyes to meet conditions to which primitive man was unaccustomed during the long period of evolution?

## Duality of Structure and Function

The dual physiological structure of the retina—that is, the rods and the cones—coupled with experimental evidence of a very positive character, has led us to believe in a dual functioning of the eye: that the cones are used for daylight vision and the rods for the so-called twilight vision. This duplicity of structure and function seems perfectly in accord with modern conceptions of evolutionary development. During the countless ages when our visual apparatus was being developed two radically different intensities of illumination were encountered: (1) the exceedingly high illuminations of midday, and (2) the very low illuminations at night. It seems reasonable, therefore, to suspect that two sets of visual apparatus should have been developed to meet the two radically different intensities. Note that before the day of artificial illumination there was practically nothing between these two extremes. In this respect then, at least, we are imposing on the eye conditions which were not met during its evolution and for which, therefore, nature has made no provision, for the intensities customarily met in artificially illuminated rooms are midway between those of daylight and of night-time.

But the question might well be raised: What evi-

<sup>1</sup> Electrical World, Vol. 62, page 846 (1913).

<sup>2</sup> Graefes Arch. für Ophthalmologie, Vol. 81, page 153 (1913).



dence of a physiological nature is there to expect that this moderate illumination, to which primitive man was unaccustomed, would produce harmful effects on the eye? As a possible answer to this question we will consider several bits of evidence which, while not at all conclusive, are at least suggestive.

C. Behr<sup>2</sup> reports clinical observations on four persons who were afflicted with disturbances of vision due to working under artificial illumination. Aside from errors of refraction, these patients complained of disturbances evidently connected in some way with the functioning of the retina, such as flickering, inability to see their work after looking for a short time toward the darker parts of the room, a diffuse gray sensation when coming into daylight from artificial light, and other symptoms of an indefinite nature. A determination of the adaptability-time curve for these patients showed that they possessed a sensibility far below normal. Thus, if we call the sensibility of the normal eye 10,000 (the reciprocal of the minimum observable illumination) after a forty-five-minute exposure to darkness, the sensibility of these four patients was, in round numbers, 1000 for the same duration of adaptation. At least one of the patients regained normal sensibility when he returned to daylight work. Experiments by Behr on patients from whom the lens had been removed<sup>3</sup> showed that this same depression of the adaptation curve could be produced by short exposures to ultra-violet radiation greater than 350. To appreciate the full meaning of this observation we must understand the physiological process by which adaptation is accomplished, as well as the process by which radiant energy is changed into visual sensation.

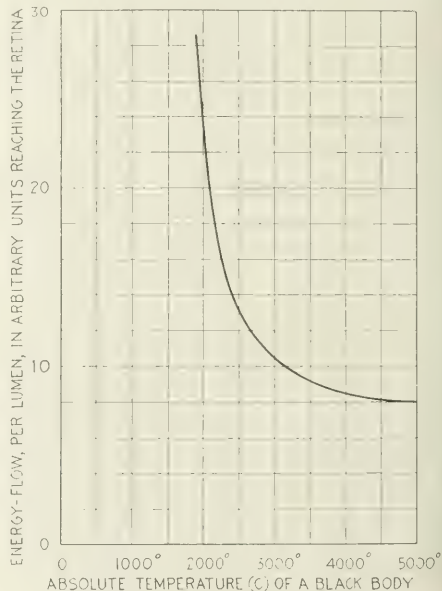
#### Obscurity of Physiological Processes

Unfortunately neither of these processes is at all clear to us. About the latter we know practically nothing. Regarding the former a reasonably good working hypothesis is based upon the "migration" of the dark pigment which is found closely associated with the rods and cones of the eyes of nearly all animals. Direct observation on microscopic sections of the excised eyes from recently killed frogs has shown that when the animal is kept in the dark this pigment crowds in around the base of the rods and cones, leaving the entire surface of these nerve ends free to receive light energy. When, however, the animal is kept in the light it is found that this pigment has pushed forward and has covered all but the tip ends of rods and cones, thus reducing the surface area upon which light may fall and consequently decreasing the sensibility. Although direct experiments on mammals have failed to show the migration of this pigment, observations by Klein<sup>4</sup> can be explained, readily at least, on no other hypothesis. The theory is at least a workable one, therefore, that in ordinary daylight vision only the tips of the rods and cones are exposed to radiation, while in twilight vision (that is, with the eye dark-adapted) the whole surface of the rods and cones is exposed.

We may, therefore, conclude that the rods and cones of primitive man were accustomed to work under only two conditions: (1) with the tip ends of the nerves receiving a high illumination and (2) with the whole surface of the rods (and cones) receiving a very low (night-time) illumination, excepting perhaps for a brief period after sunset and before sunrise.

Now, it is well known that the eye, as used in artificial illuminations, is partially dark-adapted. That is, the pigment has partially receded, leaving a part of the upper portions of rod and cone surface exposed to an intensity to which, in primitive man and animals, it was not accustomed. Ought we not, therefore, to expect on this surface an effect—we can hardly call it a burn—somewhat like the sunburn produced on the city dweller when he goes camping? The guide, accustomed to outdoor conditions all his life, experiences no ill effects.

Of course, the skin readily recovers from sunburn and soon becomes immune. Why should not these upper parts of the rods and cones soon become immune to the effects of light relatively too intense? We can only suggest an answer: the skin, from its unprotected position on the outside of the body, must have been developed to meet rapidly changing conditions, and there-



RELATION BETWEEN ENERGY-FLOW AND TEMPERATURE

fore readily adapts itself to new environments; whereas until very recently, from the standpoint of evolution the sensitive parts of the retina have never been compelled to work under any but night-time illuminations. After a few dozen centuries of artificial illumination possibly our eyes will become immunized!

#### Futility of Speculation

What this ill effect may be, or by what radiation it may be caused, it is of course idle to speculate. On the present theory, we should expect it to interfere with the mechanism of (retinal) accommodation by making a part of the rod and cone surface less sensitive to light, or, rather, less efficient in transforming radiant energy into visual sensation. This was indeed what Behr found. Furthermore, small as the quantity of ultra-violet energy in artificial sources is, to say nothing of the still smaller proportion which ultimately reaches the retina, it may yet be sufficient to cause disturbance on such a very sensitive surface as the rod and cone surface must be, especially when we consider that photo-chemical effects are not necessarily dependent on the energy of the radiation which causes them. But it does not seem necessary to hold the ultra-violet

<sup>1</sup> "Beitrag zur Frage nach den Veränderungen und Schädigungen des Auges durch Licht," *Graefes Arch. für Ophthalmologie*, Vol. 82, page 509 (1912).

<sup>2</sup> The lens is opaque to radiation shorter than  $375\mu$ , but all other eye media are transparent to at least  $330\mu$ . So that with the lens removed radiation down to  $330\mu$  would reach the retina.

<sup>3</sup> Fr. Klein: *Archiv. für Anatomie und Physiologie* (physiologic section), 1911, page 339.

alone responsible. It may be that energy of any wavelength, of an intensity so many times that for which it was intended, falling on the exposed rod and cone surface of the partially dark-adapted retina would cause deleterious effects.

In this connection it is to be noted that many persons subject to eye strain and kindred disturbances of a seeming retinal origin work with perfect comfort in daylight. This would be expected. When the eye is light-adapted to the intensities usually met in daylight, the injured surface of the rods and cones is covered up and only the tip ends are functioning. These same people are fairly comfortable under a very weak artificial illumination—which again agrees with the theory here put forth.

#### Individual Preferences in Light Sources

There are those who, for the sake of comfort, prefer the carbon lamp to the tungsten; and even the old open-flame gas burner, with its still smaller proportion of blue, violet and ultra-violet, to the carbon. One case which has recently come to the writer's attention was that of a person who had been accustomed to work at a desk lighted by a 16-cp carbon lamp. The carbon lamp was replaced by a 25-watt tungsten, and immediately

TABLE SHOWING ENERGY-FLOW AND WATT-PER-LUMEN RELATIONS

Source	Watts per Lumen	Percentage Absorbed by Eye Media	Percentage to Retina	Watts per Lumen on Retina*
4-watts-per-cp carbon lamp	0.385	87.9	12.1	0.047
1 25-watts-per-cp tungsten	0.126	80.0	20.0	0.025
Black body at 2000 deg. C. ....	0.223	89.7	10.3	0.023
Black body at 2500 deg. C. ....	0.0795	76.7	23.3	0.0185
Black body at 3000 deg. C. ....	0.0310	65.1	34.9	0.0108
Black body at 4000 deg. C. ....	0.0155	45.9	54.1	0.0084
Black body at 5000 deg. C. ....	0.0115	30.5	69.5	0.0080

\*The term "watts per lumen on the retina," as well as the corresponding term "watts per lumen absorbed by (the several eye media)," in the article referred to by Luckiesh, is really a misnomer if taken literally. It is really an abbreviation for the longer statement, "watts per lumen available as visual energy," only a small part of which reaches any one retina to be transformed in part into visual sensation. In other words, this column gives in arbitrary units the flow of energy per lumen reaching the retina, assuming (what we probably have no right to assume) that pupil opening is not affected by the spectral energy distribution of the source concerned.

eye strain began to be felt. After a time the carbon lamp was replaced and the eye strain at once ceased. It may be that the physiological reason back of this peculiar preference for "yellow" light—a preference which those of us who are scientifically inclined stigmatize by calling a "notion"—is based on some such effect as has here been suggested, namely, that the larger proportion of violet and ultra-violet in the whiter sources acts in a more harmful—or at least unpleasant—manner on those parts of the rod and cone surface accustomed only to night-time conditions, even though the intensities of illumination, photometrically measured, produced by the several artificial sources may be equal.

The above suggestions are recorded simply as possibilities to be established or—more likely—cast aside by future experimental work. Certain it is that, after much investigation in this field an explanation of the peculiar phenomena observed appears to be as far away as ever, and those who are working along these lines seem to welcome suggestions from any source which may serve to aid their efforts.

## Hydroelectric Development and Irrigation

At the recent conference of United States Reclamation Service attorneys held at Salt Lake City, Utah, Mr. E. C. Finney, assistant attorney for the Reclamation Service, read a paper entitled "Hydroelectric Development on Public Lands in Relation to Irrigation," which presented the policy of the present administration in so far as it is governed by the legal representatives of the Reclamation Service. The author briefly outlined the history of irrigation both in this country and abroad.

In speaking of the reclamation measure now before Congress, Mr. Finney said: "The bill seeks to protect the investor, encourage investment and secure early development of the water-power resources under conditions favorable to the public, but it retains fee in or reversion to the United States for such use or disposition as may appear proper and expedient to the people and to Congress at the expiration of leasehold periods." Congress recognized the necessity for hydroelectric development in connection with irrigation in 1906 and then made provisions covering such developments. In waterlogged lands and marshes cheap electric energy is practically necessary in order to insure reclamation. The author pointed out that pumping by hydroelectric energy permits the irrigation of only those lands worth while, by dividing the work of irrigation among a number of successive stations. Besides the advantages of irrigation, electricity offers the farmer energy for lighting, threshing, sawing and many other kinds of labor. Electricity also assures the irrigator a steady flow of water and a saving of water and will probably be the means of inducing manufacturers to settle in the neighborhood, thus insuring a nearer and better market for farm products.

In closing, Mr. Finney stated that "Far-seeing statesmen propose to retain in the United States the ownership of these valuable power sites for the public lands and reservations, and to procure development through long-time and definite leases, thus retaining such control over the future as will enable the American Congress of that day and generation to make new and proper legislation fitting those times and their needs, and thus insuring the greatest and most enduring good to the people generally, but particularly to those of us whose homes are in the West and whose interest in water and its possibilities is direct and vital. With the full and wise development of the irrigation and power possibilities of the West, her opportunities for increased prosperity and well-being are boundless and will far outdistance the most vivid word picture of our Western boomers."

## Electricity in Salt Lake's Wasatch Carnival

Electricity played a prominent part in the celebration of the annual carnival of "the Wizard of the Wasatch" at Salt Lake City, Utah, Aug. 25 to 29, the principal feature being the electrical pageants. The floats in the procession were built on motor-equipped flat cars furnished by the Utah Light & Railway Company, and more than 5000 lamps were used in producing the lighting effects. These lamps were for the most part concealed in coves and the light reflected against the face of the floats, producing beautiful effects in illumination and shade without revealing any exposed lamps. In the industrial parade of Wednesday the lighting company entered an electric-truck float showing Jupiter, thunderbolt in hand, in the foreground and at the rear Benjamin Franklin drawing lightning from the skies with his kite.



# Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods, and Current Practice Among Successful Utilities

## Central Station Boosts State Fair

The Arkansas Valley Railway, Light & Power Company, Pueblo, Col., has donated to the Colorado State Fair Association all of its contracted advertising space in the newspapers of the Arkansas Valley, including those published in Pueblo, Canon City, Cripple Creek, Victor, La Junta, Rocky Ford, Manzanola, Swink, Fowler and others. This newspaper space will be used for advertising the state fair, to be held in Pueblo Sept. 14-19, inclusive. In calling the fair to the attention of local merchants, the central-station company also has suggested that they co-operate with the movement by mentioning the state fair in their own advertisements.

## Rural Electric Service in Central Indiana

To those who have watched the extensive growth of rural telephone service in the United States the ultimate solution of the rural electric lighting and motor-service problem reveals itself in the simple statement of fact that the farmer will have electric lighting and motors. Many utility operators have objected that rural electric service is impossible, urging that the cost of construction and maintenance makes it prohibitive. But in the earlier days of the rural telephone, when the company could not afford to make extensions, the farmer—the independent rural citizen—said, "I'll bear part of the cost." He did, and to-day he is still a satisfied telephone customer. Indeed, it might almost be said that his wife would not live with him if he discontinued his telephone contract.

Thus the electric-service man can learn a lesson from his telephone brother. He should liken the existing high-tension transformer lines (including those of interurban railway companies) to the telephone toll lines of twelve or fifteen years ago, and then he should recall how the telephone business grew from one small pay station in the village general store to an exchange of 1000 customers.

If these comparisons are made and the tendencies of the early telephone days are recalled to mind, the map

reproduced herewith will be of unusual interest, for it shows how a progressive utility company in the central part of the Hoosier State is applying these lessons. Eighteen miles of rural circuit has already been built and is in operation, and 19 miles of additional line is

TABLE I—DATA ON SMALL TOWN AND RURAL ELECTRIC SERVICE IN CENTRAL INDIANA

City	Population	Customers
Russville .....	700	125
Cutler .....	175	50
Sedalia .....	400	50
Moran .....	250	35
Irvington .....	800	150
Middle Fork .....	70	20
Michigantown .....	600	65
Kirkland .....	750	150
Hillsburg .....	200	40
Sirclesville .....	200	40
Forest .....	500	60
Line north of Forest .....		20
Russiaville .....	800	125
New London .....	140	35
Line west of Russiaville .....		5
West Middletown .....	150	30
Alto .....	75	15
Center .....	250	50
Hemlock .....	250	50
Nevada .....	75	15
Other lines from Kokomo .....		36
Greentown .....	1,100	175
Swayzee .....	1,000	125
Converse .....	1,200	200
Amboy .....	600	90
Point Isabel .....	150	30
Herbst .....	100	25
Other lines from Swayzee .....		12
Total .....	10,535	1823

either in process of construction or "proposed." The word "proposed" as used here means that practically all contract and franchise arrangements have been made and that the lines are but awaiting the coming of the construction crews. An accompanying table gives the names of the small cities interconnected, with their populations, the column headed "Customers" including the farmers who are connected up along the line.

An enumeration of the principal features of the con-



"THE LITTLE FRAME COTTAGE" WITH ITS INDIVIDUAL STEP-DOWN TRANSFORMER

"THE BIG BRICK HOUSE" WITH ITS ELECTRIC PUMPHOUSE IN THE BACK YARD

FIGS. 1 AND 2—BRINGING ELECTRIC SERVICE TO THE FARMER IN CENTRAL INDIANA

tract under which this business is secured will be of interest as showing how the farmers and the company are working together. A minimum of five customers are required for each mile of new extension. The cost of the line complete is guaranteed not to exceed \$300 a mile,

tracts within a distance of a mile and one of these customers desires to use a 1-hp motor, the basis of settlement will be seven customers per mile, or \$43 each. Rates for service are 12 cents a kw-hr., subject to a 10 per cent discount for prompt payment, with a minimum

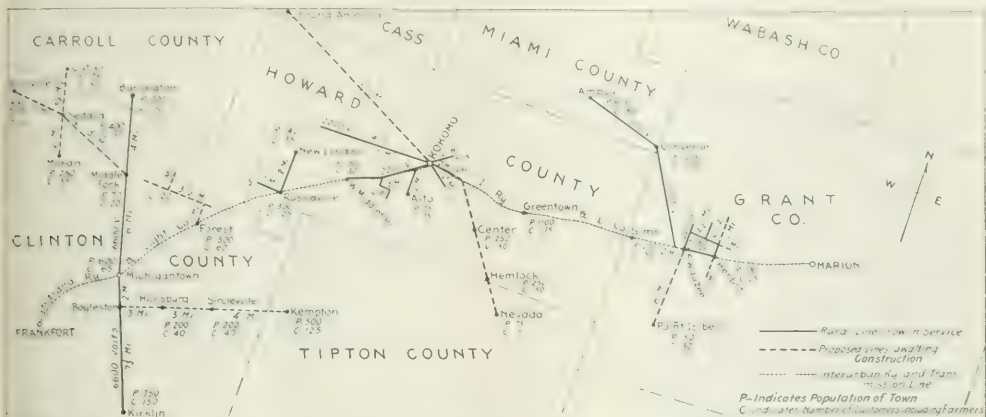


FIG. 3—MAP SHOWING EXTENSIONS OF ELECTRIC SERVICE TO FARMS AND SMALL TOWNS OVER THE LINES OF THE INDIANA RAILWAYS & LIGHT COMPANY

the company agreeing to pay all additional expense over and above this amount. Each customer must promise to pay his proportion of the cost of the line immediately upon its completion. The company collects no charges for electricity from any customer until his interest in the line is repaid in full; or, in other words, the company first earns the value of the line in service rendered to the customer before any energy charges are made. In case other customers wish connections before the line is fully earned by the company, each is required to pay his proportion to the charter members before service will be rendered. Any customer desiring to use a motor of 1-hp rating or larger is counted as two customers but is required to pay only as one customer. If, for example, six customers have signed con-

of \$1 a month for all, except customers who have motors of 1-hp rating or larger. In the latter case the regular motor rate of 5 cents per kw-hr. prevails, with a minimum of \$1 per hp per month.

#### Details of Line Construction

Line construction for this type of rural service has not yet been standardized, some of the rural lines being operated at 11,000 volts, some at 6600 volts and some at 2200 volts, with the latter two pressures predominating. In general, however, all lines are single-phase and are carried on cedar and cypress poles spaced thirty to the mile, porcelain insulators being used almost exclusively. Where two customers are within ten spans of each other they are served from the secondaries of a



RURAL-SERVICE LINE ON INTER-URBAN RAILWAY SIGNAL-WIRE CROSS-ARMS

WHERE THE 2200-VOLT LINE LEAVES THE RAILROAD RIGHT-OF-WAY

CORNER POLE IN A CROSS-ROADS VILLAGE SERVED WITH ELECTRICITY

TYPICAL CUSTOMERS' SERVICE FROM RURAL DISTRIBUTION LINE

FIGS. 4 TO 7—BRINGING ELECTRIC SERVICE TO THE FARMERS IN CENTRAL INDIANA



single transformer; otherwise a single transformer feeding to a drop of No. 10 copper is used for each service. A table herewith shows the estimated cost of 6600-volt line construction on the line between Michigantown and Burlington, which are approximately 10 miles apart. Some of the types of customers' services are also shown in the accompanying illustrations.

Of the rural customer it may be said with truth that the external appearance of his house gives slight indication as to his availability as a "prospect." Along the lines of the company transformers are to be found in front of both little frame cottages and big brick farm-houses, and at many of the latter special pumping sta-

TABLE II—ESTIMATE OF COST OF 10-MILE TRANSMISSION LINE, MICHIGANTOWN TO BURLINGTON, IND.

296 steel poles, at \$4.05.....	\$1,194.00
63,300 ft., or 11,970 lb., No. 4 hard-drawn copper wire at \$0.17.....	2,034.90
91,800 ft., or 11,680 lb., No. 6 hard-drawn copper wire at \$0.17.....	1,980.60
325 3-ft. cross-arms, at \$0.35.....	103.00
975 insulators, at \$0.04.....	39.00
30 lightning arresters, at \$6.25.....	187.50
592 braces, at \$0.05.....	29.60
Bolts and lag screws.....	15.00
10 1-kw transformers, at \$20.75.....	207.50
25 meters, at \$5.75.....	143.75
One-half transformer station in Michigantown.....	375.00
Transformer station at Burlington.....	225.00
Labor, approximately \$45 per mile.....	441.00
Total cost.....	\$6,975.85
By using cypress poles and No. 6 hard-drawn copper all the way this estimate can be reduced by.....	1,150.00
Or a total of.....	\$5,825.85

tions have been built in the rear to supply water to the house and barn. But the farmer who lives in the little frame cottage can also afford electric lights, as one of the illustrations herewith shows.

Those who have been closely identified with the rural electric-service work of the Indiana Railways & Light Company near Kokomo, Ind., are Mr. T. C. McReynolds, secretary, treasurer and general manager; Mr. P. H. Palmer, engineer of construction, and Mr. O. M. Booher, contract agent.

### Salt Lake City Employees Get Half Rate

The Utah Light & Railway Company has granted its employees a 50 per cent discount from its regular cooking rate so that hereafter the company's staff may enjoy a rate of 2 cents per kw-hr., subject to 10 per cent discount for prompt payment. The minimum charge will be \$1 per month for all electrical energy used for heating and cooking purposes.

Employees of the Salt Lake company have enjoyed a half rate for lighting for several years. Announcement was also made Aug. 1 that electric heating and cooking appliances would be sold to employees at a price just enough above cost to cover the expense of handling. Mr. Joseph S. Wells, general manager of the company, in announcing the special rates explained that they are granted to employees for the purpose of encouraging and stimulating the use of electricity.

### Fifty Thousand Electric Irons in Use in Detroit

The electric-appliance department of the Edison Illuminating Company, Detroit, Mich., reports that it sells electric flatirons faster than any other appliance. Toasters are the next in popularity. Since the first of April the entire city has been canvassed five times by the company's salesmen. It is estimated that there are now about 50,000 electric flatirons in use in Detroit.

### Central-Station Advertising in Motion-Picture Shows

The light and power department of the Fort Wayne & Northern Indiana Traction Company is now advertising electric service at Fort Wayne by attaching motion pictures directly to the end of regular reels used in the theaters about the city. These advertising film inserts were taken especially for the purpose and show outside views of the company's reconstructed power house, interior views of the turbine room, the switching gallery and one of the traveling cranes. Being attached to the regular films and thrown on the screen without interruption, following the regular pictures, the scenes are received by the public without the resentment generally found where advertising slides are shown. In addition, they are intrinsically interesting. Mr. M. V. Stagg, under whose direction this work has been carried out, says that the company expects a fair return from this general publicity.

### Electric Truck for Delivering Appliances in Cincinnati

The "appliance company" operated by the Union Gas & Electric Company, Cincinnati, Ohio, has recently placed in operation a 1000-lb. electric truck to be used exclusively in the delivery of electrical appliances.

Mr. P. H. Kemble, manager of the electric commercial department, under which the appliance company is



CINCINNATI'S NEW ELECTRIC TRUCK FOR USE IN DELIVERING ELECTRICAL APPLIANCES

operated, has made a study of the costs of various methods of delivery of electrical appliances, including street cars, horses and wagons, and motor cycles. As the result of his investigations he has recommended this truck, which it is believed will take care of deliveries in Cincinnati and its suburbs, as well as Covington, Newport and several towns on the Kentucky side of the Ohio River served by the appliance company.

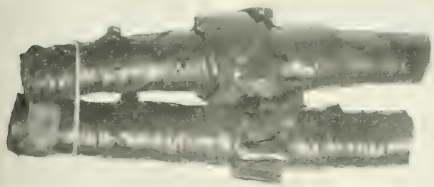
The truck, which was manufactured by the Walker Electric Vehicle Company, is equipped with forty-two Philadelphia lead cells and a single series-wound 60/80-volt, 32-amp motor. It is designed for a speed of 14 miles to 15 miles an hour and will run 50 miles to 60 miles on a single battery charge. A feature of this truck is that it is equipped with a motor ordinarily used on a 1-ton truck, which will enable it to pull a maximum load up Cincinnati's hills with a relatively low energy consumption.

# Illumination and Wiring

## Deterioration in Cable Joints

BY WILLIAM A. KEATING

The accompanying illustration shows how deterioration takes place in a high-tension aerial-cable joint previous to actual breakdown. This joint was in an 11,000-volt, three-phase cable suspended on a railroad bridge. The joint was made in 1911, and was covered with varnished-cloth insulation and inclosed in a compound-filled iron sleeve with a vent pipe at the top. Its location on the bridge exposed it to the direct rays of the sun for the greater part of the day. The heat thus



DETERIORATION IN AN 11,000-VOLT CABLE PRIOR TO BREAKDOWN

generated caused the compound to liquefy and to ooze out through the vent pipe, until by the time the joint was removed, which was last spring, nearly half the compound was gone.

The charred insulation lay directly below the opening of the vent pipe. No trouble had ever been experienced with this cable, and its ultimate removal was caused by the rebuilding of the bridge.

The foregoing instance indicates the advisability of re-making aerial joints periodically. While the iron-sleeve type of joint is no longer used, the dry, lead-sleeve type has been found to show deterioration of the outer four or five layers of insulation after about five years of service.

## Ornamental Lamp Standards for Washington, D. C.

The city of Washington, D. C., is at the present time engaged in the completion of an installation of approximately 450 125-cp incandescent street lamps in its "downtown" or business section. The type of lamp now installed has been adopted by the city authorities as standard for incandescent lighting, and the present installation will replace a few old-style arc lamps and a large number of gas lamps.

Fig. 1 herewith shows the type of post which is being used for this installation. It is quite similar to those previously installed in the capital, excepting that the ornamental acorn top has been omitted. The same illustration shows that portion of the pole which is placed underground and the method of extending the wires up the pole. For a long time efforts have been made to do away with the acorn top, and in the present installation this was made possible by designing a receptacle for the bulb, in the form of a straight pipe which is attached to the top of the pole and extends midway of the globe. The simple globe without any ornamentation also presents a better appearance, and it is believed that the absence of the cast-iron top will prove most desirable.

The appropriation by Congress making available a fund for these new lamps will expire with the present fiscal year, and all of the new lights, it is believed, will be burning by that time. The District's electrical engineer, Mr. W. C. Allen, announces that a large num-

ber of additional lamps will be erected during the next fiscal year. Plans for this new installation are now being prepared, but will not be definitely decided upon until some time in the fall.

The new posts are 10 ft. 3 in. high, measured from the ground to the center of the globe. In some sections, as in front of the White House and on Pennsylvania Avenue, the posts are 12 ft. high. Alba globes are



FIGS. 1 AND 2—WASHINGTON POST AND METHOD OF INSTALLING

used, with 14-in. balls on the smaller posts and 16-in. balls on the larger ones.

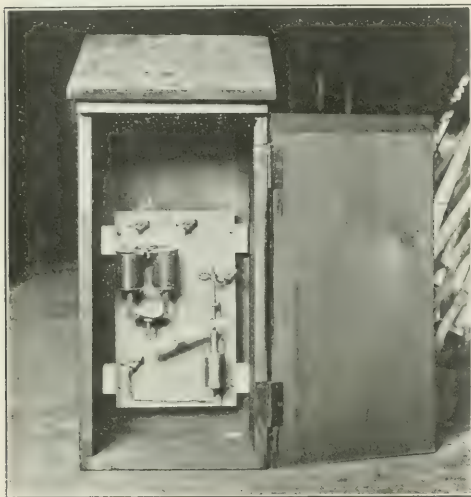
Fig. 2 shows the unique method used for providing cable connections to the lamps. A trench about 8 in. deep and 6 in. wide is dug just inside and alongside the curbing. In this trench the cable is laid and on top of the cable is placed a narrow strip of board, about 3 in. in width, which serves as a protection to the cable. No hand-holes are necessary, as the cable is run directly up the pole without splicing. At street and alley crossings one-way conduit is used. This method has proved to be very economical as well as satisfactory.

## Automatic Switch for Controlling Outlying Lamp Circuits

Some thirty of the automatic switches shown herewith, which were designed by Mr. J. A. Keniston, of the Cumberland County Power & Light Company, Portland, Maine, are now in service controlling lamp circuits on the company's lines. The switch proper consists of a pair of solenoids whose cores are attached with a lead sinker to a common cross-bar, the latter being connected by a short rod to a lever at the outer end of which is a vertical rod with a flexible wire at the top and a piston at the bottom. The piston is free to move up and down with the rod through a fiber washer at the top of a brass cylinder about one-third full of mercury covered by about 0.5 in. of oil. The solenoids are connected in series with the usual 6.6-amp street-lighting circuit, so that when the latter is thrown into operation at the station the plungers are drawn into the cores, removing the lever and making a contact in the cylinder between the mercury and the piston. The solenoid



coils were taken from an old General Electric arc lamp. The cylinder is 2 in. long and 1 in. in diameter. The lever is of fiber, 6 in. long, and all joints are made extra large to permit free play. In actual service these switches control from one to 120 lamps, according to location, and they are of particular value in parks and other places remote from the nearest substation. On tests, one of these switches has broken a current of 130 amp at 220 volts without damage. Many of the cluster-lamp switches in the Portland display-lighting installation are controlled by switches of this type, mounted in boxes hung on the back of a cross-arm by transformer lugs. Experience has shown the importance of drilling the mercury cylinder out of a single piece of brass, in order to avoid leakage of mercury through joints. The company now makes up these



SERIES SWITCH FOR CONTROLLING OUTLYING LAMP CIRCUITS

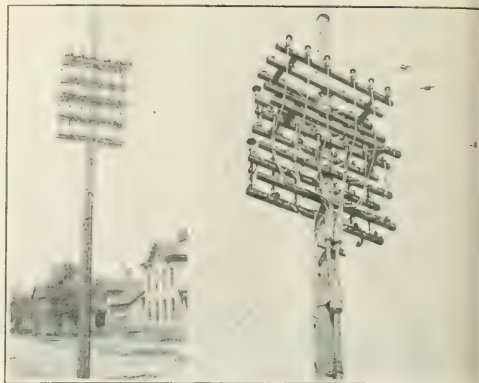
switches in its own shops for local service, and the cost per switch does not exceed \$10. The device is not patented.

### A Well-Built Terminal Pole

After traversing the "underground district" of Peoria, Ill., in conduit, the local series arc-lamp circuits begin their aerial travels from terminal poles designed for maximum neatness and strength. One of these poles, shown herewith, is typical.

From the conduit the lead-covered cable rises in an iron pipe along the face of the pole to a point a few feet beneath the lower cross-arm, the exit being sealed. Just above this point the circuits are divided into two groups each of which emerges from a separate pot-head. From these group pot-heads one set of conductors is led to each side of the pole, individual pot-heads sealing off the exit of each separate circuit. The systematic arrangement of the individual pot-heads on the cross-arms and the symmetrical disposal of the lead-covered cables leading to them give the pole a neat and workmanlike appearance.

Each of the six arc-lamp circuits radiating from this pole is equipped with a lightning arrester of the compression type. These arresters are mounted on the opposite side of the double arms from the pot-heads.



FIGS. 1 AND 2—A WELL-BUILT TERMINAL POLE

Correct alignment with proper anchoring makes the construction substantial and gives assurance of permanence.

### Railway-Station Platform Lighting

Almost without exception the platforms of the older type of railway stations in cities of medium size might well bear improvement in the method of their illumination. However, an installation recently completed in the new station of the Pennsylvania Railroad Company at Fort Wayne, Ind., is a decided improvement along this line—an effort having been made to prevent the light rays from the lamp itself from falling directly upon the eye.

As will be seen from the two-lamp posts shown below of which there are twenty-four placed in four groups of six each at the ends of the two platforms, the shades are open at the bottom but conceal the filaments of the 25-watt lamps from persons standing on the platform. A single row of eighteen similar fixtures equipped with 25-watt lamps has been used to light the shelter house and open train sheds on the platforms. Tracks and passenger platforms at this point are elevated about 20 ft above the street level, and the concrete stairways which lead to the station proper are illuminated with tungsten lamps in diffusing bowls. Throughout the entire station all light sources have been inclosed and naked filaments are everywhere concealed.



FIGS. 1 AND 2—RAILWAY-PLATFORM LIGHTING, FORT WAYNE, IND.

### Lighting Fixtures with Staff Ornamentation

An appearance of well-to-do ease, dignity and comfort, coupled with economy in lighting expenditure, has been achieved in the lobby of the new Hotel Stowell, Los Angeles, Cal., through the use of modern tile in combination with mosaic and staff, and an original treatment of the lighting fixtures.

The architects, Messrs. Frederick Noonan and William Richards, of Los Angeles, having determined upon staff decoration of capitals and panels, considered it logical to extend the same treatment to the lighting fixtures, which, architecturally speaking, are ornamental units pendent from the ceiling.

The original conceptions embodied in the fixture are apparent in the illustration. The lower ornamental band just above the translucent glass segments conceals a horizontal septum with curved reflecting surfaces above and below. Lamps extend radially from the stem, immediately above and below the septum, and the light of the upper lamps is distributed vertically and horizontally by the plaster-reflecting surface above. The gallery or mezzanine floor shown also imposed the restriction of providing for its illumination and at the same time concealing from this view-

in. from the ceiling, and the top of the reflector is 3 ft. 6 in. from the ceiling. A panel near each end of the lobby is equipped with a stained-glass skylight, which transmits sunlight from the light court above. Lamps are set above the glass, around the panel, in such a way that they cast no shadow during the day and yet give good lighting through the glass at night. These glass panels carry ornamental fixtures, like the others, but normally their lamps are not operated.

The feature of the installation, as already pointed out, lies in its demonstration of the handsome effects which can be produced at very low cost by skillful and harmonious treatment of ceiling and fixtures in staff, a combination which is particularly suitable for the production of fine polychrome effects.

### "White Way" for Boston Retail District

An installation of "white way" lighting will shortly be made in the Scollay Square-Tremont Row district of Boston, a contract having been made with the Somerset Company, Inc., for the lighting of the retail section between Pemberton Square and Somerset Street by magnetite lamps of the ornamental type. The district has been losing prestige which it is trying to regain.



LOBBY OF THE NEW HOTEL STOWELL, LOS ANGELES

point the illuminants and all mechanism. The solution was worked out in the dimensions of the reflecting surfaces and ornaments.

The vertical members produce upon the eye the pleasing effect of carrying the mass from the reflector to the ceiling—the fixture would look insufficiently supported if carried on only one central spindle. The main reflector and ornament above are made of a metal-reinforced plaster mix, the supports hooking into the metal reinforcements. The main reflector receives the light of four 60-watt tungsten units. Direct downward illumination is given from three 40-watt tungsten lamps mounted between the lower reflecting surface of the septum and the inclosing segments of ground glass. The glass is supported by metal bands with the staff ornament wired on. The mezzanine floor obtains direct lighting from the fixtures, which duplicate the lower part of the lobby type. The lanterns on pillars and chandeliers, of staff on metal, harmonize in their octagonal design and ornamentation with the octagonal columns and ceiling fixtures. Each is equipped with one 40-watt tungsten lamp. The lanterns are kept lighted through the day for ornamental effect.

The ceiling panels, each containing one of the main fixtures, measure 20 ft. by 20 ft. and are 16 ft. above the ceiling. The lowest point of the fixture is 5 ft. 6

## Letters to the Editors

### A Chance for Comparative Data

To the Editors of the *Electrical World*:

SIRS:—In commenting on the Alton (Ill.) station of the East St. Louis Light & Power Company, described in the *Electrical World* of Aug. 15, 1914, the writer of your editorial omitted mention of what seems to me a very important feature of this station, namely, the possibility here presented for securing in actual practice data concerning the comparative cost of energy purchased at wholesale from a distant hydroelectric plant and energy generated in a modern steam station equipped with ample apparatus for testing. Surely the central-station company operating this property has not overlooked this opportunity, and at a future date, when the station has been in operation for a sufficient period, the presentation of such data would be not only interesting but highly instructive.

Chicago.

J. S. MITCHELL.

### Universal Electric-Vehicle Charging

To the Editors of the *Electrical World*:

SIRS:—Referring to your editorial calling attention to the need for more charging plugs for electric vehicles and trucks (*Electrical World*, June 27, page 1469), why not build vehicle motors with two commutators? With such an arrangement and with the motor provided with a commutating switch and a clutch to disconnect it from the shaft when not driving the car, could not the battery be charged through its own motor from any 110-volt direct-current source?

Chicago, Ill.

L. E. GOULD.

[Carrying our correspondent's idea a step further, the windings of the vehicle-motor armature might also be brought out to slip-rings, thus enabling the machine to act as a converter to furnish direct-current energy to its battery from any alternating-current source. A shunt-field winding would, of course, have to be added, and this could be energized by the vehicle battery.—EDS.]



# Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

## Combination Gas-Engine and Steam Generating Sets for Ford Factory

In the combination gas-engine and steam plant being built for the Ford Motor Company at Highland Park, Detroit, Mich., each generating set will consist of a two-cylinder tandem gas engine and a compound tandem condensing steam engine connected to a single shaft in a manner similar to that used in a cross-compound steam engine. A 3750-kw electric generator will be connected direct to the engine shaft. Each engine will be capable of developing 6000 brake-hp.

It is claimed that this combination "gasteam" engine, as it is called, will give the economy of a gas engine and the reliability of a steam engine. As a gas engine operates most efficiently when fully loaded, the set will be so designed that the gas side will always be working at full load. Except for overspeeding, there will be no governing on the gas side, all governing otherwise being done on the steam side. In case of trouble on the gas side, the steam side, it is declared, will be able to pull the entire load with a late steam cut-off.

The two gas cylinders of the engine will be of the four-cycle, double-acting type and will be water-cooled. Each cylinder will be 42 in. in diameter and will have a stroke of 72 in. The tandem compound condensing unit will have a high-pressure cylinder 36 in. in diameter and a low-pressure cylinder 68 in. in diameter and will operate with a stroke of 72 in. The low-pressure cylinder will be connected to a surface condenser, which in turn will be placed in a closed heater. The vacuum will be regulated to correspond to atmospheric temperatures. During the winter months the vacuum will be reduced to about 18 in. The entire amount of circulating water will be pumped through all the factory buildings, which are heated by hot water.

Superheated steam will be used with a pressure of 175 lb., and the high-pressure cylinder will be equipped with poppet valves, while Corliss valves will be employed on the low-pressure cylinder. The exhaust from the gas engine will be conducted into a steam superheater placed in the steam line between the high-pressure and the low-pressure steam cylinders, thus utilizing waste gases for reheating the high-pressure exhaust steam. Part of the exhaust gases will be shunted through the jacket of the high-pressure steam cylinder, which accordingly will eliminate any steam-heat loss in that cylinder. The exhaust gases will then be conducted to the boiler-feed water heater and will heat all the feed water required for the steam boilers. Feed water for the heater will be secured from the water used for cooling purposes in the gas-cylinder jackets, where it will be brought up to temperatures of from 150 deg. Fahr. to 180 deg. Fahr. This water will finally be raised to a temperature of about 250 deg. by means of the exhaust gases as previously mentioned.

The Hoovens, Owens, Rentschler Company, Hamilton, Ohio, is the manufacturer of these combination gas-engine and steam sets. The electric generators were made by the Crocker-Wheeler Company, Ampere, N. J.

## Apparatus for Operating 11,000-Volt and 13,200-Volt Equipment in Parallel

To facilitate parallel operation of the 11,000-volt equipment in the generating station at Camden, N. J., with the rest of its electric-service system, which operates at 13,200 volts, the Public Service Electric Company of New Jersey employs auto-transformers whose voltage ratios can be changed by an ingeniously designed remote-controlled switch. By varying the transformation ratio of these transformers it is possible to compensate for voltage drop between stations as well as to regulate the load carried by each.

Three auto-transformers each having thirteen taps are arranged as shown in the accompanying diagram. The units are connected in star; the eleven end-taps

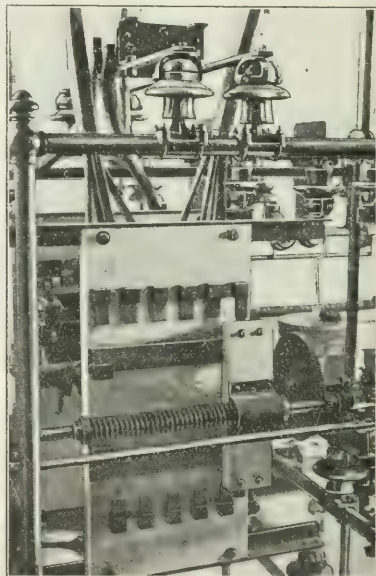


FIG. 1—ONE OF THE SLIDING CONTACT PANELS

from each are joined with as many contacts on three distinct marble panels, while the intermediate tap from each transformer are connected with the 11,000-volt buses.

The switching equipment consists of the marble contact panels (previously mentioned) arranged in single vertical plane in front of which is a sectioned threaded rod carrying three sliding contact block. Operated in conjunction with each panel are four circuit-breakers actuated by the screw rod. The auxiliary apparatus consists of travel-limit switches, a motor for turning the screw rod, and switches installed remote from the apparatus to control the sliding-contact switch.

The motor is connected with the screw rod by means

of sprocket wheels and a chain. The rod is divided into three sections by insulated-disk couplings. Geared to each section is an auxiliary rod operating the circuit-breakers referred to before. The stationary contacts on each panel are staggered as shown in the illustration and connection is made between any one of

and reversing switch. As soon as the motor starts, the control switch is opened and the motor continues to run until the current is interrupted by half-circle slip-rings on the motor shaft. These rings are placed so that the contact-finger blocks will stop directly over the lips. When the motor circuit is opened by these

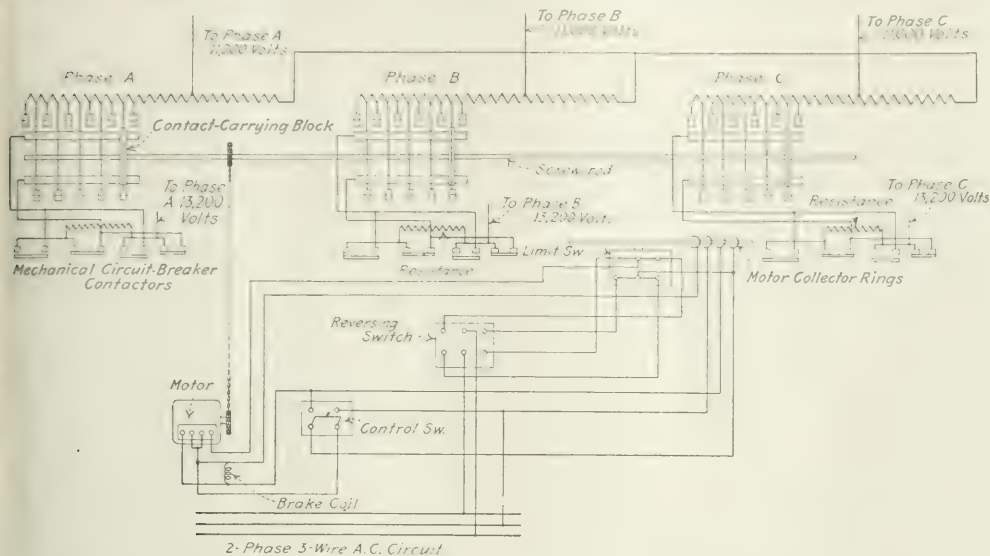


FIG. 2—CONNECTION OF APPARATUS FOR PARALLELING 11,000-VOLT AND 13,000-VOLT EQUIPMENT

them and the same phase of the 13,200-volt bus by two sliding contacts fastened to a marble block attached to the screw rod.

In changing the connection from one contact to another it is desirable to prevent interruption to service and still not short-circuit any turns in the auto-transformers. This is accomplished by arranging the stationary contacts or lips so that one sliding contact will remain in contact with a lip until the other contact engages with the next consecutive lip. The sliding con-

tacts a magnetic brake is applied to stop further movement due to inertia. The switch can be operated by hand by disconnecting a clutch between the motor and the screw rod.

### Testing Large Transformers Without Loading

Please describe an economical method of determining the efficiency of a large step-down transformer.

H. L. T.

Data for plotting the efficiency curve of a transformer may be obtained without connecting the rated full load to the unit's secondary terminals, by determining the iron and copper losses as follows: The iron losses are obtained by energizing either the high-tension or the low-tension winding at normal voltage and frequency and measuring the power input into it with the other or secondary winding left open. This iron loss remains practically constant for all loads. The resistance or copper losses are determined by applying a relatively low voltage to the high-tension winding, the low-tension winding being meanwhile short-circuited, and gradually raising the pressure until full-load current flows in the high-tension circuit. By measuring the power input and current in each circuit for each change in the impressed voltage it is possible to determine total resistance losses with different current values. The power input consists of the resistance losses plus the core loss corresponding to the reduced voltage, but as the latter is only a small fraction of the pressure normally applied to the primary terminals the wattmeter readings may be assumed to give the resistance losses only. The efficiency at various loads may then be computed from the losses at the current values corresponding to those loads, remembering that the efficiency is equal to the output in watts divided by the output plus the iron and copper losses also expressed in watts.

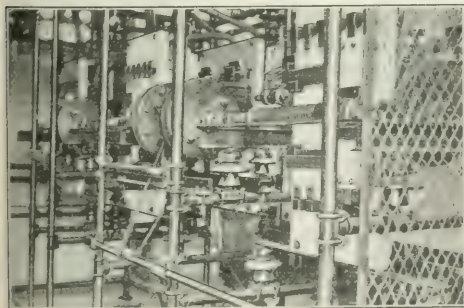


FIG. 3—TRANSFORMATION-RATIO CHANGING SWITCH

tacts are connected by a resistance during the transition, this being accomplished by the circuit-breakers indicated in the wiring diagram. When a contact finger is squarely over a lip the resistance is shunted and direct connection is made between the lip and its respective 13,200-volt bus.

The motor operating the transformation-ratio-changing switch is started by closing both the control



# Digest of Current Electrical Literature

## Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

### Generators, Motors and Transformers

**Equalizing Connections on Compound Direct-Current Generators.**—E. P. HILL.—A frequent source of trouble, and even of serious damage, to expensive electrical plants lies in the incorrect knowledge of the function and position of equalizing connections. The usual switchboard equipment consists of a double-pole switch and a single-pole circuit-breaker, together with the usual meters, etc., for each machine. Should, in the existing plant, the equalizer main be on the positive side, it is frequently found that the circuit-breaker is arranged in the new plant on the positive side, and trouble will develop from the following causes. Referring to Fig. 1, if for any reason the circuit-breaker operates,

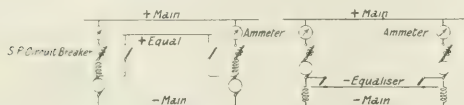


FIG. 1 — EQUALIZER WRONGLY CONNECTED

FIG. 2 — EQUALIZER RIGHTLY CONNECTED

the other machine will still be capable of receiving power through the equalizer main. The second trouble which arises in this respect is that the ammeter is usually connected in the same main as the circuit-breaker. The result is that, since the equalizer is on the same side, the ammeters are equalized independently of the actual loads on the various machines in parallel. The rule to be observed (Fig. 2) is that ammeters and circuit-breakers (if single-pole) must be connected up in the opposite polarity from that of the equalizer main, or their functions become useless when parallel running is attempted.—*London Elec. Eng'g*, Aug. 20, 1914.

**Alternating Electromotive Forces in Parallel.**—A. E. CLAYTON.—A mathematical paper on the subdivisions of the current between alternators in parallel and transformers in parallel. The author points out that by the aid of the symbolic method due to Steinmetz problems connected with the parallel operation of sources of alternating currents can be solved as readily as similar problems connected with continuous currents. In the method given the equations deduced in their general terms would hold good for both continuous and alternating currents. The whole method is based upon sine functions, although if necessary with non-sinusoidal emfs each harmonic can be considered separately.—*London Electrician*, Aug. 14, 1914.

**Polyphase Induction Motor.**—H. KAFKA.—An article, illustrated by diagrams, in which the author shows how to get from the ordinary Heyland diagram the exact circular diagram for the polyphase induction motor, taking into consideration the primary resistance and the iron losses.—*Elek. u. Masch.* (Vienna), July 12, 1914.

### Generation, Transmission and Distribution

**Hydroelectric Stations in Norway.**—The list of large industrial ventures based upon a continued exploitation of Norway's water-power is steadily increasing. Thus a large power station with a rating of some 50,000 hp is being laid out at Folla River, an auxiliary to the

Surna; in the Surendale. The building of another hydroelectric power station has just been decided upon, the cost of exploitation and transmission amounting to about \$975,000. The power will be derived from the Høgfoss Falls and will amount to some 25,000 hp, which is to be transmitted to the town of Tisør, a distance of about 30 miles. The Arendal Water-Power Company, which is already in operation, is to be greatly extended, at an outlay of \$1,200,000, and the Bjølvo falls are to be developed. A Norwegian journal of some standing has recently given expression to some apprehension of an overproduction of hydroelectric power stations, more especially as far as the electrochemical industry is concerned. Only a few years ago it was difficult to find uses for ratings of 5000 hp to 10,000 hp in this industry, but such ratings no longer count for anything. Now the installations and projected schemes comprise ratings of 50,000 hp, or even several hundred thousand horse-power, in Norway, Italy, Spain, Savoy, Canada and even Iceland. As far as Norway goes, not only are the installations already in operation at Rjukan, Tysse, Arendal, etc., being extended, and that on a large scale, but schemes are being proposed at Sande, Matre, Tyin, Aura, Take, Lysefjord, Bøve, Høvangen, Osa, Glomfjord, etc. If, say, only half of the projects just enumerated are completed within the next few years, the question presents itself as to where all this power shall be applied. The old or original electrochemical products—aluminum, carbide, ferro-alloys—all have limited areas of consumption, which no doubt grow every year, but even a small overproduction leads immediately to a decline of prices, and to business crises. Such have already arisen twice during the comparatively short span of the fifteen or twenty years which have passed since these manufacturers commenced operation, and experts are already prophesying a third crisis, with ruinous prices below the cost of production, as being near at hand. During the former crisis at least two Norwegian carbide factories had to stop. The losses were heavy, as the factories had to be sold for a song. On the other hand, the opinion is often expressed that the new atmospheric nitrogen-fixation industries—making artificial fertilizers—have an unlimited scope for the sale of their products. But this view must be accepted with considerable reserve. On the market for artificial fertilizers the consequences of overproduction are already felt. The quotation for Chile saltpeter dropped from \$2.63 at the beginning of March to \$2.39 on May 1, the market having been unable to receive the offered quantities of Chile saltpeter and artificial fertilizers. No does the position of sulphate of ammonia offer any encouragement, as German reports show.—*London Eng'g*, July 3, 1914.

**Conveying Plant in Iron Works.**—An illustrated article on the conveying plant of the Trzynietz iron works of the Austrian Mining & Iron Works Company. The use of aerial tramways for conveying coke from the ovens to the furnaces, for loading, removing and piling blast-furnace slag and for loading the pig iron is described.—*London Electrician*, Aug. 14, 1914.

**Speed Regulation.**—E. BLAU.—An article, illustrated by diagrams, on the regulation of the speed of large

three-phase motors in mines and metallurgical plants without regulation losses.—*Elek. u. Masch.* (Vienna), July 12 and 19, 1914.

#### Installations, Systems and Appliances

**Electricity Supply in Great Britain.**—A. H. SEABROOK.—The conclusion of his review of the development of electricity supply in Great Britain. In the present instalment the author deals with electric heating and cooking and with the endeavors now being made for the co-operation of British electricity supply stations with other industries.—*Elek. Zeit.*, July 23, 1914.

**Outside Substations.**—W. E. MITCHELL.—A profusely illustrated description, with detailed drawings, of the outdoor substations of the Alabama Power Company.—*Elek. Zeit.*, July 9 and 16, 1914.

**Switchgear for Phase Advancers.**—CHARLES C. GARRARD.—An article, illustrated by diagrams, describing the connections employed in switchgear for phase advancers. The author first deals with Kapp's phase advancer or vibrator and then with rotary phase advancers.—*London Electrician*, July 24, 1914.

**Induction Motor Operation at Abnormal Frequency.**—At the Mureaux plant a certain number of induction motors designed for 220 volts and fifty cycles will have to be operated at 220 volts but at a frequency of forty-one and two-thirds cycles. The author discusses how an abnormal frequency reacts on efficiency, power-factor, no-load current, etc. It is shown to be possible to operate a fifty-cycle motor from a forty-two-cycle network. The diminution of speed can be remedied by a change in the gearing.—*L'Industrie Elec.*, April 10, 1914; abstracted in *La Revue Elec.*, July 17, 1914.

#### Wires, Wiring and Conduits

**Fuses for Alternating-Current Circuits.**—K. FAURE.—The fundamental equation determining the operation of a fuse states that the energy supplied to the fuse in a certain time is partly used for raising the temperature of the fuse and partly lost by radiation, conduction and convection. The energy supplied equals  $Cdt + Atd\delta$ , where  $C$  is the heat capacity of the fuse in calories per deg. C.,  $t$  the temperature difference in deg. C. between the fuse and the surroundings,  $\delta$  the time in seconds, and  $A$  the capacity of the fuse for giving off heat to the surroundings in calories per second per deg. C. The ratio  $T$  of  $C$  to  $A$  has the dimension of time and is called the "time constant." The author applies the general theory, first, to the case of direct-current fuses and then to the case of alternating-current fuses. Fig. 3 gives five heating curves for an alternating-current fuse. Fig. 4 gives five corresponding heating curves for a direct-current fuse. In both cases the abscissas represent the time and the ordinates the difference of temperature between the fuse and its surroundings. The five different curves in each case refer to time constants of 0, 0.5, 1, 2 and 5 seconds respectively. With direct

current the temperature becomes higher with alternating current than with direct current, a smaller current will suffice to melt the fuse in the case of an alternating-current system than of a direct-current system. The critical current intensity is therefore smaller for alternating current than for direct current. Hence fuses should be rated differently for direct current and for alternating current.—*Elek. u. Masch.* (Vienna), July 26, 1914.



FIG. 4—HEATING CURVES FOR DIRECT-CURRENT FUSE

#### Electrophysics and Magnetism

**Powerful Magnet.**—A COTTON.—An article describing the work which has been done so far on the project of installing a powerful magnet at the University of Paris to permit experiments with fields of 100,000-gauss intensity. The university has granted \$10,000 for the purpose. Weiss and Cotton have proposed the construction of a very large electromagnet of the Weiss type weighing some 200,000 lb. Deslandres and Perot have proposed the construction of various apparatus of smaller size of their own design. The commission is in favor of the first project. The author gives a review of the whole subject of electromagnet design. He first discusses electromagnets without iron core. He examines the form to be given to the coil and the method of winding, and the energy necessary to produce a certain field in the interior. He next discusses means of getting rid of the Joulean heat in the magnet winding. He then takes up the design of an electromagnet with an iron core and refers to the work of P. Weiss, who makes use of ferro-cobalt for the central part of the pole pieces since in this way fields 10 per cent higher than with pure iron can be obtained. He then discusses the problem how to proceed in enlarging a given electromagnet design to one of much larger dimensions. In the second part of the paper details are given of the electromagnet design of Deslandres and Perot and of the electromagnet of Weiss with polar coils. He concludes that a magnet such as wanted by the University of Paris would cost \$40,000, so that the available grant is not yet sufficient.—*Revue Gen. des Sciences*, July 15 and 30, 1914.

#### Units, Measurements and Instruments

**Temperature Scale.**—In the recent annual report of the (British) National Physical Laboratory it is mentioned that much correspondence has passed between this laboratory, the Reichsanstalt and the United States Bureau of Standards with regard to the establishment of a practical scale for measuring of temperature up to, say, 1100 deg. C., and that the three laboratories are in practical agreement with regard to this. The matter was brought before the International Conference on Weights and Measures, sitting at Paris in October last, by Dr. Stratton of the Bureau of Standards and by Sir David Gill, and it appears possible that international agreement as to a scale for practical use may be reached shortly.—*London Electrician*, June 26, 1914.

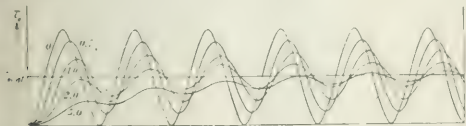


FIG. 3—HEATING CURVES FOR ALTERNATING-CURRENT FUSE

current the temperature of the fuse increases continuously, approaching a final limiting value. With alternating current the temperature fluctuates, although in the average it is constantly increasing, the more quickly the higher the time constant. While in practice the direct-current fuse reaches a final constant temperature, the temperature of the alternating-current fuse oscil-



### Telegraphy, Telephony and Signals

**Automatic Telephone System.**—An illustrated description of the Betulander relay automatic telephone system, which is being demonstrated in an installation in London. In this system no electromechanical devices are used, but connections are made entirely by relays. A special feature of the system is that the relays which select and indicate the idle junction and subscribers' lines, after performing their respective functions, are automatically cut out of circuit and are available immediately for building up other connections.—London *Electrician*, July 10, 1914.

### Miscellaneous

**The War.**—An editorial pointing out that the German electrical and general commercial invasion of England, her colonies and numerous foreign lands has been due to the fact that the Germans made both the price and the quality "right." It will become necessary for Great Britain to manufacture materials heretofore imported from Germany. "That the present embarrassment of the German manufacturer and merchant will redound to the lasting good of the British electrical industry we firmly believe, but the reasons for the presence of the German in the market as now divulged must certainly not be disregarded over here. New methods, better and more accurate machine tools, the forcing up of the output to higher figures and production upon a 'world-market' scale may be mentioned as a few matters which will require the attention of the home manufacturer. We have been set a wonderful example in the science and art of production of every class and size of market throughout the world. Because Germany has been a great rival and a fellow aspirant to imperial, commercial and industrial honors she is not to be despised. Her diplomacy and her naval and military operations may be proved to be grievously at fault, but her achievements in the sciences and arts are undisputed and are worthy of emulation. This success has been largely due to thoroughness. The lesson for the British manufacturer of certain classes of articles, electrical in particular, can be learned now. If we fail to be taught by it, the handicap which the German people appear to have imposed upon themselves will, through our laxity, be removed in time, and opportunity to profit by it will be irretrievably lost."—The commercial and industrial section of London *Electrician*, Aug. 21, 1914.

**Necessity of Making Certain Materials in Great Britain.**—HENRY TINSLEY.—A letter pointing out that the time has come for British manufacturers to make and sell materials equivalent in price and quality to those heretofore made and sold by Germany. "Excellent ebonite, manganin wire and permanent magnets have undoubtedly been obtained from Germany, which it has been impossible to obtain of an equal quality in England, so far. . . . The one essential condition for manufacturers who are willing to launch out in this respect is that they should do their work thoroughly and scientifically, paying every possible attention to the electrical, mechanical and physical properties of what they manufacture. By so doing we might once more regain some of the smaller manufactures we could undoubtedly undertake, and not only produce equally good stuff for home consumption but obtain some of the foreign markets already held by the Germans."—London *Electrician*, Aug. 21, 1914.

**Military Biplane.**—A profusely illustrated description of the military biplane of the Allgemeine Elektrizitäts Gesellschaft. Steel construction does not lead to a higher weight than wood construction. Seamless steel tube construction is largely used with oxy-acetylene welding. Each biplane unit consists of the

biplane and an automobile on which all necessary equipment is carried.—A. E. G. Zeit., June and July, 1914.

**Electrical Exports from Germany.**—Statistical tables showing the exports of electrical goods from Germany to different countries during the first six months of 1914 in comparison with the corresponding period of last year.—London *Elec. Review*, Aug. 21, 1914.

**Tercentenary of Logarithms.**—A long editorial giving an account of the recent Napier tercentenary celebrated in Edinburgh. A full account is given of Lord Moulton's inaugural address, and brief notices are added on the papers presented by J. W. L. Glaisher, G. Vacca, Gibson, Eugene Smith and Cajori.—London *Eng'ing.*, July 31, 1914.

## Book Reviews

**AMERICAN ELECTRICIANS' HANDBOOK.** A Reference Book for Practical Electrical Workers. Compiled by Terrell Croft. New York: McGraw-Hill Book Company, Inc. 712 pages, illus. Price, \$3.

As the name implies, the book treats of American practice and is suited to the use of the electrician, the practical man, as distinguished from the electrical engineer, who has less frequently to carry out the details of construction. None the less it is a volume the electrical engineer may well have available for reference. The first requirements of a good handbook on any subject are that it shall give abundant information in practical form upon the subject it is supposed to cover and that the arrangement of the material and the indexing shall be such that the information may be readily referred to. This book fulfils both of these requirements to a remarkable degree. Numerous cross references in the text add to its general usefulness, the authority for much of the information is given, and the mechanical make-up of the book is in keeping with its other good features. The volume consists of six sections as follows: Fundamentals, generators and motors, outside distribution, interior wiring, transformers, and illumination. If any one of these sections were to be picked out for special comment, it appears to the reviewer that Section II, on the operation and management of electrical machinery, motors and generators, is especially complete and full of information of use to those who install and care for such machinery.

**HANDBOOK OF ELECTRICAL METHODS.** Compiled from the *Electrical World*. 286 pages, illus. New York: McGraw-Hill Book Company, Inc. Price, \$3.

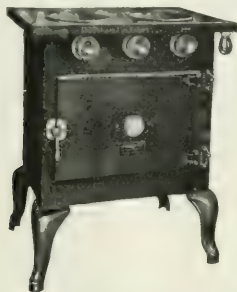
A unique volume in which the construction method and special "kinks" that have appeared from time to time in the *Electrical World* for the last three or four years have been brought together into form for ready reference. Only the methods which it is expected will prove of general use have been included, and these have been classified under the following heads: General notes, line construction and equipment; meters; operation of and changes in circuits; switchboards and power house details; signs, display lighting; special lighting appliances; lamps and lighting circuits; signal-bell connections, etc.; transformers, oil switches and circuit breakers; interior wiring; motors, motor switches, generators, etc. As these headings indicate, all of the more important departments of control, maintenance and operation are treated, and the book should prove of special interest to those in charge of the installation, extension and repairs of distribution systems. The index is complete and the information contained in the book covering any specific subject can be readily found.

# New Apparatus and Appliances

An Illustrated Descriptive Record of Recently Developed  
Manufactured Products of Interest to Electrical Readers

## Electric Range

The range shown in the accompanying illustration is being made by the Rutenber Electric Company, Logansport, Ind. This range is formed of pressed steel and has nickel-plated trimmings. It is equipped with two

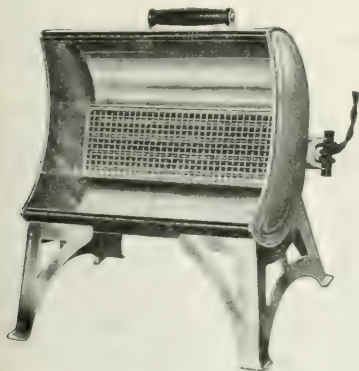


ELECTRICALLY OPERATED RANGE

1.5-in. hot plates, which are controlled by three-point switches. The oven measures 12 in. by 12 in. by 18 in. and is inclosed by insulated walls.

## Luminous Heater

A heater of the glowing-coil-and-reflector type, designed for warming bathrooms, small offices and other small rooms, is shown herewith. The device is rated at 600 watts and can be connected to any lighting socket. It is made of pressed steel and is finished in polished nickel and black lacquer. The heat is thrown outward

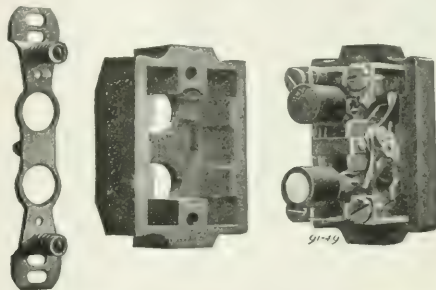


GLOWING-COIL HEATER WITH COPPER REFLECTOR

a polished-copper reflector. The over-all dimensions are 10 in. by 12 in. by 12 in., and the total weight is 4 lb. The heater is equipped with handles so that it can be easily carried from place to place. This "El Radio" heater, as it is called, is being placed on the market by the Hotpoint Electric Heating Company, Ontario, Cal.

## Push-Button Switch

A push-button switch with molded-insulation cover for the mechanism is shown with parts detached in the accompanying illustration. The supporting yoke shown in Fig. 1 is equipped with slots in the recessed ears

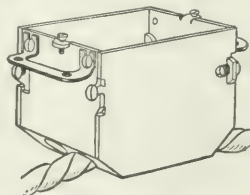


FIGS. 1, 2 AND 3—METAL YOKE, COVER AND MECHANISM

which are provided for any necessary adjustment. Spring-tension nuts for the face-plate screws prevent over-tightening of the screws or buckling of the face plate. The screws which hold the mechanism to the base are staked to a brass strip in a groove on the back of the base before being covered with insulating wax. This is done to prevent loosening of the screws. This switch is being manufactured by the Bryant Electric Company, Bridgeport, Conn.

## Sectional Switchboxes

Cast-iron switchboxes designed for use with non-metallic flexible and rigid conduit are being made by the Chicago Fuse Manufacturing Company, Chicago, Ill. The box shown in the illustration is used particularly in the rewiring of old buildings, as the beveled corners, the manufacturers declare, permit its insertion into small openings in the walls, thus making it easy to fish the ends of flexible conduit into the box. The box is equipped with four knock-outs, and two sides



CAST-IRON SECTIONAL SWITCHBOX

are removable. These sides are fastened to the box by means of a bent lug at one end and a straight lug at the other. A screw passing through the bent lug fits into a notch cut into one end of the box. The straight lug forms a part of the other end of the box; a screw through this lug fits into a pocket in the side piece.



### Electric Conveyor Scales

Scales for weighing bulk material in motion are shown in the illustration herewith. The apparatus consists essentially of a short section of conveyor suspended from scale beams mounted in a heavy steel



BELT-CONVEYOR SCALE AND FRAME

frame. A corresponding length of the unloaded part of the conveyor is suspended from the scale on the opposite side of the fulcrum from the loaded part, so that its weight acts counter to the weight of the loaded part. In this way the tare weight is automatically deducted and the scale is self-balancing.

The operation of this apparatus is based on the principle that the total weight passing a point in a unit of time is proportional to the product of the average weight of a unit length of the stream and the speed of motion. The voltage of a dynamo is maintained proportional to the speed of motion, and the current is

varied with the weight of the part of the conveyor suspended.

The rheostat is controlled by scale beams of the lever and knife-edge type. The counterpoise of the scale is a cylindrical plunger, which is partly floated in mercury. With every change in the weight on the conveyor the plunger instantly adjusts itself to a new position, thereby at the same time changing the level of the mercury. The rheostat consists of double-wound coils connected to contact points in the mercury chamber. As the mercury level rises or falls the resistance changes. The recording instrument may be placed either in a nearby office or close to the scales.

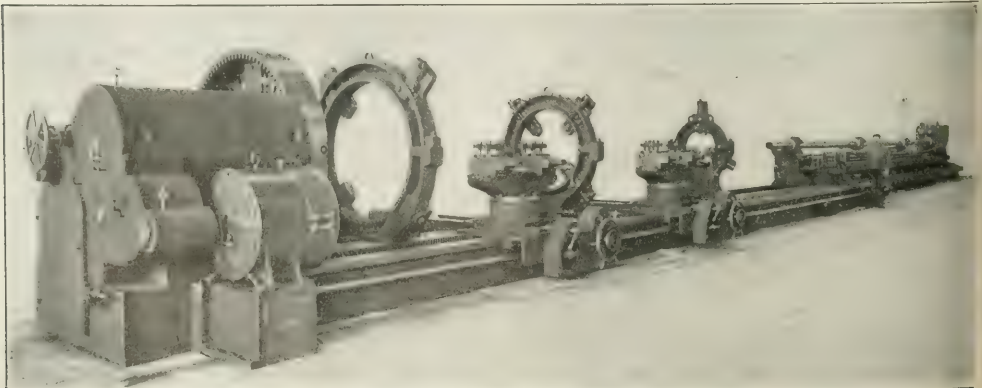
These scales are being made by the Electric Weighing Company, 180 Thirteenth Avenue, New York.

### Large Lathe for Ordnance Manufacture

A 75-in. boring and turning lathe designed for use in the manufacture of 8-in. guns is shown in the accompanying illustration. The lathe is equipped with two carriages, a boring bench and a boring bar, and is driven by a 40-hp direct-current motor. The distance between the face plate and the boring bench is approximately 52 ft. The head-stock is a cored-out box casting 63 in. long on the bed and approximately 54 in. wide. The face plate is 75 in. in diameter and is securely fastened to a steel spindle. The over-all length of the spindle is approximately 67 in. The main bed of the lathe is approximately 73 in. wide across the top and about 64 ft. long. The total length of the bed, including a portion 26 in. wide extending under the boring bench, is approximately 110 ft.

The carriages have bearings on the bed 5 ft. long and are moved by 15-hp motors. The boring bench is 20 in. wide at the top, 24.5 in. deep, and approximately 56 ft. 6 in. long. The boring bar is of forged steel 1 in. in diameter and approximately 57 ft. long. The boring bar and boring bench are also moved by 15-hp motors. The boring bar is driven by a 15-hp motor mounted on the rear bearing and connected to the bar through gears. The machine is equipped with a motor driven pump for supplying the cutting fluid through the boring bar. A 1-hp direct-current motor is used to operate this pump.

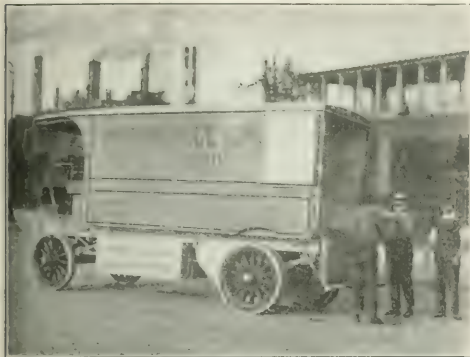
This lathe is one of three machines recently manufactured by Niles, Bement, Pond & Company, New York. All the motors were made by the Diehl Manufacturing Company, Elizabeth, N. J. Cutler-Hammé controllers are used throughout.



LATHE FOR MANUFACTURING 8-IN. GUNS

### Electric Ice Truck

A 3.5-ton electric truck designed for hauling ice long distances in hot climates is shown herewith. The sides, the front and the roof are of double-panel construction, 4 in. thick, cork being packed in between the



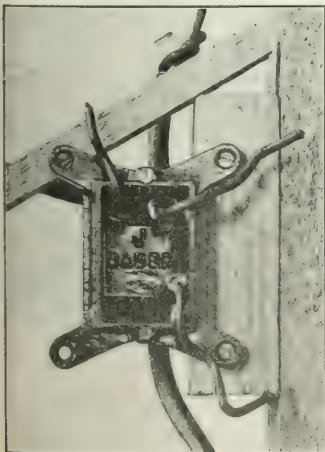
ELECTRIC ICE TRUCK FOR HOT CLIMATES

panels. To withstand the heat from the ground the floor is made 4.5 in. thick and is built in layers. From top to bottom these layers consist of 1 in. of oak planks, 1.75 in. of asphalt composition, 1 in. of cork boards and 0.75 in. of pine boards. The rear doors of the truck are of the refrigerator type. Trap outlets are provided in the bottom of the body to let water out without admitting air. Inside the body are adjustable cross-bars used to hold the ice fast while the truck is moving. The rear step is of the folding type, and when it is folded up no one can ride on the rear. This truck was built by the Baker Motor Vehicle Company, Cleveland, Ohio, for the Porto Rico Ice Company, Porto Rico.

### Cast-Iron Switchbox

A cast-iron switchbox, which is designed so that it can be placed in a 2-in. partition or a sliding-door casing, is being made by the Bauer Switch Box Manufacturing Company, Cleveland, Ohio. The box is

provided with long ears so that the screws can get a good "bite." In the illustration is shown a method of installing the box at a uniform distance from a door casing. A short 2-in. by 4-in. beam is nailed to the door buck, to which the box is fastened by two wood screws. A third screw is fastened to a cross-piece as shown.



METHOD OF INSTALLING SWITCHBOX

### Receptacles for Pipe Taplets

The plug receptacle for pipe taplets shown in Fig. 1 and the lamp receptacle for pipe taplets in Fig. 2 require no tap wires. The main wires are bared for half

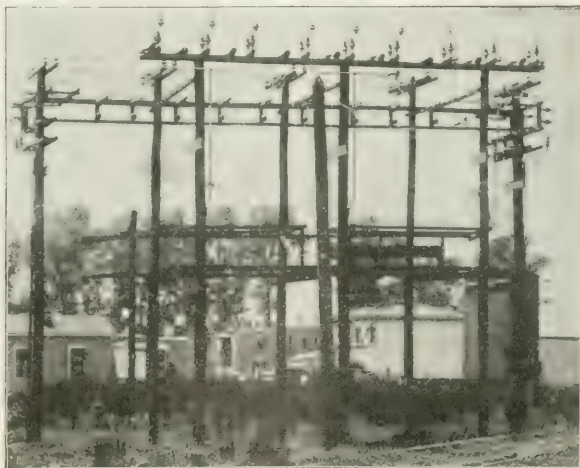


FIGS. 1 AND 2—PLUG AND LAMP RECEPTACLE

an inch and fastened directly to the binding screws of the fittings. There is also room under the base for a third wire. The same type of base is used for both devices, and the caps, therefore, can be interchanged without taking the base from the taplet. For waterproof work a rubber gasket is used for the screw-shell receptacle. These receptacles are being made by the H. T. Paiste Company, Philadelphia, Pa., for which the Hart & Hegeman Manufacturing Company, Hartford, Conn., is sole selling agent.

### Air-Break Switching Station

In the accompanying illustration is shown a 13,200-volt installation of pole-top switches consisting of three three-phase switches designed to open loaded circuits and twenty-one single-pole weather-proof disconnecting switches. The equipment controls three lines feeding two underground circuits and one overhead system. The station is built on nine 40-ft. poles and gives sufficient space, it is declared, for the necessary pot-heads, arresters and busbars. The switching equipment for this installation was manufactured by the Delta-Star Electric Company, Chicago, Ill.

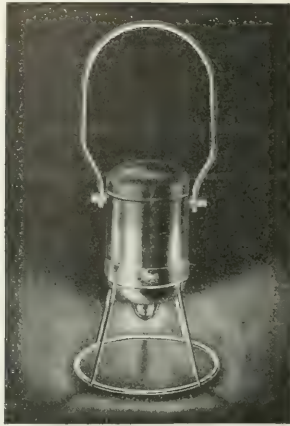


WEATHERPROOF AIR-BREAK SWITCHING STATION



### Electric Lantern

An electric lantern with its lamp below a cylinder, in which a dry-cell battery is placed, is shown in the accompanying illustration. The lamp is protected by a wire guard on which the lantern may stand. The



ELECTRIC LANTERN RESTING ON LAMP GUARD

cylinder containing the battery is 3.125 in. in diameter. This lantern is being placed on the market by the Federal Sign System (Electric), Chicago, Ill.

### Small Ventilators

Ventilators of the fan and blower types are shown in the accompanying illustrations. The fan in Fig. 1 is designed to throw the air directly to the front instead of spreading it out. For this purpose the ends of the blades are abruptly turned up. The motor is inclosed. The blower shown in Fig. 2 is designed for use with systems of piping or where some resistance is offered to the passage of the air. The essential parts of this blower are the motor, the Sirocco blower wheel mounted on the motor shaft, a cast-iron housing to direct the air current, and a supporting base. The blower housing can be revolved and reversed so as to

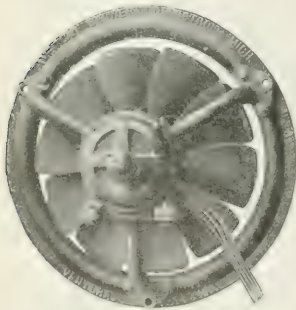


FIG. 1—VENTILATING FAN

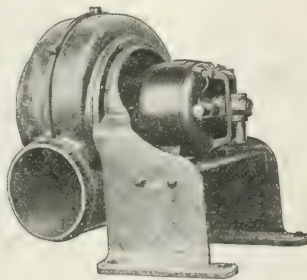
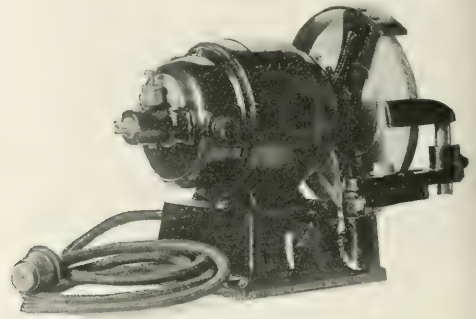


FIG. 2—ELECTRIC BLOWER

direct the discharge horizontally to either side or vertically up or down. The fans and blowers on these outfits are being manufactured by the American Blower Company, Detroit, Mich., and they are operated by Westinghouse motors.

### Electric Grinder

A grinder which is operated by a 0.25-hp direct-current motor is being manufactured by the Atwater Electric Works, Coopersville, N. Y. The grinding wheel is 6 in. in diameter and is connected directly to the shaft of the motor. The wheel is protected by a strong guard, and an adjustable rest is provided for grinding the work. The shaft is of chrome-nickel steel and runs in long phosphor-bronze bearings. The brushes of the motor can be removed from the outside without dis-

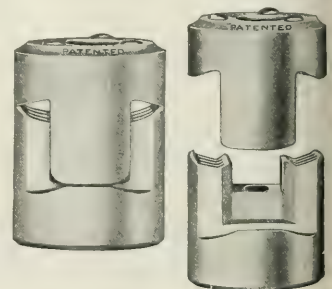


MOTOR-DRIVEN GRINDER

turbing any of the other parts. Rectangular carbon brushes of the cartridge type are used. The motor is dust-proof, and each bearing is equipped with felt packing rings which are kept tight by threaded brass collars. The field coils are wound with enamel wire and the armature with combination enamel and silk wire. The commutator has twenty-four parts, which are built up on threaded steel bushings. A snap switch is concealed in the base.

### Reversible Split Knob

The round reversible split knob shown in the accompanying illustrations is provided with two wire grooves. The two pieces interlock and can therefore be kept in place while being installed. The knob can be put in place with either screws or nails. The wire way is triangular in construction and grips the wire, the



REVERSIBLE SPLIT KNOB

manufacturers declare, without causing injury to the insulation.

This "Buckeye" knob, as it is called, is being manufactured by the Findlay Electric Porcelain Company, Findlay, Ohio.

### Electric Brewery Trucks

The electric "keg-roll" truck shown in Fig. 1 is equipped with a body made of steel I-beams, the I-beams being padded with oval iron which is said to lessen the wear on the wooden kegs. The back is

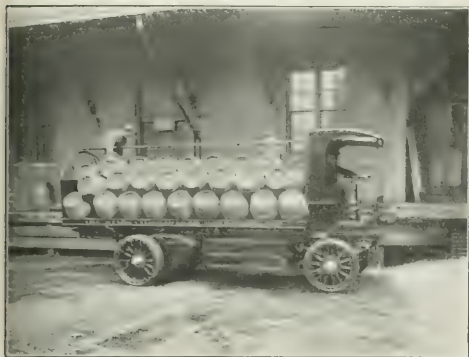


FIG. 1—ELECTRIC KEG-ROLL TRUCK

equipped with a sign panel of the German type. This truck is of 4 tons capacity and has a loading space 15 ft. 6 in. long and 62 in. wide. The truck is designed to carry forty full half-kegs and fifty-nine empty half-kegs. The body is so constructed that it will carry eighth-size, quarter-size, half-size and full-size barrels. The driver's seat is equipped with storm front and side curtains.

In Fig. 2 is shown a 4-ton electric truck designed to carry 100 thirty-six-bottle cases (bottles filled) or 150 twenty-four-bottle cases (bottles filled). The length of the loading space is 15 ft. and the width is 33 in. In this truck the side-door stakes and the end stakes are removable. A driver leaving the brewery with a complete load of full cases starts unloading from either side, and as he picks up empty cases he loads them into the truck from the front to the rear, working continually farther back into the truck. Toward the end of the trip he is working from the rear door



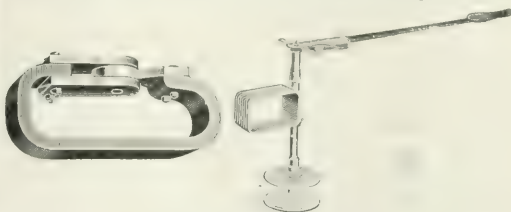
FIG. 2—ELECTRIC BREWERY TRUCK FOR CARRYING BOTTLE CASES

instead of the side doors, and has completely unloaded and reloaded the truck without having been obliged to lift the cases.

These trucks were built by the Baker Motor Vehicle Company, Cleveland, Ohio.

### Direct-Current Meters with Long Scales

Direct-current meters of the moving-coil and permanent-magnet type, with angular deflections of 300 deg. or more, are being made by the Record Electrical Company, Ltd., Caxton House, Westminster, S. W., London, England. The permanent magnet is in the shape of an elongated C as shown in Fig. 1. To one pole of this magnet is bolted a ring-shaped extension, around which the movable coil swings, the movement being limited only by the supporting neck of the pole. This pole is interleaved between polar cheeks fixed to the opposite extremity of the magnet, leaving an air-gap on both

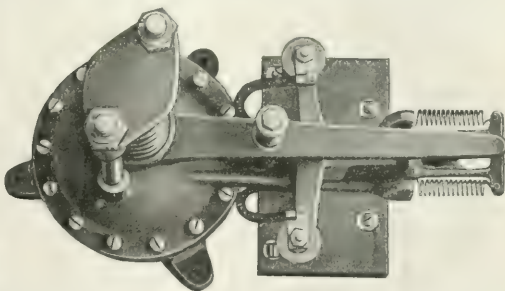


FIGS. 1 AND 2—PERMANENT MAGNET WITH POLE PIECES AND MOVING COIL

sides with a free movement of the coil. The whole moving system is very light. The coil is shown in Fig. 2. The weight of the pointer balances the coil in the larger instruments; in the smaller ones a slight extra weight is added. The large angle through which the pointer swings permits the use of a large scale, which in many respects is advantageous.

### Automatic Pressure Regulator for Controlling Small Motors

The double-pole, diaphragm-type pressure regulator illustrated herewith is designed for automatically controlling small direct-current or alternating-current motors operating on pressure systems. This regulator stops the motor when the maximum pressure desired is reached and starts it again when the pressure drops to the low value for which it is set. For direct-current motors with ratings up to 1 hp and alternating-current motors with ratings up to 5 hp this regulator controls the motor without an additional magnetic switch and



AUTOMATIC PRESSURE REGULATOR DESIGNED TO CONTROL SMALL MOTORS

automatically maintains pressure in the systems between given limits.

The device described above is being manufactured by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis.



# Jobber, Dealer and Contractor

## Co-operation Between Electrical Contractors and Jobbers

To promote co-operation among the branches of the electrical industry on the Pacific Coast a joint committee of jobbers and contractors of the California Association of Electrical Contractors and Dealers has issued an interesting statement of the principles for which it stands, outlining also the line of work which it proposes to follow in order to educate the industry and its members for greater responsibilities.

"It is fully recognized," declares the committee, "that the economic and proper channel of distribution of electrical supplies is through the electrical-supply jobber to the dealer and contractor, who, in turn, serves the consumer. By this method the dealer and contractor is enabled to have the advantage of a complete stock of electrical merchandise in the warehouse of the jobber which can be drawn on at any time, whether one item or a hundred are needed. Thus the dealer can also be assured of prompt shipments and satisfactory service.

"The jobber makes it his business to keep in close personal contact with the dealer and contractor in his territory, studies his wants and plans to serve his needs, whatever they may be. Through frequent calls of his salesmen he is often enabled to give valuable information. He also keeps himself advised of the new lines of standard goods on the market and furnishes technical data or gives such other information as may be useful from time to time.

"He is frequently able to be of service by 'carrying' a contractor or dealer who has been tied up financially on account of delays in jobs over which he has had no control.

"The dealer and contractor is the natural channel for distributing electrical devices to the consuming public. He carries the material in stock and displays it on his counters and in his show windows. The consumer is thus enabled to see the material which he is purchasing, and knows that he is getting full value for his money."

The object of the joint committee, as set forth by itself, is to promote the use of electrical appliances and to influence the public to adopt the idea: "Do it electrically." Its statement continues:

"The co-operation of the central station in each district is highly desirable, and a closer relationship with the architect and those engaged in the industry must be recommended. In the past the industry has failed to provide suitable showrooms at which the consumer can obtain electrical appliances, therefore the committee will encourage the establishing of proper stores where material can be obtained at retail.

"To accomplish this end a campaign of education is about to be instituted. It provides for visits by the committee to all parts of the State, where public lectures will be given, supplemented by moving pictures, stereopticon views and working demonstrations of electrical appliances.

"In order to gain the full confidence of the public in the industry we represent, the class of material furnished and the excellence of workmanship in its installations must be of the highest order.

"We recognize that in our business, probably more than in any other, the public is woefully ignorant of the quality and merits of devices. Whether or not customers are satisfied depends upon how we serve them. We should recognize that the National Electrical Code, while it has accomplished great good, does not to the

fullest extent accomplish the desired results for the reason that it does not distinguish between standards of material. We will advocate the grading of material by the National Fire Protection Association.

"We recognize that local inspection bureaus are not responsible for installations in compliance with architects' specifications. We will advocate the employment of one or more competent electrical engineers, whose duty it will be to furnish architects with certificates, certifying that work has been performed in accordance with the specifications embodied in the contract."

## The Electrical Contractor as a Business Man

In his recent address to the members of the Louisville (Ky.) Electrical Clearing House Association, which includes all of the fifty or sixty electrical contracting concerns in the city, Mr. Frank A. Good, electrical engineer for F. A. Clegg & Company, sought to give reasons why 88 per cent of the men who enter the electrical-contracting business fail, and outlined means by which the average contractor could reasonably insure success in business.

The reasons why contractors fail, according to Mr. Good, are: Because of lack of business training; inability to estimate accurately costs on work undertaken; unfair competition; catering to general contractors, and failure to add the overhead costs to their estimates.

The ranks of the contractors are recruited from the ranks of the wiremen, Mr. Good pointed out, and though these men feel confident that they are particularly well equipped to succeed at the contracting business they fail because they pay most attention to the practical side and too little to the commercial. It is along the latter line that they should school themselves.

Their systems of estimating and cost accounting are often faulty, and they not only fail to keep a general labor record but neglect to retain detailed records of previous jobs to guide them on others. Almost never, of course, are the labor items carried out to the unit basis. Such contractors need to post themselves on estimating and record-keeping methods.

Concerning the contractor who indulges in unfair competition, not only does this man eventually put himself out of business, but while he does last and while he does take work "at any old price," he is discrediting and taking bread out of the mouths of his fellows who are trying to conduct their businesses on a safe and legitimate basis.

It is the fault both of the general contractor and the electrical sub-contractor that the matter of catering to the general contractors has come to be the evil it is a present, Mr. Good declared. In the first place the sub-contractors should not allow themselves to be used by the general contractor but should make one price and stick to it. There are many general contractors who would and do play fair, but they are often besieged by sub-contractors who intimate that if they knew what other bids were being made they could probably make better prices.

In concluding, Mr. Good dwelt at length on the failure of electrical contractors to add in the "overhead" to their estimates on jobs. Many of them "get by," he said, by adding a gross profit to their estimates, which is sufficient to mean a net profit for themselves, but since the overhead charge differs widely on almost every job, no general average for the gross profit is safe. It is this feature on which most of the electrical contractors who fail "fall down" very heavily. The study of "overhead" should be undertaken by every contractor who is not already versed along those lines.

# Industrial and Financial News

## Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

**Orders for Small Motors.**—The Bell Electric Motor Company, Garwood, N. J., is reported to be receiving a number of orders for small motors. The business of this company, taken as a whole, is said to be good, although at present there is no demand for large units.

**New Building for Wire Company.**—The Detroit Insulated Wire Company, Detroit, Mich., is erecting a new building of steel construction, covering a space 57 ft. by 138 ft., and a smaller building, covering a space 35 ft. by 50 ft. These buildings will provide for new machinery to be added to the company's equipment.

**Electric Manufacturer in New Field.**—The Trumbull Electric Manufacturing Company, Plainville, N. J., is now making armored cable, flexible conduit and armored flexible cord. The company recently purchased the machinery and patent rights from a former manufacturer and is now turning out the above products in its own factory.

**Salesmen's Annual Meeting.**—Thirty salesmen of the F. Bissell Company met at the home office in Toledo, Ohio, in annual session on Wednesday of last week. On the following day they went to Cedar Point and then proceeded to Cleveland, where Friday, Saturday and Monday were spent at Nela Park. The business sessions took place at the latter place, where the men lived in tents.

**No Shortage in Permanent Magnets.**—In spite of the fact that the European war has eliminated several foreign sources of permanent magnets required in the electrical industry, no dearth in the American supply is as yet apparent. The Esterline Company, Indianapolis, Ind., is reported to be holding its own in this respect, and is prepared to furnish on short notice permanent magnets of various types.

**Motion-Picture Supplies from Paris.**—Mr. W. B. Cook, manager of the Patheoscope Company, Eolian Hall, New York, states that shipments from the Paris factory are being received in spite of the war, and that the company will be able to take care of all orders. Although the plant in Paris has been operating with a reduced force, it is expected that the full complement of employees will soon be again working.

**Insulator Pins via the Panama Canal.**—Mr. J. A. Navarre, Toledo, Ohio, dealer in locust insulator pins, lately shipped a carload of pins to San Francisco, Cal., from his mill in Pennsylvania via New York and the Panama Canal. The shipment made up part of the cargo of the steamship *Missourian* of the American-Hawaiian line, which passed through the canal on Aug. 15, being the first trading ship to make the trip.

**American Glassware Production Increased Because of Foreign Unrest.**—The European war has tended to decrease foreign competition in glassware for lighting fixtures. The Holophane Works of the General Electric Company, Cleveland, Ohio, are said to have noted an increase in business as a result. This concern is putting out a new type of tinted glassware which diffuses the rays so that the light approximates a daylight value.

**Importer's Supply of Carbon Cut Off.**—Hugo Reisinger, 1 Broadway, New York, importer of carbon, is said to be receiving no carbon from abroad at present. This concern gets its supply chiefly from Nurnberg, Germany. Before the war in Europe began the amount of carbon on hand was smaller than usual on account of the generally poor business conditions throughout the summer. This supply was soon exhausted after hostilities commenced.

**Motor-Driven Pumps for Saskatoon, Sask.**—The City Council of Saskatoon at its meeting of June 29 accepted the tender of Messrs. Escher, Wyss & Company, of Montreal, Quebec, for a turbine-driven centrifugal boiler-feed

pump. The same company was also awarded a contract for one 4,000,000-gal. motor-driven centrifugal pump to operate against a head of 162 ft. and one 4,000,000-gal. motor-driven centrifugal pump to operate against a head of 40 ft. The motors and switchgear are of the Canadian General Electric Company's manufacture.

**Business in Lamps Good.**—The Laco-Philips Company, 131 Hudson Street, New York, continues to receive shipments weekly from its plant in Eindhoven, Holland, and its business in the United States is said to be very good. Since the majority of the employees in the plant in Holland are women, the company is not short of help because of the war conditions throughout Europe. The company's plant in Vienna, Austria, has been closed, but the establishment in Holland will be able, it is claimed, to take care of all orders for some time to come.

**Rapidly Decreasing Supplies Curtail Output.**—The H. W. Johns-Manville Company, New York, is reported to be meeting with considerable difficulty in manufacturing certain of its products on account of the shortage of supplies from foreign countries. Among these are cork from Spain and sal ammoniac from England. A certain amount of sal ammoniac can be obtained in this country but it is usually of an inferior quality. This company is also having a hard time obtaining suitable quantities of rubber. A large number of orders are being received, although the tendency is toward small amounts.

**No Outlet for German Machinery.**—The Wiener Machinery Company, sole agent in the United States for Heinrich Lanz, manufacturer of locomobiles, is receiving no equipment from abroad. Prior to the European war the business of this company was booming. Many orders now remain unfilled. The Wiener company, however, is evincing considerable optimism, and as soon as the war ceases the business, it is declared, will again be thriving. It is said that the number of employees in the Lanz factory has been reduced to one-third of what it usually is, the majority of the other two-thirds being at the front.

**German Electrical Plant Becomes a Hospital.**—It is reported that the plant of Koerting & Mathiesen, Leipsic, Germany, has been made over into a temporary hospital. The motor factory at Aix la Chapelle, which place formed a base for the German armies in their operations against Belgium, has been burned, and a large stock was destroyed. The Kandem Electric Company, 49 East Twenty-first Street, New York, agent for the above company, has received no shipments from Germany for some time. The amount of stock on hand now is practically exhausted, and the company will perforce have to rest on its oars until the great European conflict is ended.

**Louisville Fixture Company Changes Name.**—When the merger of Louisville (Ky.) utilities resulted in the organization of the Louisville Gas & Electric Company, confusion was caused by the similarity of the new name with that of the Louisville Gas & Electric Fixture Company, which had been doing business in Louisville for several years. As telephone users were, for example, regularly getting the wrong party, the fixture company in the interest of harmony and identity decided to amend its charter and to change its name to the Louisville Wiring & Fixture Company. Since this title describes the activities of the company better than did the old name—for, according to Mr. Thomas O'Leary, secretary of the company, "there is no gas-fixture business in Louisville any more"—the company feels that the change of firm style is a decided advantage.

**War Boosts Ball-Bearing Industry.**—Prior to the great conflict now raging in Europe a large number of the ball



bearings used in this country were manufactured in Germany. After hostilities broke out, however, manufacturers made haste to increase their facilities in the United States. One of the concerns initiating this movement is the Norma Company of America, 1790 Broadway, New York, which is enlarging its American plant. Shipments have not been received from its establishment in Stuttgart, Germany, for a month, although word has been received both by letter and cable that the factory is working and that shipments will be made via Rotterdam, Holland. This company was fortunate to have a supply of some 500,000 ball bearings when the war began, and with this supply added to the output of the American plant all orders have been easily taken care of. The ball-bearing industry generally seems to be healthy and to be improving in spite of unsettled conditions.

**The Mica Situation.**—Mr. J. Meirowsky, of Meirowsky Brothers, 106 Broadway, Jersey City, N. J., declares that, although it is too early to say what the definite effect of the European war will be on the mica market, there are some results that can be clearly seen at the present time. It is rumored, he states, that certain mines in India will be closed for some months to come, and it is even reported that all mines in India will be ordered shut down by the English government because of the large amounts of explosives used. In addition to the curtailment of production, the shipping facilities have also been affected, and so it is natural to expect a rise in prices. On the other hand, Mr. Meirowsky remarks, the consumption of mica has also been reduced. To Germany, Austria and France, where large amounts of mica are used for manufacturing purposes, shipments have practically ceased. The conclusion seems to be that there may be an advance in prices, especially on block mica. Mr. Meirowsky has also heard that mica has been declared contraband of war by England.

**A Large Electric Company's Welfare Work.**—The General Electric Company provides a 25-cent table d'hôte dinner for its employees at its Schenectady plant. Food supplies are obtained from a farm adjoining the plant, which is owned and operated by the company. In addition to the table d'hôte dinners, which are served only during the noon hour, à la carte service is provided during the rest of the working day. The shop restaurant is an attractive two-story concrete building designed especially for restaurant purposes. The building has two large dining rooms, each with a seating capacity of 450, and another large dining room for the use of foremen and other supervisory help. It is equipped with every modern convenience for the cooking and refrigeration of foodstuffs. All food is prepared in the building. In addition there are also lunch counters in several of the largest buildings where women are employed. Tea, coffee and milk are served at the counters, with light lunches obtained from the main restaurant. The large office building, eight stories high, also has its restaurant. The company employs a welfare secretary. Interest in the fostering of athletics, the education of foreign employees and the beautifying of workmen's surroundings are among the evidences of the company's care for its working force.

#### NEW YORK METAL MARKET PRICES

Standard spot*	Sept. 1		Sept. 8	
	Bid	Asked	Bid	Asked
Copper	Selling Prices		Selling Prices	
London, standard spot*	12.50	to 12.75†	12.50	to 12.75†
Prime Lake	12.50	to 12.35†	12.20	to 12.30†
Electrolytic	12.25	to 12.35†	12.20	to 12.30†
Casting	12.15	to 12.25†	12.15	to 12.25†
Copper wire base	13.75	to 14.00	13.75	to 14.00
Lead	3.90		3.90	
Nickel	40.00	to 45.00	40.00	to 45.00
Sheet zinc, f.o.b. smelter	8.50		8.50	
Spelter, spot	6.00	to 6.10		to 5.85
Aluminum	19.50	to 20.50	19.50	to 20.50

#### \*COPPER EXPORTS

Total tons to Sept. 8.....4,735

\*From daily transactions on the New York Metal Exchange.

†Nominal.

Note.—The New York Metal Exchange and the London Metal Exchange have been closed until further notice. No reliable quotations on old metals can be obtained for the present. There is no buying in this market.

## Corporate and Financial

**Receivership for Seven Cities Company.**—The Southern Trust Company, of Little Rock, Ark., has been appointed temporary receiver for the Seven Cities Company, Russellville, Ark., on application of the Russellville Water & Light Company.

**Mexico Electric Company.**—Mr. Simon B. Storer, president and treasurer of the Mexico Electric Company, Mexico, N. Y., and his associates expect to take all of the securities recently authorized to be sold at par by the Public Service Commission of the Second District of New York. The securities are \$41,000 first-mortgage 6 per cent bonds and \$20,000 capital stock.

**To Pay Interest on Notes.**—The Kansas City (Mo.) Railway & Light Company announces to holders of certificates of deposit representing the 6 per cent notes due on Sept. 1, 1912, that it has arranged for the payment on Sept. 1, 1914, at the New York Trust Company, New York, of interest on notes from March 1, 1914, to Sept. 1, 1914, at the rate of 7 per cent per annum.

**Public Service Properties.**—The firm of W. S. Barstow & Company, of New York, has issued a thirty-five-page booklet in leather giving general data regarding public utility companies under its management, with yearly gross earnings in excess of \$4,000,000. The booklet contains the capitalization of each company, and in the case of railroad companies maps are also shown.

**Idaho-Oregon Sale.**—In holding that the \$718,000 first and refunding mortgage bonds, ownership of which is claimed by the Idaho Railway, Light & Power Company, were obtained without consideration, as stated by the Priest committee, Judge Dietrich cleared the way for the stockholders to bid in the property of the Idaho-Oregon Light & Power Company, Boise, Idaho, according to Receiver W. J. Ferris.

**Additional Virginia Railway & Power Company Bonds Listed.**—The New York Stock Exchange has granted the application of the Virginia Railway & Power Company of Richmond, Va., to list \$200,000 additional face value of its first and refunding mortgage 5 per cent bonds and also to list an additional \$550,000 of the bonds upon official notice that they have been sold and passed beyond the control of the company. This makes the total amount applied for \$12,253,000.

**Commonwealth Earnings.**—The Commonwealth Power Railway & Light Company, Jackson, Mich., in its condensed earnings statement for the twelve months ended June 30, 1914, showed gross earnings of \$2,981,684, made up of \$2,463,861 as earnings on stocks owned by the company in subsidiary companies and \$517,823 as miscellaneous earnings. Expenses and taxes amounted to \$114,508, and interest charges of \$659,842 swelled the total deductions to \$774,350, thus leaving \$2,207,334 as net income available for dividends, replacements and depreciation. Deducting \$960,000 for dividends on preferred stock left a balance of \$1,247,334.

**United Light & Railway Company's Consolidated Earnings.**—The consolidated earnings sheet of the subsidiary companies of the United Light & Railways Company of Grand Rapids, Mich., shows gross earnings of \$1,491,355, an increase of \$170,103 over 1913. Expenses and taxes amounted to \$97,384, an increase of \$17,454 over 1913, thus leaving \$1,393,971 for net earnings, or an increase over 1913 of \$152,651. Deducting interest charges of \$401,598 and dividends of \$627,932 leaves a balance of \$464,441, which is an increase of \$13,768 over 1913. This balance is exclusive of \$34,484 suspended earnings pending rate adjustment, now in progress.

**Northern Idaho & Montana Power Company.**—The annual report of the Northern Idaho & Montana Power Company, Sandpoint, Idaho, for the year ended Dec. 31, 1913, shows gross earnings of \$668,035. From this is deducted \$383,380 for operating expenses, leaving \$284,655 as net earnings. Other income amounted to \$8,426, making gross income \$293,081. Bond interest amounted to \$317,581 and general interest amounted to \$38,265, thus leaving a deficit of \$62,765. During the year, Mr. H. M. Bylesby, the president, stated, the net floating debt was reduced by \$550,399.

thus saving interest charges to the amount of approximately \$33,000 per annum. Had this been effective during the whole twelve months the deficit would have been but \$41,850.

**New Bond Issue for an American Company in Havana.**—The Havana Electric Railway, Light & Power Company, which is a corporation formed about a year ago by the fusion of the Havana Electric Railway Company and the Cia de Gas y Electricidad de la Habana, both American corporations, has arranged for a new issue of \$25,000,000 5 per cent bonds for the purposes of refunding the outstanding bonds of the two constituent companies, amounting to approximately \$18,000,000, and of providing capital for improvements.

**Dividend Period Changed.**—The Elmira (N. Y.) Water, Light & Railroad Company will declare a quarterly dividend of 1½ per cent, payable on Oct. 1, on the \$1,000,000 5 per cent cumulative second preferred stock as a result of the dividend period having been changed from semi-annual to quarterly. On July 1, 1 2-3 per cent was paid, covering four months. From September, 1907, to March, 1904, 2½ per cent was disbursed semi-annually. The last payment, 1 per cent on the \$1,000,000 common stock, was made December, 1913, distributions having been 1 per cent in October, 1910, and 4 per cent in 1911, 1912 and 1913.

**American Public Utilities Company Elects Officers.**—At the annual meeting of the American Public Utilities Company held in Grand Rapids, Mich., on Aug. 25, officers were elected as follows: President, Mr. Joseph S. Hart; secretary, Mr. Blaine Gavett; assistant secretary-treasurer, Mr. Willis J. Ripley. Mr. Charles B. Kelsey was elected chairman of the board of directors. The remainder of the board is as follows: Messrs. John H. Blodgett, Boston; C. A. Boalt, St. Paul, Minn.; Joseph H. Brewer and Blaine Gavett, Grand Rapids; Hugh H. Harrison, Indianapolis; Joseph S. Hart, Grand Rapids; E. Clarence Miller and Henry S. Morris, Philadelphia; W. J. Maloney, Wilmington, Del.; Charles McPherson, Grand Rapids; W. B. Parsons, Winona, Minn.; George T. Whitworth and W. J. Ripley, Grand Rapids.

**Iowa-Nebraska Public Service Company Changes Hands.**—Upon the completion of the reorganization plans of the Iowa-Nebraska Public Service Company, Norfolk, Neb., which has been in the receiver's hands since May 31, 1913, the properties formerly operated by this company passed into the control of the Continental Gas & Electric Corporation, of Cleveland, Ohio. The reorganization as carried out was the incorporation of the Nebraska Gas & Electric Company and the Iowa Gas & Electric Company, these companies taking over the Iowa-Nebraska company's interests in the respective states. These two companies were then separately sold to the Continental company. Funds for the reorganization were raised by the Continental Gas & Electric Corporation's sale of its securities. Besides the purchase price, the sale provided funds for improvements.

**Pump Company Receivership.**—Receivers have been appointed for the International Steam Pump Company. The action was taken by the court at the request of three creditors, Messrs. William W. Conley, Alexander J. Lindsay, and J. Harris Harding, who brought a friendly suit in equity against the company in order to protect the assets of the company. The receivers named were Messrs. C. Philip Coleman and Grayson M. R. Murphy. Dividends on the preferred stock have not been paid since May, 1913, although from two years after its incorporation in 1899 the company paid regularly 6 per cent dividends. The liabilities of the corporation as set forth in the complaint are \$10,839,937, of which \$9,542,895 represents bonded indebtedness. The assets have been placed at \$52,000,000, but the complaint states, they are of such a nature that any attempt to liquidate them at this time would result in injury to the creditors. According to a statement sent out in behalf of the directors, the receivership was rendered necessary since the company, although earning more than the interest charges, would not be able to make the interest payment of about \$250,000 and the sinking fund payment of \$250,000, due Sept. 1, on its \$9,347,900 worth of first-lien twenty-year 5 per cent bonds. The company also lacks working capital. Moreover, the company will be unable to meet on Oct. 2 the 7 per cent interest on its \$1,150,000 worth of outstanding collateral-trust notes.

**Steps Taken Toward Salt Lake City Consolidation.**—Permission to consolidate the franchise granted by Salt Lake City to the Merchants' Light & Power Company with the franchise of the Utah Light & Railway Company was requested from Salt Lake City on Sept. 1 by the Utah Power & Light Company, which owns the franchise of the Merchants' company and proposes to buy the property and franchises of the Utah Light & Railway Company, now owned by the Harriman railroad interests. The request was taken under advisement by the City Commission, which has intimated that it will insist on lower rates for energy before granting the request. The Merchants' company franchise was granted on Aug. 22, 1912, and was subsequently assigned to the Utah Power & Light Company, which controls the wholesale business of the region and a considerable portion of the retail field. The petition to Salt Lake City is the first public step toward the change of ownership of the Utah Light & Railway Company, which had been rumored for some time. Mr. P. B. Sawyer, general manager of the Utah Power & Light Company, has issued the following statement: "Interests connected with the Utah Power & Light Company propose to acquire the property, rights and privileges of the Utah Light & Railway Company. The acquisition of the property and rights of the Utah Light & Railway Company is not completed, but is still more or less tentative. The Utah Power & Light Company is now the owner of a light and power franchise from Salt Lake City, one of the terms of which is that the grantee shall procure the consent of the commission to any consolidation, either direct or indirect, of the business and properties of the grantee with that of any other company in Salt Lake City. The franchise itself is a very advantageous one to the city, inasmuch as the right of regulation is reserved by the city. Many advantages to Salt Lake City and its inhabitants will result from an economical management and control of the properties."

**Financing of the Coon Rapids Development.**—A bond circular recently issued by H. M. Bylesby & Company gives an interesting account of the financing of the Northern Mississippi River Power Company, which owns the new Coon Rapids hydroelectric plant on the Mississippi River 11 miles above Minneapolis. It is announced that the Minneapolis General Electric Company has leased for a period of forty-eight years the property of the Northern Mississippi company. Under the lease the Minneapolis company agrees to operate the plant to its full rated output, pay all operating expenses and taxes, make necessary repairs and replacements, maintain the plant in good condition, and at the termination of the lease to deliver the plant in as good condition and repair as when received, reasonable wear excepted. The lease may not be modified in any way, except with the consent of the trustee, and then only when the Minneapolis company shall have assumed the payment of the principal and interest of the Northern Mississippi River Power Company's first-mortgage 5 per cent bonds. The Minneapolis company is to pay as rental 7 mills for every kilowatt-hour of electricity generated, but a minimum rental is provided payable in monthly instalments, which shall be \$125,000 per annum from 1914 to 1917, \$175,000 from 1918 to 1921, \$225,000 from 1922 to 1925, \$250,000 from 1926 to 1929, \$275,000 from 1930 to 1933, and \$325,000 from 1934 to the termination of the lease. This minimum rental obligation of the Minneapolis company is sufficient to pay the interest on these bonds as it accrues and the principal of the entire authorized issue at maturity. The capital stock of the Minneapolis company is owned by the Northern States Power Company and is pledged as collateral for \$5,000,000 6 per cent notes due June 1, 1917, of the latter company. Upon the payment of these notes the Minneapolis company covenants that it will purchase the property of the Northern Mississippi company and as part of the purchase price will assume the payment of the principal and interest of the Northern Mississippi company bonds. The Minneapolis company further agrees, in order to preserve the equity behind this assumption, that it will not place any additional mortgage on its properties without setting aside \$2,500,000 bonds of such issue, to be deposited with the Continental & Commercial Trust Savings Bank of Chicago as trustee of the Northern Mississippi company bonds as additional security therefor.



## NEW ENGLAND'S STEADY GROWTH

Returns from Central Stations Operating in This Section for June Show Same Steady Increase as in Previous Months for 1914 Over 1913

The returns as received by the *Electrical World* for June from 67 per cent of the central-station industry of New England show an increase in income derived from sale of energy of \$120,000, or 8.3 per cent, and an increased output of over 5,000,000 kw-hr., or 11.1 per cent. These figures cover practically all of the larger towns and cities and a large majority of the smaller towns. They do not, however, cover to any great extent the municipal electric light and power plants, the returns from which have been rather slow in coming in from this section of the country. It will be noticed, by referring to the tables, that the income growth has remained practically the same for April, May and June. In each case there was an increase of somewhat over 8 per cent. Two companies, one in Massachusetts and one in Vermont, showed decreases in energy output. In neither case, however, was the loss large, the entire income loss being less than \$1,000 and the output loss being approximately 40,000 kw-hr. Table I gives the gross returns from 60 per cent of the New England industry. These figures are strictly comparable, having been received from the same companies for both May and June. The figures there shown are upheld by additional companies and may be taken as indicative of the strength of the entire industry of the New England States from the percentage standpoint.

### Existing Unfavorable Circumstances

The returns as shown in the tables do not tell the whole story. The increases as shown are the results of new contracts for motor load. Former years have shown expansion during the summer season owing to the fact that New England was growing fast as a summer resort. It is a fact that New England had a very poor season this year, weather and poor business combining to keep down the vacation and excursion trade. The street-railway traffic was by no means as heavy as was planned for. The small seaside resorts that ordinarily use much energy for their "dime-catching" devices in many cases had to close down for want of trade.

TABLE I—COMPARATIVE RETURNS FOR MAY AND JUNE, 1913 AND 1914, COVERING 60 PER CENT OF THE CENTRAL-STATION INDUSTRY OF THE NEW ENGLAND STATES

	GROSS INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
May	\$1,741,141	\$1,606,903	8.4	52,418,397	50,573,673	3.7
June	1,504,830	1,390,336	8.2	51,355,018	46,089,852	11.4

This, coupled with the slump in business all over the country in June, helps to give the accompanying statistics a much more favorable aspect than would be apparent at a first glance.

### Bearing of Community on Returns

These operating returns show well the commercial and domestic character of New England. From the time of their first dealings with the Indians the sturdy people of these States have been a steady, cautious folk. The manufacturers have been satisfied with established methods and have been slow to scrap their old machinery in favor of machinery of more recent design and greater economy. A trip through Fall River, Mass., Providence and Pawtucket, R. I., or along the Connecticut River, will show the majority of the manufacturers relying on their own power. Little by little the people are realizing the advantages to be derived from central-station energy, and the figures in the accompanying tables are indicative of the extent to which they are changing over. The New England households have

been slow to install electricity for lighting purposes. Gas gained a strong foothold while electricity is finding it difficult to overcome. In the outlying communities kerosene lamps are still in vogue. Many of the larger towns are just starting to illuminate their streets to any extent by means of central-station energy. Arc lamps are used only in the more important districts.

### Great Industrial Center

This section of the country is one of America's greatest industrial centers. Fall River is America's great cotton manufacturing stronghold; Rhode Island is strong in the

TABLE II—RETURNS FOR APRIL, MAY AND JUNE FOR ALL NEW ENGLAND COMPANIES REPORTING TO ELECTRICAL WORLD

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
April (52 per cent of industry)	\$1,501,773	\$1,384,255	8.5	43,386,624	39,181,988	10.8
May (63 per cent of industry)	1,745,160	1,609,234	8.4	52,752,247	50,779,103	3.9
June (67 per cent of industry)	1,560,872	1,442,178	8.3	53,463,013	48,049,756	11.1

manufacture of jewelry; Lowell, Mass., is noted for its large number of different industries of worldwide renown; Massachusetts does an enormous shoe trade; New Haven is a large railroad center; Connecticut has large gun and ammunition factories and is prominent in the silversmith trade; Maine is noted for its pulp mills, canneries and granite quarries; Vermont, while mostly agricultural, mines considerable marble and granite; New Hampshire, long known as the "Granite State," is noted for its manufacture of boots and shoes and cotton goods. In New England all of the more important and many of the less important of this country's industries have taken root and flourished. This section, the first to be settled industrially, became the breeding ground for the nation's business.

### Future for the Central Station

With the prevailing conditions the 8 per cent increase as shown above clearly indicates the steady advancement of the central stations in New England. With the large cities of Boston, Worcester, Providence and Portland rapidly expanding and with Fall River using more and more electricity to drive her mills, the central-station business ought in the next few years to become one of New England's foremost industries. With the Grand Trunk Railroad coming down through New England in the near future, industrial conditions of this region ought to advance more rapidly than heretofore. The electric truck has taken a firm root in the New England States and will undoubtedly be more prominent as the farmer starts to do a trucking business on a large scale.

## Business Notes

The Electrical Construction Company, Little Rock, Ark., has established a branch contracting and supply store at 217 South Main Street, Hope, Ark.

The Pyrene Manufacturing Company.—Mr. C. L. Allen, formerly automobile sales manager, has been promoted to the position of general sales manager for the Pyrene Manufacturing Company, New York.

Mr. E. W. Philips will sever his connection with the Kadem Electric Company, Inc. (formerly the Koerting & Mathiesen Company), 49 East Twenty-first Street, New York, on Sept. 15. The company is unable to obtain any supplies from its owners and manufacturers at Leipsic, Germany.

## New Industrial Companies

**The Star Lighting Fixture Company**, of Bayonne, N. J., has been incorporated with a capital stock of \$30,000 by Joseph Ribak, Hyman Goldberg, of New York, N. Y.; Louis Brawn, of Bayonne, and Jacob Brawn, of Newark, N. J.

**The Webster Stevens Electric Company**, of Wilmington, Del., has been incorporated with a capital stock of \$100,000 to do a general electrical business. The incorporators are M. M. Dugan, L. H. Lefferts and J. D. Frock, of Wilmington, Del.

**The United States Electric Generator Company**, of Boston, Mass., and Providence, R. I., has been incorporated with a capital stock of \$50,000 by John W. Bond, of Providence, R. I.; H. P. Morrissey, of Boston, Mass.; H. M. Spooner, of Cranston, R. I.; Arthur P. Manchester, of Providence, R. I., and John Morrissey, of Providence, R. I.

## Trade Publications

**Glass Fixtures.**—Various types of glass lighting fixtures are listed and illustrated in a booklet issued by Gill & Company, Inc., Philadelphia, Pa.

**Thread Protectors.**—A protector for conduit-pipe threads is described and illustrated in a folder issued by the Enameled Metals Company, Pittsburgh, Pa.

**Direct-Current Meters.**—Direct-current portable meters of the D'Arsonval type are the subject of a leaflet issued by Louis M. Pignolet, 78 Cortlandt Street, New York.

**Whitewashing Machine.**—Sprayers and whitewashing machines are described and illustrated in a catalog issued by the Dayton Manufacturing Company, Dayton, Ohio.

**Electric Hot-Water Heater.**—An electrically operated hot-water heater is the subject of a booklet issued by the Rathbone Manufacturing Company, Grand Rapids, Mich.

**Metal Switch Boxes.**—In folders issued by the Bauer Switch Box Manufacturing Company, Cleveland, Ohio, is described a cast-iron switch box equipped with long lugs.

**Turn-Down Incandescent Lamp.**—A so-called "dim-a-lite" turn-down incandescent lamp is described and illustrated in a leaflet issued by the Wirt Company, Germantown, Philadelphia, Pa.

**Small Lighting Outfits.**—A gas-engine-driven lighting outfit with a continuous rating of 1200 watts is described and illustrated in a folder published by the Strong Electric Company, Des Moines, Ia.

**Wood-Preserving Compound.**—In a folder issued by the C-A-Wood-Preserver Company, St. Louis, Mo., the advantages of the wood-preserving preparations put out by this company are enumerated.

**Conduit Boxes and Fittings.**—Pamphlet No. 442, published by the Sprague Electric Works of the General Electric Company, New York, contains short descriptions and illustrations of conduit boxes and fittings.

**Recording Gages.**—In Bulletins No. 82 and No. 88 published by the Industrial Instrument Company, Foxboro, Mass., are described helical-tube, diaphragm-tube and liquid-level gages. Typical charts are also given.

**Tungsten-Lamp Fixtures.**—Fixtures for nitrogen-filled tungsten lamps with ratings of 250 watts to 1000 watts are described in a leaflet issued by the Harter Manufacturing Company, 1132 West Austin Avenue, Chicago.

**Ventilating System.**—The method of ventilating the building of the Toledo (Ohio) Factories Company by means of Sirocco blowers is described in Bulletin No. 27, issued by the American Blower Company, Detroit, Mich.

**Fixtures for Nitrogen-Filled Incandescent Lamps.**—Fixtures designed for use with high-efficiency tungsten lamps are listed and illustrated in a bulletin published by the Benjamin Electric Manufacturing Company, Chicago, Ill.

**Instrument Transformers.**—Bulletins No. 2001 and No. 501 issued by the Weston Electrical Instrument Company, Newark, N. J., contain information on current and potential transformers for use with portable and switchboard instruments.

## Personal Mention

**Mr. M. H. Pengra**, formerly superintendent of the Freeport (Ill.) Railway & Light Company, is now in business at Eugene, Ore.

**Mr. A. F. Duke** has been appointed manager of the Forney (Texas) Ice & Light Company as successor to Mr. J. E. Moore, Jr.

**Mr. L. A. Elliott** has succeeded Mr. Ernest Carter as manager and superintendent of the municipal electric plant at Martin, Tenn.

**Mr. Edward Rafferty** has been made manager of the municipal electric plant at Madison, S. D., as successor to Mr. H. C. Graym.

**Mr. Thomas Cook** has been appointed superintendent of the Commerce (Tex.) Ice & Power Company as successor to Mr. P. J. Struve.

**Mr. Henry L. Elston** has been appointed superintendent of the municipal electric plant at Muscoda, Wis., as successor to Mr. J. M. Kaiser.

**Mr. William C. Buell** has been appointed superintendent of the Millville (N. J.) Electric Light Company as successor to Mr. R. C. Carey.

**Mr. J. C. Ross** has succeeded Mr. Henry Dodue as chief engineer of the Yarmouth Light & Power Company at Yarmouth, Nova Scotia, Canada.

**Mr. J. M. Jetton**, formerly vice-president of the Delta Electric & Manufacturing Company, Cooper, Tex., is now president of the organization.

**Mr. Robert E. Martin** has superseded Mr. L. G. Zeeveld as manager and superintendent of the municipal water and electric plant at Baraga, Mich.

**Mr. L. C. Wagner** has been appointed superintendent of the American Light & Power Company, St. Charles, Mo., as successor to Mr. H. J. Ward.

**Mr. William P. Bishop** has been elected treasurer of the Suffolk Light, Heat & Power Company, Southampton, N. Y., as successor to Mr. L. E. Terry.

**Mr. C. H. Nandell**, manager of the Marshall (Tex.) Electric Company, has been elected president of that company as successor to Mr. E. H. Hatch.

**Mr. O. C. Van Cleave**, formerly of Paxton, Ill., has been made local manager of the Central Illinois Utilities Company's property at Saybrook, Ill.

**Mr. Henry D. Shute**, who has been elected treasurer of the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., as successor to Mr. T. W. Siemon, was formerly acting vice-president of that organization.

Mr. Shute entered the Westinghouse works in 1893 as an apprentice and has been connected with the company from that time until the present. He spent a couple of years in the testing department, after which he was engaged in erection and laboratory work. In 1897 he entered the engineering department and one year later was transferred to the commercial department, where in 1901 he was placed in charge of the alternating-current division. Two years later he was promoted to be assistant to Vice-president L. A. Osborne, in which position



HENRY D. SHUTE

he was particularly active in the development of heavy-duty electric traction and single-phase railway work. In 1910 Mr. Shute succeeded Mr. Walter McFarland as acting vice-president, holding this position until his present appointment. Mr. Shute was educated at the Massachusetts Institute of Technology and at the School of Mines, Dresden, Germany. He is an associate member of the American Institute of Electrical Engineers and a member of the Engineers' Club, New York City. He is a director of the Pittsburgh Chamber of Commerce.



Mr. M. C. Hunter, secretary and treasurer of the Edina (Mo.) Light Company, has been made manager of the company, succeeding Mr. Harry N. Leist.

Mr. L. E. Greilich has superseded Mr. Charles Wilhelm as vice-president of the Boardman River Electric Light & Power Company, Traverse City, Mich.

Mr. Joseph Bouchard has been appointed superintendent of Willets, Ltd., the electric plant at Chambly Canton, Quebec, as successor to Mr. Brock Willett.

Mr. C. R. Fitz, who has resigned as vice-president of the Suffolk Light, Heat & Power Company, Southampton, N. Y., is still a member of the board of directors.

Mr. N. H. Johnson, formerly superintendent of the municipal electric plant at Richmond, Ind., is now manager of the Richmond (Ind.) Light, Heat & Power Company.

Mr. L. M. Macy is president and manager of the new Adel (Iowa) Light & Power Company, which formerly did business under the name of the Adel Milling Company.

Mr. Burr Gran has succeeded Mr. John Simpson as local superintendent of the electric-service system at New Boston, Ill., a Tri-County Light & Power Company property.

Mr. R. D. S. Beckstedt has been appointed superintendent of the Tagona Water & Light Company, Sault Ste. Marie, Ontario, Canada, as successor to Mr. R. A. Campbell.

Mr. M. V. Bostain has been made general manager of the Carlisle (Ky.) Electric Light & Power Company, succeeding Mr. Boon Ingels, who held the position for many years.

Mr. Luther Stover has been appointed manager of the Williams (Ariz.) Water & Electric Company, successor to the Grand Canyon Electric Light & Power Company.

Mr. Theodore Rice has been appointed business manager of the Northern Power Company, Potsdam, N. Y., to assist Mr. A. A. Potter, who is local manager of the company.

Mr. Tom Graham has been appointed district manager of the Arlington Electric Company, Clarendon, Va., which is controlled by the Alexandria (Va.) County Lighting Company.

Mr. George L. Howard has resigned as district manager of the San Joaquin Light & Power Corporation at San Luis Obispo, Cal., where he has been succeeded by Mr. Fletcher Easton.

Mr. Charles Walsh, who has been appointed secretary of the Springfield (Ill.) Gas & Electric Company, was formerly assistant to the general auditor of Hodenpyl, Hardy & Company, New York.

Mr. Alfred Montgomery has tendered his resignation as manager of the Leominster (Mass.) Electric Light & Power Company to take effect Oct. 1. Mr. Montgomery intends sailing for London in October to rejoin his mother, who is seriously ill.

Mr. F. W. Harvey, Jr., formerly business manager of *Popular Electricity*, is now assistant manager of the Electrical Trades Exposition Company, the organization which will manage the electrical show to be held at Chicago during the fall.

Mr. David R. Thomas, who since April 1 of this year has been general manager of the Michigan Power Company, Lansing, Mich., was formerly treasurer and general manager of the Port Jervis Light & Power Company and the Orange Power Company, operating within a radius of 20 miles of Port Jervis, N. Y.

Mr. George B. Tripp, vice-president and general manager of the Harrisburg (Pa.) Light & Power Company, has become operating executive of the United Gas & Electric Company, New York City. He still acts as vice-president of the Harrisburg company, but has been succeeded by Mr. C. M. Kaltwasser as general manager.

Mr. C. F. Beames, having completed his three years' engagement as chief electrical engineer to the government of the Maharajah of Mysore, India, during which time he had under his charge the operation of the Cauvery system, the largest long-distance, high-tension network in operation in the Far East, is returning to the United States.

Mr. T. Julian McGill has been appointed district manager of the Chicago office of the Westinghouse Electric & Manufacturing Company, succeeding Mr. T. P. Gaylord. Mr. McGill, who is a Virginian by birth, is no stranger to Chi-

cago, having been a salesman in the Chicago office a number of years ago. Before that Mr. McGill was connected with the old Siemens & Halske Electric Company of America. He left Chicago to become district manager of the Minneapolis office of the Westinghouse Electric & Manufacturing Company, and after that he was made district manager of the Atlanta office of the company, from which position he is about to be transferred to the management of the Chicago office. He is a member of the Jovian Order.

## Obituary

Gen. Charles Truman Hotchkiss died in Chicago on Aug. 28, aged eighty-two. In 1848 he helped his father build the first telegraph line out of Chicago, the wires being erected between Milwaukee and Chicago. He became the first operator at the Chicago end of the line. He was an officer in the Civil War.

Robert Johnson McCuen, for nearly fourteen years superintendent of the department of lamps and lighting of the city of Baltimore, Md., died Aug. 31, at the age of fifty-nine. Although he had been ailing since last June, his death was unexpected. Mr. McCuen's aim was to provide Baltimore with the best lighting system possible and at the smallest outlay of money. When he took charge of the department the annual appropriation for lighting the street was about \$450,000. This amount he reduced to \$100,000 the first year he was in office. The present lighting system in Baltimore, one of the best in the country, is credited to Mr. McCuen's labors.

Thomas E. Hughes, who had been manager of the Philadelphia office of the Standard Underground Cable Company for the last seventeen years, died at his home in Atlantic City, N. J., on Aug. 27. Prior to his connection with the Standard cable company, Mr. Hughes was with John A. Roebling's Sons Company at Trenton, N. J., an Scranton, Pa., and with the Washburn & Moen Manufacturing Company at Worcester, Mass., and Pittsburgh, Pa. For a number of years he was secretary and director of the Manufacturers' Club, Philadelphia. In the spring of 1911 while about to return from a visit to Bermuda, where he had gone for his health, Mr. Hughes suffered a stroke of paralysis which kept him from resuming his regular duties for nearly a year.

Henry Harbinson Sinclair, pioneer in electric transmission and hydroelectric development in California, whose death at Pasadena, Cal., Aug. 31, was announced in these columns last week, established the first water-power plan

on the Pacific Coast at Redlands, Cal., nearly twenty-five years ago. Born in Brooklyn, N. Y., in 1857, Mr. Sinclair went West at the age of twenty-two, and in 1889 purchased an orange grove at Redlands, Cal. Later, in company with three others, he organized the Redlands Electric Light & Power Company which developed the water power of mountain stream in the vicinity, being the first development of the kind in the State. After launching this undertaking Mr. Sinclair assisted in organizing the Southern California Edison



HENRY H. SINCLAIR

Company, originally the Edison Electric Company of Los Angeles, and became its vice-president, continuing to serve as such until his death. Several years afterward he acted as consulting expert for the Great Western Power Company of San Francisco, and in 1909 became its vice-president and general manager. In 1911 he left this organization, returning to southern California to give attention to personal interests. Mr. Sinclair was a noted yachtsman, having twice won the ocean race from San Francisco to Honolulu. He was a member of the California Club of Los Angeles and the Valley Hunt Club of Pasadena.

# Construction

## New England

**ROCKLAND, MAINE.**—The Rockland, Thomaston & Camden St. Ry. Co., of Rockland, has decided to erect a new transmission line to Warren for the purpose of furnishing electricity for the community.

**WEST FOWNAL, MAINE.**—Bids will be received by the State Board of Hospital Trustees, at the office of Dr. Carl J. Hedin, superintendent Maine School for Feeble-Minded, West Fownal, until Sept. 18, for construction of power plant and transmission line. Plans and specifications may be obtained at the office of the superintendent or at the office of Arthur B. Fels, engineer, 60 Union Street, Portland, Maine.

**DUMMERSTON, VT.**—The installation of an electric-lighting system in Dummerston is under consideration. It is proposed to secure electricity from the transmission lines of the Connecticut River Pwr. Co. of Brattleboro. The cost of erecting the line is estimated at \$3,500.

**GREENSBORO, VT.**—Surveys and estimates have been made for a 200-hp development at Greensboro, for \$20,000. The plant will supply electricity in the villages of Greensboro, East Hardwick, Craftsburg and Mill Village. M. L. Sanders, of White River Junction, is engineer.

**BOSTON, MASS.**—Merchants of Tremont Row and Howard Street have formed the Seaway Merchants' Association and have entered into a contract with the Somerset Co. to furnish electricity for lighting several blocks and also for ornamental street lamps. Standards will be erected from Pemberton Square to Somerset Street on Howard Street.

**HOLLIS, MASS.**—An electric company backed by the Connecticut River Pwr. Co., of Brattleboro, Vt., has submitted a proposal to supply electricity for lamps and motors in the town of Hollis.

**MANCHESTER, MASS.**—Arrangements are being made by the Manchester El. Co. to erect a new cable the entire distance from the Manchester-Beverly line to the electric power station on Summer Street, at a cost of about \$75,000.

**PITTSFIELD, MASS.**—A special committee has been appointed by Mayor P. J. Moore to inspect the old Van Sickle property in Appleton Avenue on the banks of the Connecticut River, consisting of mill buildings and stone dams recently been "molested, a dam across the river, a turbine and three acres of land, with a view to purchasing the property for use as a power house to furnish power to the city pumping station and also to be used as a substation or electricity which may be purchased from a transmission company in the northern part of the State. The price to the city is given as \$55,000.

**NARRAGANSETT PIER, R. I.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Oct. 1, for construction, complete, including mechanical equipment, interior lighting fixtures and approaches, of the United States post office at Narragansett Pier. Drawings and specifications may be obtained at the above office or from the custodian of site. O. Wenderoth is supervising architect.

**PROVIDENCE, R. I.**—Right-of-way has been acquired by the Rhode Island Co. of Providence for extension of transmission lines over Cherry Hill Avenue from the Providence & Danielson Railway through Hartford Road, Olneyville Terrace and Canton Heights.

**WESTERLY, R. I.**—The Westerly Lt. & Pwr. Co. expects to erect within the next six months a substation (step-up) near Westerly, to supply electricity in Watch Hill and Westerly View and Weekapaug. R. I. W. H. Spellman is general manager.

## Middle Atlantic

**CAZENOVIA, N. Y.**—The Cazenovia El. Co. is contemplating an extension of its underground 2300-volt transmission system and also of its 120-volt secondary distribution system, amounting to a total of 6000 ft. of cable and duct, in the near future. Henry Burden is president.

**OBLESKILL, N. Y.**—The Courter El. Co. is contemplating to erect at once additional coal pockets with elevators. C. I. Borst is manager.

**DANVILLE, N. Y.**—Arrangements are being made by the Danville Board of Trade for installation of an ornamental lighting system on Main Street.

**GROTON, N. Y.**—The Board of Water and Light Commissioners expects to install

within the next 30 days two new boilers (which have already been purchased) to replace old ones in the municipal electric-light plant. C. O. Rhodes is clerk.

**ILION, N. Y.**—The Electric Light Commission has entered into a five-year contract with the Utica Gas & El. Co. (with the privilege of renewal for five years) to furnish electricity to operate the municipal electric-light system, to take effect Oct. 1.

**ITHACA, N. Y.**—The contract for additional and new power lines to be owned by the Ithaca Trac. Corp., has been awarded to Fred T. Ley & Co., of Springfield, Mass. The cost is estimated at about \$30,000. Ford, Bacon & Davis, of New York, N. Y., are engineers.

**NEW YORK, N. Y.**—Bids will be received by the Board of Trustees of the Bellevue and Allied Hospitals Department of New York, Bellevue Hospital, 415 East Twenty-ninth Street, New York, until Sept. 15, for furnishing and installing all electric and gas fixtures in the nurses' home, Harlem Hospital, on 136th Street, between Fifth and Sixth Avenues. Standard forms and specifications may be obtained at the office of the contract clerk and auditor, 400 East Twenty-ninth Street, New York.

**WATERLOO, N. Y.**—The Tracy Development Co., of Waterloo, has acquired the most of the water rights along the Seneca River, has closed a contract with the Locker Construction Co. for construction of buildings for an electric power plant, at \$98,540. The contract does not include machinery or equipment.

**ALLENTOWN, PA.**—The directors of the Consolidated Tel. Co. of Pennsylvania have approved plans for the installation of new plants at Carbonate, Oliphant and Myrny, at a cost of \$39,312; a new repair shop is to be erected at Hazleton, to cost about \$2,600, and improvements will be made to the main station at Reading, at a cost of about \$10,478. The company has also decided to rebuild the system in Allentown. The total cost of improvements contemplated by the company is estimated at \$100,000.

**FREEMANSBURG, PA.**—The Freemansburg El. & Pwr. Co. has been granted a franchise to install and operate an electric-lighting plant in Freemansburg. Provision, it is understood, has been made for street-lighting service.

**JOHNSBURG, PA.**—The property of the Johnsburg Lt. & Pwr. Co. has been purchased by George J. Kaehler, of Rochester, to represent a syndicate which has secured options on the electric plants in Kane, St. Mary's and Ridgway. The syndicate, it is understood, purposes to build two power plants to supply electricity to all towns between St. Mary's and Kane. The new plant will be erected in Kane and the other in the vicinity of Ridgway.

**LANSFORD, PA.**—Plans have been prepared by Jacob & Weishampel, of Allentown, for a power station for the State of Valley Lt., Ht. & Pwr. Co. of Lansford, to cost about \$7,000. G. M. Davis is president.

**LEWISTOWN, PA.**—Investigations are being made by the Municipal Council with a view of establishing a municipal electric-lighting system in Lewistown. The matter will be submitted to the voters at the November election. The cost of the plant is estimated at about \$70,000.

**NEW SEWICKLEY, PA.**—An application will be made by the State Department for a charter by L. C. Lamb, H. L. Mitchell and R. M. Evans for a company to generate and distribute electricity for lamps, heat and motive power. Sewickley Township. New Sewickley has not a post office.

**PHILADELPHIA, PA.**—Bids will be received by the committee on property of the Board of Public Education, Room 292, City Hall, Philadelphia, until Sept. 15, for alterations to add heating and lighting systems at various schools, in accordance with plans and specifications on file at the office of the superintendent of buildings, Room 212, City Hall Building, Philadelphia, where blank forms of proposals may be obtained.

**ROSSITER, PA.**—The Public Service Commission has given its approval of the incorporation of the Rossiter El. Co., of Canoe Township, Indian Township.

**SHAMOKIN, PA.**—The Penn Ltg. Co., of Shamokin, expects to erect within the next three months 6 miles of single-phase, 2300-volt transmission line. J. A. Britton is general manager.

**YORK, PA.**—The Edison Lt. & Pwr. Co., the Merchants' El. Lt., Ht. & Pwr. Co., the Lower Windsor Township Lt., Ht. & Pwr. Co., the Spring Grove Lt., Ht. & Pwr. Co., the Spring Township Lt., Ht. & Pwr. Co. and the Heidelberg Township Lt., Ht. & Pwr. Co. will be consolidated under the name of the Edison Lt. & Pwr. Co. Application for the merger is granted by the Public Service Commission.

The last four companies are now applying for charters. They were organized recently by the Edison company and have secured or are seeking franchises in their districts.

**YORK, PA.**—Bids will be received by the board of school directors of the school district of the city of York for construction of plumbing, drainage system, electric-lighting system and heating and ventilating system for the Jackson School Building and the Madison School Building, in accordance with plans and specifications on file in the office of M. O. Lewis, superintendent of building and grounds, Central School Building. Separate bids are to be submitted on electric lighting, plumbing and drainage systems and lighting system will be received by David N. Crider, secretary, Central School Building, until Sept. 14. Bids for heating and ventilating will be received at the same place until Sept. 29.

**ATLANTIC CITY, N. J.**—The Atlantic City El. Co., we are informed, does not contemplate installing a new plant. It was reported in the issue of Sept. 5 to have been granted a permit to erect a new power house.

**IRVINGTON, N. J.**—Plans are now being submitted to the board of public utility to submit the proposition to install municipal electric-light and water plants to the voters at the November election. The Town Commission has authorized Harry J. Stanley, commissioner, to investigate and report on the approximate cost of a municipal electric plant.

**PERTH AMBOY, N. J.**—The Board of Aldermen has adopted a resolution providing for submitting the proposal for establishing a municipal electric plant to the voters at the next general election.

**TRENTON, N. J.**—The contract for wiring the filtration plant for lamps and motors, and also for remodeling the wiring in the pumping station, has been awarded to the Electric Construction Co., of Trenton.

**BLUEFIELD, W. VA.**—The Appalachian Pwr. Co., of Bluefield, has started work on the erection of a 30,000-volt transmission line to Mullens, W. Va., a distance of 13 miles, and 5 miles of 13,000-volt distributing lines. D. M. Brown is construction superintendent.

**GREGGVILLE, W. VA.**—The town of Greggville has awarded the contract for the installation of an electric street-lighting system to the Stratford El. Co. Greggville has not a post office.

**SISTERSVILLE, W. VA.**—The Sistersville El. Lt. & Pwr. Co. is installing a 2000-hp Mesta Turvyn tandem double-acting gas engine, directly connected to a 1750-kva, 60-cycle, two-phase, 2400-volt Westinghouse generator. The contract for the installation has been purchased. A. M. Jones is superintendent.

**RICHLANDS, VA.**—The Richlands Service Corp., is contemplating the installation of an electric plant and transmission line to furnish electricity in Richlands, Cedar Bluff, Raven and the coal-mining companies on Big and Coal Creeks.

**WHITTELY, VA.**—The Southern Ry. Co. has awarded the contract for construction of power house and connection with the installation of automatic signals between Amherst and Whittely to I. C. Abbot, of Brandy, Va. E. Herman, of Washington, D. C., is chief engineer of the railway company.

**WISE, VA.**—The Norton Lt. & Pwr. Co., which owns the local electric-light plant, is erecting a transmission line from Norton and when completed will furnish electricity from its plant in Norton to operate the local system. The power house in Wise will be dismantled.

**WASHINGTON, D. C.**—Bids will be received at the office of the public printer, Washington, D. C., until Sept. 15, for changes to the 600-kw generators in the power plant of the Government Printing Office, Washington. For further information address Cornelius Ford, public printer.

**WASHINGTON, D. C.**—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Oct. 3 for shipbuilding cranes at the United States navy yards, Boston, Mass., and Philadelphia. The Navy Department may be obtained on application to the bureau or to the commandants of the navy yards named. H. R. Stanford is chief of bureau.

**WASHINGTON, D. C.**—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Sept. 29, for supplies to be delivered at various navy yards and naval stations as follows: Brooklyn, N. Y., Schedule 7276—ten 24-in. parabolic searchlight mirrors, 7300 lb. rolled soft flat-sheet copper; Schedule 7281—two electrical rotating shafts for hoisting machinery; Schedule 7282—one set motor-driven bending plate rolls, to bend 1/4-in. plate to circle



8 in. in diameter, 40 in. long. Schedule 7273—600 ft. 10 lb. wrought-iron pipe, standard and commercial lengths, threaded both sides, malleable tees and elbows, screws, cast iron bushings, flanges and couplings. Washington, D. C., Schedule 7220—universal 24 in. slapping machine complete; Schedule 7273—2000 lb. drawn seamless tubing (6 1/2 in. inside diameter, 7 1/4 in. outside diameter, 20 1/2 in. long). Newport, R. I., Schedule 7273—45 lb. hard-drawn, round-rod brass and rod and sheet copper; 45 lb. hard-drawn seamless brass tubing, 8-ft. to 12-ft. lengths, 1200 lb. seamless copper tubing, 600 lb. seamless bronze phosphor tubing, 8-ft. to 12-ft. lengths. Bids will also be received at the same place until Oct. 6 as follows: Brooklyn, N. Y., and Mare Island, Cal., Schedule 7287—miscellaneous glass and storage-battery hydrometers, rubber syringe bulbs, glass syringe tubes; Mare Island, Cal., Schedule 7285—7100 ft. paper-insulated, single-conductor, lead-sheathed cable, 1100 ft. paper-insulated, two-conductor, lead-sheathed cable, 4000 ft. paper-insulated and two-conductor cable. Bids will also be received at the same place until Oct. 13 for the following: Brooklyn, N. Y., Schedule 7301—for furnaces, and for installing miscellaneous refrigerating apparatus; Mare Island, Cal., Schedule 7301—eight motor-driven (convertible type) fans. Bids will also be received until Oct. 20 for miscellaneous globes, receptacles, insulators, caps, lamps and sleeves to be delivered at Pearl Harbor, Hawaii, San Francisco, Cal., or New York, N. Y., as per Schedule 7283. Applications for proposals should designate the schedule desired by number.

**WASHINGTON BARRACKS, D. C.**—Bids will be received at the engineer depot, United States Army, Washington, D. C., until Sept. 16 for furnishing 100 cable racks with foot and 100 without foot. For further information address Joseph E. Kuhn, Lt. Col. of Engineers.

**WASHINGTON BARRACKS, D. C.**—Bids will be received at the engineer depot, United States Army, Washington, D. C., until Sept. 15 for furnishing two four-circuit, 250-volt panel boxes, eight 125-volt panel boxes, and two 125-volt, eight-eight-circuit, 125-volt, eight ten-circuit, 125-volt, and 500 extra 125-volt, 10-amp fuses. For further information address Joseph E. Kuhn, Lt. Col. of Engineers.

## North Central

**BATTLE CREEK, MICH.**—New bids will be asked for the ornamental lamp standards to be erected on West Main Street and Washington Avenue. Sufficient funds have been raised to provide for the extension of West Main Street to Washington Avenue, at \$100 per standard, the price originally paid when the lamps were installed on Main Street. Recent bids submitted are considerably above the amount.

**HAMTRAMCK, MICH.**—Contracts have been awarded by the City Council to the Peninsular El. Lt. Co. for the installation and maintenance of a new lighting system on Joseph Campbell Avenue, between the southern village limits to Caniff Road, incandescent lamps of 100 cp will be used and will cost about \$6,500.

**POTTERVILLE, MICH.**—The Council is considering a proposal submitted by R. Peck, of St. John, Mich., for the installation of an electric-light plant in Potterville.

**RAISINVILLE, MICH.**—The River Basin Hydro-Electric Co., recently incorporated, is installing an electric-light plant. The equipment will include three 100-hp. Leffel-Samson waterwheels, Woodward water-wheel governors and one 100-kva. El. Machinery Co. generator. The distributing system will run 10 miles from the power wire. W. H. Knapp, of Monroe, is engineer in charge of the work.

**SUTTONS BAY, MICH.**—Several changes, it is reported, have been authorized to the local business sections of the W. E. Flickenger, engineer of the Michigan Inspection Bureau, which will be carried out.

**CEDARVILLE, OHIO.**—Within the next six months the Cedarville El. & Pwr. Co. expects to purchase one 150-hp to 200-hp steam engine. O. L. Smith is secretary and treasurer.

**CINCINNATI, OHIO.**—An ordinance has been introduced in the city council granting the Diamond El. Co. a franchise to maintain conduits through Hatters Alley, Fountain Place and Thorpe Alley.

**CINCINNATI, OHIO.**—The installation of an ornamental lighting system on the upper and the central business sections of Vine Street is being considered by the Central Vine Street Business Association. Silas Waters is president of the association.

**CLEVELAND, OHIO.**—The Continental Gas & El. Corp., of Cleveland, Ohio, has acquired the properties formerly controlled by the Iowa-Nebraska Pub. Ser. Co. and the Iowa Gas & El. Co. The two companies supply 12 towns in Iowa and Nebraska with gas and electrical service, and \$250,000 has been appropriated for improvements and betterments to the properties. The Continental Gas & El. Corp. now operates in 45 towns in Iowa and Nebraska.

**COSHOCTON, OHIO.**—The Ohio Service Co., of Coshocton, has applied to the Public Utilities Commission for permission to issue \$630,000 in bonds for use in purchasing a number of electric and gas properties in small Ohio towns.

**LEIPISCH, OHIO.**—The Leipisch El. Lt. Co. expects to erect within the next 30 days four arc lamps and four 100-cp incandescent lamps and to purchase three 10-kw. transformers, also within the next eight months to purchase one 350-hp water-tube boiler. J. W. Cottingham is owner and manager.

**MARTINSVILLE, OHIO.**—The Wilmington Wtr. & Lt. Co., of Wilmington, has submitted a proposal to the Village Council to extend its transmission lines to Martinsville to furnish electricity for lighting the streets of the village and for domestic and commercial purposes. C. Jeannot is superintendent of the Wilmington company.

**PORTSMOUTH, OHIO.**—The City Council is contemplating the installation of electric street lamps in a suburb of the city, which is now without street-lighting service.

**PORT CLINTON, OHIO.**—The City Council has awarded the contract for street lighting to the Port Clinton El. Lt. & Pwr. Co. for a period of 10 years. Under the terms of the contract the company is to install an ornamental street-lighting system and additional lamps will be erected throughout the city.

**WILMINGTON, OHIO.**—The Clinton Tel. Co., of Wilmington, has applied to the State Utilities Commission for permission to issue \$20,000 in bonds, of which the proceeds of \$20,000 will be used for the construction of a new office building in Wilmington, \$22,000 for a new switchboard, other exchange equipment, and for improvements to its system here, and \$8,000 for improvements to its system in Sabina.

**YOUNGSTOWN, OHIO.**—Transformers and other equipment, besides considerable other apparatus, was destroyed by fire at the Lowellville station of the Mahoning & Shanango Ry. & Lt. Co., of Youngstown. The equipment will be replaced at once.

**BEATTYVILLE, KY.**—A 20-year franchise to supply electricity in Beattyville is offered for sale by the city officials, bids for which are now being received by R. B. Jackson, Mayor.

**CORBIN, KY.**—The proposal to issue \$15,000 in bonds for the purchase of the property of the Home El. Lt. Co., of Corbin, has been submitted to the voters at the November election.

**IRVINE, KY.**—The installation of an electric-light plant in Irvine is under consideration. Clyde Gaines is interested in the project.

**ARGOS, IND.**—The town of Argos is now installing a street-lighting system. C. E. Vandorn is superintendent.

**FORT WAYNE, IND.**—Plans are being considered to erect ornamental lamps on the new St. Joe Boulevard Dike now completed, from Columbus Street to the north.

**MADISON, IND.**—The Public Service Commission has granted the Madison Lt. & Ry. Co. permission to issue \$25,000 in bonds for extensions and improvements, including the installation of new boilers, an engine and generator and extensions to local lines. The company is now erecting a transmission line to Hanover to furnish electricity to operate the system of the Hanover Lt. Co.

**MUNCIE, IND.**—The City Council is considering the installation of an ornamental lighting system in the business district.

**ELMWOOD, ILL.**—Plans are being prepared for a municipal electric plant in Elmwood by L. W. Lemon, of Clinton, engineer.

**PATOKA, ILL.**—A movement has been started to establish an electric-light and power plant in Patoka.

**ROCK FALLS, ILL.**—The Public Service Commission has granted the Illinois North-Western El. & Pwr. Co., of Dixon, permission to purchase the electric plant, equipment and franchise of the Northwestern Barb Wire Co. at Rock Falls.

**ROCK ISLAND, ILL.**—Application has been made to the City Council by the Central Union Tel. Co. for permission to install underground conduits on the Seventh Avenue Boulevard between Thirtieth and Forty-sixth Streets and on Eighteenth

Street between the alley between First and Second Avenues to the river.

**CLINTONVILLE, WIS.**—Within the next three months the water and light committee expects to purchase one 12-in. by 36-in. or 12-in. by 30-in., simple Corliss engine, with double-acting valve gear. George C. Stewart is superintendent.

**ENDEAVOR, WIS.**—The Endeavor Lt. & Pwr. Co. expects to purchase within the next few months an oil engine. William H. Burwell is manager.

**FREDERIC, WIS.**—G. F. Grink, of Frederic, is planning to build a 9-mile electric plant and erect a 9-mile transmission line into Frederic this fall.

**MAUSTON, WIS.**—The Mauston El. Ser. Co. expects to purchase within the next six months one waterwheel governor. J. E. Carroll is manager.

**MONDOVI, WIS.**—Plans are being prepared, it is reported, by C. A. Dorfneid of Kenosha, for rebuilding the local electric-light plant.

**TWO RIVERS, WIS.**—The electric light commissioners are contemplating the installation of an ornamental street-lighting system in the business section of the city.

**WAUSAU, WIS.**—Extensions to the ornamental street-lighting system are reported to be under consideration.

**DULUTH, MINN.**—The cost of building an electric substation in West Duluth, which would supply the section of the city and adjacent sections is estimated at \$30,000 by Commissioner Merritt. This estimate was made for the commissioner to use in illustrating a municipal electric-light plan for the entire city in case the Duluth Edison Co. refuses the offer of \$1,075,940 for its property and franchises.

**KENYON, MINN.**—The Kenyon Lt. & Pwr. Co. has entered into a contract with the Consumers' Pwr. Co., Faribault, for the purchase of energy for a period of ten years. The Consumers' Pwr. Co. will erect a transmission line (1 mile) to reach the point of delivery and the local company will distribute same. When changes are completed a 24-hour service will be established.

**MOORHEAD, MINN.**—Bids will be received by the State Board of Control, State Capitol Building, St. Louis, until Sept. 2, for construction of classroom building to the State Normal School at Moorhead, including general building work, heating, plumbing, and electrical work, in accordance with plans and specification prepared by C. H. Johnston, architect, and to be submitted on each division of the work.

**GRUNDY CENTER, IA.**—The new building (74 ft. by 64 ft., cement block and hollow tile), to replace the power station in the local town, is nearly completed, and all the equipment except a 125-kva alternator has been purchased. Two of the boilers of the old plant were saved and will be used. The new coal plant will have a capacity of 25 tons per day. J. B. Calderwood is owner and manager.

**GLASGOW, MO.**—The contract for erecting a transmission line from Glasgow to Armstrong, Mo., has been awarded by Tattle & Pike, consulting engineers, Kansas City, Mo., to F. H. Wheeler, of Omaha, Neb., at \$5,226.

**ST. LOUIS, MO.**—Plans are being considered by the West End Business Men's Association for the illumination of Franklin Avenue to Twelfth Street at Beaumont. It is proposed to install arc lamps.

**ALEXANDRIA, S. D.**—Bids will be received at the office of H. M. Schumacher, city auditor, Alexandria, until Oct. 5, for furnishing a street-lighting system. K. S. Putnam, of Huron, S. D., is consulting engineer. For details see proposal column.

**DALLAS, S. D.**—The B. H. Martin El. Lt. & Pwr. Co., of Dallas, expects to purchase within the next 30 days a waterwheel (it will utilize 4000 gal. of water per minute under a 160-ft. fall), one 30-kw, direct-current generator, 20-hp motor and hydraulic pump and wiring supplies. E. H. Marti is president.

**LEAVENWORTH, KAN.**—The city commissioners have signed a contract with Leavenworth Lt. & Pwr. Co. for the installation of an ornamental lighting system on the business section of the city. The contract provides for the erection of 70 standards carrying five-lamp clusters.

**PEABODY, KAN.**—The Peabody Lt. & Pwr. Co., it is reported, is contemplating the installation of an ornamental lighting system on the business section of the city. J. B. Davis is president and manager of the company.

## Southern States

**HAZLEWOOD, N. C.**—The town of Hazlewood is contemplating issuing \$15,000 in water, light and sewer bonds.

**WATERBORO, N. C.**—Within the next three months the Electric Light Commission expects to purchase wire, insulators and transformers to change lines from Main Street on account of the ornamental street-light system to be installed on Main Street by the North Carolina Pub. Ser. Co. O. E. Stuart is superintendent.

**SALUDA, N. C.**—The city of Saluda is contemplating the installation of a water, light and sewer system, for which \$10,000 in bonds have been issued.

**WINTON, N. C.**—The contract for installation of a municipal electric-light plant is reported to have been awarded to the J. W. Smith El. Co., of Winton. The plant will be driven by steam power; later the town proposes to develop water-power and enlarge plant.

**WATERBORO, S. C.**—A petition has been presented to the Town Council asking that the city be authorized to submit to the voters the proposal to issue \$15,000 in bonds for the purpose of installing a municipal electric-light plant.

**ATLANTA, GA.**—Bids will be received at the special bid opening of the Department of Prisons, Department of Justice, Washington, D. C., until Sept. 24 for furnishing and delivering elevator equipment for the hospital building at the United States penitentiary at Atlanta, Ga. Plans and specifications may be obtained at the above office. F. H. Duehay is superintendent.

**AUGUSTA, GA.**—Bids will be received by the special bid opening committee of the City Council of Augusta until Sept. 25 (extension of date) for furnishing and installing X-ray apparatus at the University Hospitals in Augusta. Specifications may be obtained upon application to W. C. Lyle, M.D., vice-dean.

**CRAWFORDVILLE, GA.**—J. A. Ingram, of the Modern Equipment Co., it is reported, has submitted a proposal to the City Council to install an electric-light plant, to cost about \$4,000.

**PAVO, GA.**—The contract for construction of the proposed municipal electric-light plant has been awarded to the J. B. McCrary Co., engineer, of Atlanta.

**SYCAMORE, GA.**—The City Council has awarded a contract for the installation of an electric-lighting system in Sycamore.

**FORT MEADE, FLA.**—Bonds to the amount of \$25,000 have been voted for the installation of a municipal electric-light plant.

**HOMESTEAD, FLA.**—The City Council is considering the question of asking the State Legislature for permission to issue \$50,000 in bonds to construct an electric-light plant, water-works system, etc.

**KEY WEST, FLA.**—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Sept. 26 for furnishing and erecting one 200-hp water-tube boiler, with setting, stack and accessories, at the naval station, Key West, Fla. Plans and specifications may be obtained on application to the bureau or to the commandant of the navy yard named. H. R. Stanford is chief of bureau.

**MACCLenny, FLA.**—The Council is considering the question of submitting the proposed plan to install an electric-light plant and water-works system to the voters.

**PABLO BEACH, FLA.**—At an election held Sept. 15 the proposal to issue \$15,000 in bonds to establish a municipal electric-light plant will be submitted to the voters. J. M. Mier is town clerk.

**SEVIERVILLE, TENN.**—The Walker Milling & Produce Co., which is building a concrete dam at its mill, 2 miles east of Sevierville, will it is understood, install an electric plant and furnish electricity for lighting the town. Preparations are now being made to wire the town for electric service.

**MERIDIAN, MISS.**—Bids will be received by R. L. Blankens, city clerk and treasurer of the city of Meridian, until Sept. 22 for the construction of a new city hall. Copies of plans and specifications may be obtained from the city engineer, Meridian, for which a deposit of \$25 will be required, to be refunded upon return of same.

**PINEVILLE, LA.**—Plans are being considered by the State Board of Control, Baton Rouge, for the installation of a power plant at the State Insane Asylum, plans for which are being prepared by Favrot & Livaudais, of New Orleans.

**MUSKOGEE, OKLA.**—Bids will be re-

ceived at the office of the supervising architect, Treasury Department, Washington, D. C., until Sept. 25, for the installation of a system of electric passenger elevators in the United States post office and court house at Muskogee. For details see proposal columns.

**FOND CREEK, OKLA.**—Within the next three months the city of Fond Creek expects to purchase one 50-kva generator and exciter, one 50-hp internal-combustion engine, two 20-hp single-phase motors and two centrifugal pumps for the municipal electric-light plant, and to erect about 1 1/2 miles of transmission line. C. C. Shepard is city superintendent.

**AUSTIN, TEX.**—The City Council has appropriated \$4,000 for the purpose of laying conduits in which the electric-light cables will be placed in the nearest parallel alley between Seventh and Tenth Streets. The Council is also contemplating placing all wires along the alleys south of Seventh Street to Fifth Street, and from the power house along West Avenue to Fifth Avenue, later on, the cost of which is estimated at \$20,000.

**DALLAS, TEX.**—Negotiations have been closed between the Texas Pwr. & Lt. Co. and the Texas Trac. Co., under the terms of which the Texas Pwr. & Lt. Co. will furnish energy to operate the traction system and has leased the electric generating plant of the traction company at McKinney. Transmission lines will be erected to connect the present transmission system of the Dallas Pwr. & Lt. Co. with a northern group of towns served by the company. Work will also soon be started on the new generating station on the Oklahoma side of the Red River.

**EASTLAND, TEX.**—The Eastland Lt. & Pwr. Co. recently installed a 50-hp internal-combustion engine. Allen D. Dabney is president.

**FORT STOCKTON, TEX.**—The Fort Stockton Lt. & Pwr. Co. expects to install an internal-combustion engine to replace the steam engine in use within the next six months. E. F. Woodruff is manager.

**GREENVILLE, TEX.**—The Greenville, Whitewright & Northern Trac. Co. has amended its charter, changing its name to the Greenville & Northwestern Ry. Co. Plans for construction of the proposed railway, including erection of power plant, are well under way.

## Pacific States

**CATHLAMET, WASH.**—Steps have been taken for the installation of a municipal electric-light plant in Cathlamet. The initial installation provides for an engine-driven unit costing about \$5,000. Usually it is proposed to utilize the water-power of the Elcomen River, near here, to operate the plant.

**PUYALLUP, WASH.**—The County Commissioners of Pierce County have granted a franchise to the Puyallup Lt. & Pwr. Co., organized with a capital stock of \$25,000, a franchise to erect electric transmission lines and telephone lines on the county roads. The company will supply electricity to the farmers on the south side of the Puyallup River between Tacoma and Puyallup.

**SEATTLE, WASH.**—The city utilities committee of the City Council has authorized an appropriation of \$5,000 for the city light funds to be used in investigating and surveying the proposed power project on Lake Cushman.

**SEATTLE, WASH.**—The Commissioners of King County have granted the city of Seattle authority to extend the transmission lines of the municipal electric-light system from Bryn Mawr to Renton, and along the line of the State Aid Road No. 7, to extend the continuation of Ranier Boulevard.

**SHERIDAN, ORE.**—The Sheridan Lt. & Pwr. Co. has just completed the erection of a 5-mile transmission line connecting Sheridan and Tillamook. The company will furnish electricity to farmers residing along the line. J. F. Thompson is general manager.

**SUMMERVILLE, ORE.**—The Klees El. Co., of Summerville, will let contract for 2,000 ft. of pipe line this fall. The company is now erecting 7 miles of 6600-volt, three-phase pole transmission line. It will also install a 20-in. waterwheel this year. C. E. Rogers is engineer.

**REDDING, CAL.**—The substitution of the Northern California Pwr. Co. at Redding was destroyed by fire on Aug. 28, leaving the city without light, power and water service.

**SAN DIEGO, CAL.**—The San Diego

Consol. Gas & El. Co. expects to purchase within the next few months (through the Chicago office of H. M. Bylesby & Co.) three 1000-kva, 220/11,000-volt transformers. The company is now installing two 600-hp Babcock & Wilcox water-tube boilers, one 5000-kva General Electric three-phase, 60-cycle turbo-generator, one 100-kw General Electric turbo-exciter, and one 500-kw, 600-volt, direct-current motor-generator set. L. M. Klauber is superintendent of electric department.

**TAYLORSVILLE, CAL.**—The California Water Power Commission has granted the Engels Copper Mining Co., which is operating extensive copper deposits in Lights Canyon near Taylorsville, permission to develop a hydroelectric power plant on Lights Creek, utilizing 60 second of water. Electricity generated at the plant will be used to operate the machinery at the mines.

**LEWISTON, IDAHO.**—A survey has been made of the Clearwater River by J. W. Morris, of Portland, Ore., with a view of constructing a hydroelectric power plant for the city of Lewiston. As yet Mr. Morris' report has not been submitted. J. G. Wagner is superintendent of the water-works system.

**WALLACE, IDAHO.**—Surveys are being made by George H. Potter and Arthur C. Pratt, engineers, of the Montana Pwr. Co., near Butte, Montana, with a view of a new high-tension transmission line from Wallace to connect with the main line of the Chicago, Milwaukee & Puget Sound Railway at some place near Mullan.

**MANTI, UTAH.**—The city of Manti has recently installed an ornamental lighting system on Main Street. The poles are set four to the block, mounted with 60-cp tungsten lamps, with 100-cp lamps at each corner street. Within the next two months the city expects to purchase one or two transformers from the Capital El. Co., of Salt Lake City. George Brox, manager.

**SALT LAKE CITY, UTAH.**—The Utah Pwr. & Lt. Co., of Salt Lake City, has applied to the City Council for authority to take over the Utah Lt. & Rys. Co., which owns and operates the street railway and electric light and power systems of Salt Lake City and adjoining towns, and also the gas and electric light and power systems in Ogden. The Salt Lake Lt. & Trac. Co., recently incorporated with a nominal capital stock of \$1,000,000, was organized by the city and franchises of the Utah Lt. & Rys. Co.

**HIGLEY, ARIZ.**—Arrangements are being made by the Chandler Improvement Co. for the installation of an electric plant in Higley to supply electricity to pump water for irrigating purposes. J. T. Germann, of Higley, is reported interested in the project.

**JEROME, ARIZ.**—The American Hydraulic Pwr. Co. has applied to the Corporation Commission for permission to issue \$200,000 in bonds for the construction of a larger plant on the Upper Verde River. It is understood that transmission lines from the new plant will reach many communities in this vicinity and will furnish energy to the cities of Jerome and also for pumping water for irrigation purposes in the valleys north.

**NOGALES, ARIZ.**—The International Gas Co., of Nogales, is contemplating the installation of an electric plant to supply electricity for lamps and motors in this city and also in Nogales in Sonora, Mexico; also to furnish energy for a large pumping irrigation project in that vicinity. An ice factory is also included in the project. The company has applied to the corporation commission for permission to issue stocks and bonds amounting to approximately \$300,000. Spino S. Proto, of Nogales, is president of the company.

**SIDNEY, MONT.**—The Glendive Ht. Lt. & Pwr. Co., of Glendive, has applied to the City Council for a franchise to install an electric-light system in Sidney.

**WHITE OAKS, N. M.**—The Wild Cat Mining Co., of White Oaks, is contemplating the construction of an electric power plant and the erection of transmission lines to its mines in Noral Canyon and to Carrizozo. A. B. Graham, J. H. Fulmer, J. T. Mishawka, and others, are interested in the company.

## Canada

**BRANTFORD, ONT.**—Tenders will be received until Sept. 16 for the installation of an electric passenger elevator, including motor-generator set and shaft, for use in Brantford. Plans and specifications may be obtained from the Department of Public Works, Ottawa. E. C. Desrochers is secretary.



## Miscellaneous

MELBOURNE, AUSTRALIA.—Bids will be received by Peter McRidge, agent general for Victoria, Melbourne Place, Strand, London, W. C. England, until Oct. 14 for furnishing and delivering at the port of Melbourne supplies as follows: Contract No. 25,823—low-tension headgear and instruments; Contract No. 26,108—low-tension cables; Contract No. 26,111—fuse distribution boxes and fuses. Specifications,

etc., may be obtained on application to John Coates & Co., Ltd., consulting engineers, 115 Victoria Street, London, S. W., England. For details see proposal columns.

## New Incorporations

ALAMEDA, CAL.—The Mountain L. & Wtr. Co. has been incorporated with a capi-

tal stock of \$25,000. The directors are: J. F. Hughes, M. J. Russell and Grace L. Stulwell. Hyattsville, Md.

PEABODY, KAN.—The Peabody Lt., Ht. & Pwr. Co. has been chartered with a capital stock of \$20,000.

LEWISTOWN, MONT.—The Polmar El. Co. has been incorporated with a capital stock of \$10,000 by Ray R. Polson, W. J. Dittmar and Harry A. Polson, all of Lewistown.

# Weekly Record of Electrical Patents

## UNITED STATES PATENTS ISSUED SEPT. 1, 1914.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York, N. Y.]

- 1,108,883. BATTERY CONNECTIONS; J. Bijur, New York, N. Y. App. filed Sept. 6, 1913. Particularly for storage batteries.
- 1,108,886. SYSTEM OF DISTRIBUTION; F. Conrad, Pittsburgh, Pa. App. filed June 6, 1911. Storage-battery charging.
- 1,108,890. OVEN; R. W. Davenport, Detroit, Mich. App. filed Nov. 25, 1912. Multiple chamber electric heater.
- 1,108,892. IGNITION COIL; E. Eismann, Stuttgart, Germany. App. filed Nov. 9, 1911. Resistance in the primary circuit.
- 1,108,895. SIGNALING BY SOUND AND OTHER LONGITUDINAL ELASTIC IMPULSES; R. A. Fessenden, Brookline, Mass. App. filed Jan. 10, 1914. For submarine work.
- 1,108,905. MOTOR CONTROLLER; C. T. Henderson, Milwaukee, Wis. App. filed April 23, 1909. Automatic acceleration.
- 1,108,907. MOTOR CONTROLLER; A. J. Horton, White Plains, N. Y. App. filed June 6, 1908. Adjustable maximum.
- 1,108,919. HEATER; F. F. Long, Campbellford, Ontario, Canada. App. filed May 13, 1913. For candy-making, etc.
- 1,108,924. ELECTRIC FURNACE; J. W. Moffat, Toronto, Ontario, Canada. App. filed Nov. 22, 1913. Reduction chamber and tilting crucible.
- 1,108,927. ELECTRIC SIGNALING SYSTEM; C. P. Nachod, Philadelphia, Pa. App. filed Feb. 25, 1910. Block system for electric railways.
- 1,108,931. SYSTEM OF ELECTRICAL DISTRIBUTION; J. S. Peck, Manchester, Eng. App. filed Oct. 2, 1909. Polyphase alternating current.
- 1,108,934. TEMPERATURE INDICATOR; M. C. Rypinski, Bradwood, Pa. App. filed Jan. 5, 1907. Differential resistance.
- 1,108,940. COLLECTOR RING; C. W. Starker, Pittsburgh, Pa. App. filed Dec. 6, 1912. Insulation.
- 1,108,998. SIGNALING SYSTEM; M. Levison, Chicago, Ill. App. filed April 15, 1911. Annunciator system for hospitals, etc.
- 1,109,016. COUPLING; G. A. Quin, Toronto, Ontario, Canada. App. filed Feb. 24, 1913. Conduit fishing.
- 1,109,034. SEALING-WAX-APPLYING DEVICE; B. Bryan, Washington, D. C. App. filed June 17, 1912. Electric heater.
- 1,109,036. ELECTRIC FUSE; P. C. Burns, Chicago, Ill. App. filed Sept. 14, 1905. Cartridge type.
- 1,109,037. MOUTHPIECE ATTACHMENT FOR TELEPHONE TRANSMITTERS; P. C. Burns, Chicago, Ill. App. filed Aug. 12, 1909. Glass with attachment.
- 1,109,058. INSULATOR; O. J. Fritz, Weisenburg, Pa. App. filed Aug. 23, 1913. Slotted-pole-line type.
- 1,109,064. IGNITION APPARATUS; P. H. Hawker and I. J. Reutter, Anderson, Ind. App. filed Dec. 2, 1912. Regulating resistance.
- 1,109,091. TIME-LIMIT CONTROL FOR CIRCUIT-BREAKERS; C. S. Van Nuis, New Brunswick, N. J. App. filed Feb. 19, 1909. Retarding device with a reservoir and float.
- 1,109,111. TELEPHONE SYSTEM; O. Coleman, Wawanesa, Manitoba, Canada. App. filed April 8, 1912. Party-line selective ringing.
- 1,109,128. GALVANIC CELL; M. L. Kaplan, Brooklyn, N. Y. App. filed Jan. 27, 1914. Depolarizing hydrated manganite.
- 1,109,129. GALVANIC CELL; M. L. Kaplan, Brooklyn, N. Y. App. filed June 1, 1914. Depolarizing manganous polymanganite.
- 1,109,163. TELEPHONE-EXCHANGE SYSTEM; E. R. Corwin, Chicago, Ill. App. filed Aug. 10, 1912. Electromagnetic extensions.

- 1,109,164. TELEPHONE-EXCHANGE SYSTEM; E. R. Corwin, Chicago, Ill. App. filed Aug. 10, 1912. Common selector switches.
- 1,109,165. TELEPHONE-EXCHANGE SYSTEM; M. L. Johnson, Chicago, Ill. W. App. filed Aug. 10, 1912. Condition signal.
- 1,109,166. TELEPHONE; M. L. Johnson, Chicago, Ill. App. filed Oct. 9, 1912. Semi-automatic extension.
- 1,109,167. TELEPHONE; M. L. Johnson, Chicago, Ill. App. filed Oct. 9, 1912. Semi-automatic.
- 1,109,181. ELECTROGALVANIZING SOLUTION; G. Sacerdote, New York, N. Y. App. filed July 21, 1909. Includes salts of aluminum and manganese with acetic acid.
- 1,109,205. STATIC ELECTRIC MACHINE; J. B. Dempster, Des Moines, Ia. App. filed Oct. 9, 1911. Silica-crystal surface.
- 1,109,216. AUTOMATIC TELEPHONE-EXCHANGE SYSTEM; G. Grabe, Berlin, Germany. App. filed Dec. 11, 1909. Groups selector system.
- 1,109,234. RETRIEVING TROLLEY; C. E. Lang, Los Angeles, Cal. App. filed June 22, 1908. Automatic return.
- 1,109,235. CONTROL SYSTEM; H. A. Laycock, Schenectady, N. Y. App. filed Feb. 21, 1912. Voltage regulation.
- 1,109,236. REGULATING SYSTEM; H. A. Laycock, Schenectady, N. Y. App. filed April 28, 1913. Improvement on Tirrill vibrating contact, patent No. 726,234.
- 1,109,242. SIGNALING DEVICE FOR LETTER-BOXES; C. E. McIntosh and S. S. Hopkins, Waynesboro, Va. App. filed Jan. 13, 1913. Operated by lid.
- 1,109,244. CURRENT-REVERSING RELAY; E. J. Murphy, Schenectady, N. Y. App. filed March 5, 1913. Electromagnetic.
- 1,109,245. ELECTROMAGNETIC SWITCH; E. J. Murphy, Schenectady, N. Y. App. filed June 5, 1913. Mechanical construction.
- 1,109,310. TELEGRAPH KEY; B. B. Youmans, College Park, Ga. App. filed April 4, 1913. Equalizing resilient support.
- 1,109,311. METHOD AND MEANS FOR ELECTROLYZING SALINE SOLUTIONS; E. A. Allen, Rutherford Falls, Me. App. filed Jan. 1, 1912. Prevents absorption of chlorine.
- 1,109,325. ELECTRIC DRILL; W. O. Duntley, Chicago, Ill. App. filed May 2, 1904. Portable.
- 1,109,330. STABILIZING MEANS FOR ELECTRIC-ARC FURNACES; C. E. Guye, Geneva, Switzerland. App. filed Jan. 8, 1912. Coil of copper free from iron.
- 1,109,337. BRAKE-VALVE-CONTROLLING DEVICE FOR VEHICLES; F. T. Jones, Baltimore, Md. App. filed Dec. 27, 1912. Operated by shoe.
- 1,109,338. CONTROL OF ELECTRIC MOTORS AND APPARATUS THEREFOR; P. N. Jones and J. W. Welsh, Pittsburgh, Pa. App. filed Nov. 12, 1913. For vehicle drive.
- 1,109,339. SIGNAL SYSTEM; F. H. Webster, Marvel, Ark. App. filed Jan. 17, 1913. Visual calling signal operated on telephone circuit.
- 1,109,391. COLLAPSIBLE OUTLET BOX; W. J. Billings and M. P. Caffé, New York, N. Y. App. filed Aug. 15, 1912. Folding sides.
- 1,109,411. TELEGRAPH TRANSMITTER; R. F. Gale, Fort Wayne, Ind. App. filed Jan. 15, 1913. Automatic vibrator.
- 1,109,415. MINER'S LAMP; R. G. Harris, Peoria, Ill. App. filed Dec. 13, 1913. Combined with cap.
- 1,109,450. TESTING LAMP AND FUSE TESTING DEVICE; C. W. Mitchell, New York, N. Y. App. filed May 8, 1912. Pocket device.
- 1,109,470. POOR INSULATOR; J. A. Sanford, J. East Liverpool, Ohio. App. filed Feb. 21, 1913. Spacing elements.
- 1,109,472. TELEPHONIC AND TELEGRAPHIC APPARATUS; J. Schiessler, Vienna, Aus-

tria-Hungary. App. filed Aug. 19, 1908. Relay with incandescent resistance.

1,109,481. RAIN ANNUNCIATOR; J. H. Stroud, Mabel, Minn. App. filed Dec. 29, 1913. Hygroscopic element.

1,109,511. TELEPHONE-EXCHANGE SYSTEM; E. E. Clement, Washington, D. C. App. filed July 14, 1906. Automatic with relays.

1,109,534. CONTROLLING DEVICE FOR RAILWAY VEHICLES; C. König, Vohwinkel, Germany. App. filed Aug. 1, 1912. Indicates the movement.

1,109,536. APPARATUS FOR THE CONTROL OF ELECTRIC CIRCUITS; H. Leitner, London, Eng. App. filed May 5, 1913. Charging lighting circuits.

1,109,551. ELECTRIC RADIATOR; M. H. Shoenberg, San Francisco, Cal. App. filed Feb. 3, 1914. Reflection.

1,109,554. AUTOMATIC MUSICAL-INSTRUMENT PLAYER; I. B. Smith, Philadelphia, Pa. App. filed March 23, 1908. Electro-magnetically operated piano.

1,109,565. PERFORATING MACHINE; E. H. Bickley, Detroit, Mich. App. filed Dec. 26, 1912. For micrograph ribbon (see patent No. 1,050,203).

1,109,586. LINE-DISCONNECTING SWITCH; E. M. Hewlett, Schenectady, N. Y. App. filed May 5, 1909. For tower and pole work.

1,109,589. ELECTRIC-LAMP SOCKET; M. Larsen, New York. App. filed Jan. 18, 1908. Adjustable angle.

1,109,591. WELDING TOOL; S. S. Morgan, St. Charles, Mo. App. filed May 23, 1914. Portable hand tool.

1,109,592. ELECTRIC WELDING APPARATUS; S. S. Morgan, St. Charles, Mo. App. filed May 23, 1914. For attaching nails, etc.

1,109,594. ELECTRIC SWITCH; J. A. Osborn, St. Louis, Mo. App. filed June 1, 1911. For hand-welding tools such as those described in patents Nos. 1,042,467 and 1,042,468.

1,109,595. ELECTRIC SWITCH; J. A. Osborn, St. Louis, Mo. App. filed June 1, 1911. Foot-operated.

1,109,615. TELEPHONE-EXCHANGE SYSTEM; E. E. Clement, Washington, D. C. App. filed Sept. 21, 1905. Semi-automatic.

1,109,616. ELECTRICAL SIGNALING SYSTEM FOR TELEPHONE EXCHANGES; E. E. Clement, Washington, D. C. App. filed April 12, 1906. Composite.

1,109,617. TELEPHONE-EXCHANGE SYSTEM; E. E. Clement, Washington, D. C. App. filed June 23, 1906. Combination of manual and automatic (eighteen drawing sheets).

1,109,618. TELEPHONE EXCHANGE; E. E. Clement, Washington, D. C. App. filed July 20, 1906. Semi-automatic.

1,109,619. TELEPHONE-EXCHANGE SYSTEM; E. E. Clement, Washington, D. C. App. filed April 6, 1907. Automatic and manual control.

1,109,620. TELEPHONE EXCHANGE; E. E. Clement, Washington, D. C. App. filed Feb. 26, 1908. Selecting switches.

1,109,621. TELEPHONE APPARATUS; E. E. Clement, Washington, D. C. App. filed July 13, 1907. Automatic switches.

1,109,622. TELEPHONE APPARATUS AND SYSTEM; E. E. Clement, Washington, D. C. App. filed July 15, 1907. Impulse transmitter.

1,109,634. MAGNETIC ORE SEPARATOR; G. L. Seattle, Wash. App. filed May 24, 1913. Wet system.

1,109,650. TELEPHONE-EXCHANGE SYSTEM; T. G. Martin, Chicago, Ill. App. filed June 16, 1906. Trunking apparatus (14 claims).

13,795. (reissue). SIGNALING SYSTEM; E. R. Gill, Yonkers, N. Y. App. filed Aug. 16, 1913. Original patent No. 1,019,781 dated March 12, 1912. Train dispatching

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## Result of Secret Jobbers' Meetings

The Electrical Supply Jobbers' Association has doubtless convinced the Department of Justice that it is not a combination in restraint of trade. It opened one of its meetings at Niagara Falls last week to persuade the manufacturers of that fact, and also to show that it does not attempt to dictate prices. The shame of it all is that it should ever have been called on to make any such defense, or that its existence as a national body should ever have been threatened because of alleged illegal practices. But so long as the supply jobbers continue to meet behind closed doors, so long as they shroud their deliberations in secrecy, so long will their actions be viewed with suspicion. In this day and generation only those who have something to conceal or who purpose to do something they ought not to do meet regularly in secret. There are occasions when executive sessions are desirable and when matters of policy will dictate them, but when these are the rule rather than the exception suspicion is naturally aroused. We have implicit faith in the integrity of the jobbers' association as a national body. Its membership in the Society for Electrical Development shows that it can and will co-operate. The organization is a legitimate one. Its aims are honest and its purpose constructive. As one of the great divisions of the electrical industry it needs to give and to imbibe strength to and from the other branches. If it would measure up to the full stature of a national body, however, it must abandon the tactics of the ostrich. It has nothing to conceal and should not therefore, in justice to itself, invite the odium which attaches to closed sessions.

## Economy or Government Taxes

The imposition of government taxes to meet the deficit in revenues resulting from the war is both expedient and necessary. Since the government is compelled to take this step, all that business men can ask is that the taxes shall be distributed fairly. No burden should be laid upon classes of industries or people unless they are capable, under the changed conditions of war, of bearing it without distress. The next question is whether the government will do what any plain, prudent business man does when he is confronted with seriously reduced revenues. The government should look about to see where it can economize. When the government commits itself to an expense it thereby commits some element of the population to a part in the payment of that expense. The less it commits itself, the less there is to be collected in taxation. For the legitimate purposes of the government every dollar that

is wanted is proper. But for government waste, favoritism and unwise congressional appropriations not a penny should be spared under the emergency conditions of the times. Let the government officials who have been prodigal learn thrift. One great trouble with men who become habituated to public life is that they learn the ways of spending money but not of saving money. They are hardened spenders. When a tax is the simple means of overcoming deficits and no thought need be given to such a revenue-raising problem as ordinary business men confront the tax is likely to follow. But the resort to that easy course does not prevent government officials from reducing expenses if they but have the will to turn their activities in that direction.

## Effect of War on Gas Lamps

Manufacturers of gas mantles, who have been largely dependent upon Germany for their supply of thorium, are now face to face with the problem of producing mantles from present stock and domestic materials, maintaining at the same time, if possible, former prices. If the war is of short duration, it may be that they will succeed, but the fact that the manufacturers are entering upon an undertaking of magnitude is shown by the tone of letters written by the heads of two large mantle-manufacturing companies and printed elsewhere in this issue. The seriousness of this effort to keep down costs is shown by the fact that operating gas companies have been asked to save mantle ash that this scrap may be used to replenish the manufacturers' thorium supply. If the present situation should bring an upward trend in mantle prices, the advantages already held by tungsten lamps will stand out more clearly to the purchasers, and the sales of gas-filled electric lamps and of lighting fixtures should be greatly accelerated.

## Electrochemical Opportunities

One of the effects of the present terrible disturbance of the world's industries ought to be to awaken new interest in electrochemical matters in this country. In particular, the closing down of many of the Continental works will weigh heavily on the world's supply, and it looks as though attention might profitably be directed specially toward the manufacture of nitrates and nitric acid from the fixation of atmospheric nitrogen. As our readers well know, on the other side of the water there are many plants of this character, although some of the first impulses toward the exploitation of this field came from the inventors of our own country. The Scandinavian works, which are among the largest, are unaf-



fect, yet if the war continues for a considerable period, as it well may, the inevitable result will be to raise the prices of nitrates and nitric acid by a considerable amount, with small probabilities of a very rapid drop at the close of hostilities. Norway, we believe, holds the record for cheap energy production, some of the nitrate plants obtaining this from their own hydroelectric installations at a cost quoted as low as \$5 or \$6 per kilowatt per year. With such figures we can here perhaps hardly compete, but in many respects an electrochemical load, from its steadiness and the possibility in some instances of working it at off hours, is a highly desirable one. In fact, it is altogether likely that certain hydroelectric situations could be developed to furnish energy for eight or nine months a year when water is plenty at so low a figure as to attract electrochemical industries even if they had to work on short time or shut down during the months of low water. The utilization of hydraulic energy in such a form that it may be stored, so to speak, is a very important matter in utilizing the energy now running to waste, and the situation should encourage the upbuilding of such industries at this particular time. Nitrates for fertilizers find a ready market, and even fixation of atmospheric nitrogen directly into nitric acid, heretofore regarded as somewhat unprofitable, may be worth trying on a considerable scale.

### Storage Batteries for Isolated Plant Service

Out of the smoke of battle comes a rather striking contribution to the arts of peace, as exemplified in central-station practice, in the form of a brief paper on a large Berlin storage-battery installation of which some account is given in our Digest. The particular plant considered is that of the Kaiser Hotel in Berlin. It is very well known that from the standpoint of the central station hotel loads are rather troublesome. They add heavily to the peak without affording a large amount of long-hour service. For many reasons the tendency has been to install an isolated plant in a large hotel like the one under consideration. In the original installation at the Kaiser Hotel use was made of producer-gas equipment. For the past few years, however, the load has been carried by the central station and excellent results have been obtained.

Instead of taking the large hotel load, amounting to about 400,000 kw-hr. per year, directly on the mains, use was made of a large storage battery to take care of the whole load. The battery is charged at off-the-peak hours when the energy can be obtained at the lowest possible price. The battery, feeding energy to a  $2 \times 220$ -volt three-wire system, is charged by means of a pair of motor boosters between 10 at night and 7 in the morning, or at the lightest hours of station load, when the added duty is welcome. The upshot of the matter is that, allowing against the battery full charges for care, depreciation and interest, the gain by its installation is not less than a sixth of the total cost of energy without it, which in turn showed economy over the local generation of energy.

This plant furnishes an excellent example of means for filling up the load curve at the station to the advantage of all parties concerned. The plan is one which may well be of frequent assistance in getting business from that class of large consumers which ordinarily draws heavily on the peak load. There has been considerable tendency among the larger American stations to coddle the big consumer to an extent which the character of his load does not in the least warrant. In fact, there is little doubt that in some such cases energy is furnished at little if any above cost, and in order to keep up the average earnings the smaller consumers have to pay somewhat heavily for the anxiety of the central station to suppress the isolated plant. The plan tried in the Kaiser Hotel gives the consumer the benefit of a legitimate low rate without burdening the station and distributing network at unseemly times.

### Artificial Daylight

The article in this issue by Mr. M. Luckiesh on artificial daylight is an important contribution to the subject in that it deals with the use of the new gas-filled lamps modified by screens of colored glass to give a fair degree of efficiency and remain reasonably permanent. One of the fundamental difficulties in obtaining artificial daylight is to discover what daylight really is. The most casual consideration indicates that it is a very variable quality and that sunlight, whether direct or reflected from white clouds, is a very different thing from the light of the blue sky. Moreover, the variety of daylight desired for any particular use may represent either of these characters or something between them. To meet these varied requirements Mr. Luckiesh shows the results obtained from a bluish screen designed to give the effect of the northern sky, a screen giving an approximation to ordinary sunlight, and a still further modified screen of somewhat higher efficiency which perhaps may be regarded as approximately matching the sunlight of the late afternoon. The efficiency of the north-light screen is obviously very low even with the advantage of the gas-filled tungsten lamp as source. That of the other two is relatively better, since less of the longer waves of the spectrum have to be absorbed in order to obtain proper balance with the weak blue end of the source. Unquestionably for work where color matching is of importance such screens will be of considerable service, as indeed similar devices have already proved to be.

Considering the possible advantage of closely simulating the color of daylight in artificial illumination, it may well be questioned whether the game is worth the candle for general use, or indeed whether the artificial light may not actually be easier on the eyes than the natural light. Helmholtz once remarked that if an optician sent him an instrument as badly made from the optical standpoint as the human eye he would promptly return it, and from the standpoint of chromatic vision the eye is rather worse than in most respects. The ends of the spectrum, full red and deep blue, are fortunately

of very low luminosity, else we should never be able to get clear focus at all. The eye sets itself in focus for the rays of high luminosity in the center of the spectrum, and these as Mr. Luckiesh himself and others have shown give rather better vision than does the whole spectrum. It may therefore be considered questionable whether for ordinary purposes of seeing it is at all advantageous to increase the rays of low luminosity at the ends of the spectrum, which actually renders the retinal image less sharp, unless for the definite purpose of displaying particular color values. For this definite work artificial daylight is certain to have its use, and Mr. Luckiesh is to be congratulated on the advances he has made in this direction.

### Electrical Securities

The effect of the war on the value of securities cannot yet be rightly estimated since the stock exchanges are still closed and there is little light on what few private transactions have been undertaken. Even if the prices were of record, they would convey little information as to the real values which would be established in the case of an open market. It seems to us, however, that the holders of electrical securities stand much better than the average chance of retaining good valuations through this time of stress. So far as manufacture goes, of course, there is a slackening demand owing to the inability to get ready money for construction work. Yet, since all the foreign countries which are large manufacturers of electrical goods are crippled in output even if the doors of their works are not already shut, it would seem that the market in those countries which are at peace would within a reasonable length of time make up to the American manufacturers all the temporary injury of the home market. Nobody can yet safely predict how long the present hostilities will last. The longer the war endures the more serious will be the crippling of manufacturing industries from lack of men and money, if not from actual destruction of property. Even Italy and Switzerland, not yet involved in the actual struggle, are seriously affected by mobilization and are liable at any time to be drawn into the war with all that that implies. It looks, therefore, as though the American manufacturers of electrical products, although temporarily inconvenienced, will find in undenied export markets a valuable opportunity. As regards public utilities, there is even now being felt a light adverse pressure, unlikely, however, to become serious.

Lessened activity in many lines of work, throwing many out of employment, is bound to produce a temporary effect even on the receipts of central stations and railway companies. As the immediate pressure is relieved, however, as it is likely ere long to be, the lost business will come back, so that it does not seem probable that receipts will suffer more than a very temporary setback. Electric service has come to be so much of a necessity that it should not be given

up in any large measure unless during a period of depression unlikely to persist while the United States is the only great manufacturing country left in peaceful possession of the general market.

The effect of the war on this country is partly very real and partly psychological. Human nature becomes more or less hardened to long-drawn-out horrors, and capital, now held tight in unproductive isolation, will before long be coming out of retirement and looking after earnings. As it does so public utilities will find normal conditions of business returning, and there should be no considerable effect upon their earning values even though quotations may be somewhat lowered. This is no time, therefore, to let go of securities unless one is compelled to do so by necessity. Those who have interests in electrical manufacturing or operating enterprises would do well to rely on a reasonable assurance that earning values will hold up well as compared with those of other branches of industry less stable and not so firmly based.

### Municipal Operation Versus Commission Regulation

If agitations for municipal ownership and operation of public utilities were confined to localities not now being served by private companies or to communities in which the service is unsatisfactory or unduly expensive, present central-station owners might feel secure in the knowledge of the fact that the former and present high-grade economical service would render their property immune from confiscation or destructive competition. Such, however, is not always the case. In some cases the only important feature taken into consideration seems to be the fact that the municipality has the legal right to own and operate a plant if a sufficient number of citizens so desire. One fact practically always overlooked by the advocates of municipal operation is that the underlying elements which spell success under private operation are lacking when the utility is operated by the municipality. Reference is here made to the belief on the part of the employees that their promotion in the company depends upon merit and not political influence, and the knowledge on the part of the manager that his success in life is inseparably associated with the success of the utility in meeting the needs of the public. The claim that the city must own and operate the lighting plant as it does the water-works in order to obtain proper service for the citizens has little weight anywhere, and none at all in states in which the utilities are controlled by commissions. What the public wants is adequate and satisfactory service at reasonable rates, which result can be insured by proper commission regulation. Numerous examples can be cited to show that with privately operated utilities suitably regulated the result is much more satisfactory than with municipally operated utilities either with or without regulation. When the service is unsatisfactory or the rates too high the fault lies in the controlling commissions. The remedy is to be found in improved regulation and not in municipal operation.



# The News of the Week

## Activities and Events in the Electrical Field— Reports of Meetings—Commission Findings, Etc.

### Boston Edison Purchases Energy in Bulk

The Metropolitan Water and Sewerage Board of Massachusetts has sold to the Edison Electric Illuminating Company of Boston for a five-year period the entire output of a hydroelectric plant which is to be built during the next year by the board at the Sudbury reservoir, in Southboro. This plant will be the second of its kind to be constructed by the State in connection with the Boston water-supply system, the first installation having been made at Clinton about three years ago. The Sudbury station will be a three-unit plant with a total output of about 3,000,000 kw-hr. per annum. Two units will use the discharge of the reservoir into the Weston Aqueduct, the third outfit utilizing the discharge of the reservoir into the so-called Framingham Reservoir No. 3.

Three-phase, sixty-cycle energy will be delivered by the State to the Edison system at the boundary of the State property. The plant will be in operation sixteen hours per day except on Sundays and legal holidays. The Edison company's bid was \$6.25 per 1000 kw-hr. for all energy generated. The Connecticut River Transmission Company, which operates the most extensive high-voltage hydroelectric system in New England and which now purchases the greater part of the output from the Clinton station at \$5.30 per 1000 kw-hr., offered to pay \$5.50 per 1000 kw-hr., with the provision that the company would take not less than 1,000,000 kw-hr. yearly, and \$3 per 1000 kw-hr. upon a guaranteed minimum purchase of 2,000,000 kw-hr. annually.

### Electric Vehicle Course at Armour Institute

Prof. E. H. Freeman, of the Armour Institute of Technology, gave an informal talk to the Chicago Section of the Electric Vehicle Association on Sept. 8 concerning the new special course relating to electric vehicles now available at Armour Institute. The instruction given at Armour follows two lines—a regular four-year college course, and evening classes taking up more elementary studies. The special course in electric vehicles is an evening-class course. It consists of twenty lectures extending over a period of ten weeks, two lectures being given each week. The course is designed especially for practical men engaged during the daytime in electric-vehicle or garage work. The idea is to give instruction in the underlying principles relating to electric circuits, transformers, motor-generators and rectifiers, direct-current motors, storage batteries, controllers, various types of instruments, etc. A number of lectures will be given by men who are actively engaged in the automobile industry. The tuition fee for the course is \$10, and Professor Freeman asked for the active co-operation of the Electric Vehicle Association.

Announcement was made of a proposed run from Pittsburgh to Philadelphia and return at the time of the Philadelphia convention of the parent association next month. The evening's program, which followed a dinner at the Hotel La Salle, was concluded by a motion-picture play entitled "Selling Electrical Vehicles."

### Flood in Manila Interrupts Electric Service

Electric-lighting and street-railway service in Manila, P. I., was partially interrupted on Sept. 2 and 3 by a flood resulting from recent typhoons. According to cable advices received from the Manila Electric Railway & Light Company by its operating manager, the J. C. White Management Corporation, New York City, part of the company's generating plant were under water. Operation of the street railway was interrupted part of one day, and considerable difficulty was experienced in maintaining full electric service. On Sept. 3 electric service was improved and seventy-five cars were placed in operation. Normal service was resumed on the following day. Aside from slight damages to the roadbeds of the street railway and damage to a few cars, the electric-service company suffered little loss.

### Boston Street-Lighting Situation

At a meeting of the City Council last week Mayor Curley of Boston presented a new draft of the proposed street-lighting contract designed to supersede the present agreement with the Edison Electric Illuminating Company. The draft was prepared by Corporation Counsel John A. Sullivan after three conferences with President Charles L. Edgar and Counsel Frederick M. Ives, of the Edison company. While providing for ten-year agreement, it includes an important concession relative to rates. The previous price of \$87.53 per year is named for each 6.6-amp magnetite arc lamp with the provision that within ten days after the contract is signed it will be submitted at the request of both parties to the Massachusetts Gas and Electric Light Commission for decision as to the fairness of the above price. An adjoining clause declares that if a change in the price will be made if the commission decides that the contract price is too low. If the board decides that the price above quoted is too high, the company will accept the ruling of the commission as a fair price. Another concession is that only six months' notice instead of a year's warning shall be required in connection with the termination of the contract, and that in case of arbitration the board of appeal will not include a Massachusetts Institute of Technology professor, as named in the first draft, but will consist of three men, one chosen by each party and the third by these two. In discussing the proposed contract Mr. Sullivan assailed the proposal to terminate the present contract without agreeing upon a new one or pointing out that if such action is taken the city will have to pay at the rate of \$103.54 per lamp per year until the termination is effective, which cannot be in less than twelve months, and that a rate of \$108.54 would thereafter have to be paid for one or two years while arbitration was proceeding. More than 4000 lamps are involved. Councilman Watson, upon being challenged by the Mayor, virtually admitted that his municipality ownership plan, involving the expenditure of perhaps \$20,000,000, was devised for political rather than for practical purposes. The matter was taken under advisement.

### Municipal Ownership Agitation in Dayton

An ordinance was introduced in the Dayton (Ohio) Commission on Sept. 9 providing for the issue of \$500,000 bonds to secure funds for the construction of a municipal light plant. The ordinance was promoted by the socialists of the city, who ask that the citizens be allowed to express their desires at the election on Nov. 3. Mr. L. W. O'Brien, who appeared before the commission, suggested that if a municipal plant is to be established the Dayton Power & Light Company's plant be purchased and that a bond issue of \$5,000,000 be authorized for that purpose. He also stated that he is in a position to form a company to take over the municipal water-works system, which, he said, can be operated more economically and with greater satisfaction to the people than under the present plan. The fact that a tremendous amount of money will be needed in the near future by the city of Dayton for water-works rehabilitation, garbage disposal and street and river-front improvements will have an important bearing on the outcome, as will also the progressive attitude of the management of the Dayton Power & Light Company, which is serving the community efficiently at fair rates and which created a very favorable impression by the rapid rehabilitation of its electric-lighting properties in Dayton immediately after the flood.

### Gas-Mantle Industry in Predicament

Since thorium, the base of the incandescent gas mantle, has to quite a large extent been imported from Germany and present conditions make it impossible to secure the product from that source, serious attention has been given to the problem of supplying the United States with mantles. Letters from heads of two large mantle manufacturers, recently published in the *Gas Record*, seem to indicate that these concerns are making a determined effort to prevent raising the prices of mantles. In one of these letters Mr. Sidney Mason, president of the Welsbach company, said in part:

"The European war has seriously unsettled the mantle industry in the United States, and if the gas-lighting industry is not called upon to suffer it will be due simply to the foresightedness of our company and its ability, due to its capital resources, in providing enormous and expensive stocks of raw materials. We will have a serious and difficult task to handle the situation so as to prevent entirely any possibility of impairment, which, in the interest of gas lighting, means that gas mantles of good grade must be supplied to the consumer without raising the price and without any interruption in deliveries.

"We do not consider ourselves in a congratulatory position; on the contrary, we are very much distressed and are regretful of the plight not only of the domestic competitors but as well of the manufacturers abroad. There is not a day that I am not receiving cables from England and South America from concerns representing in their market a similar relation to our position in the American market urging our assistance for a thorium supply, and who, when the test comes, are found to be in the class with the foolish virgins—"without oil."

"We are now asking the gas companies' co-operation in making their demands to normal requirements in order that we shall have enough to go round and take care of everybody, and rigidly to conserve mantle ash, to be returned to us as augmenting our supply of thorium to enable us to keep to our announced plan of a reduction in price of high-grade mantles, made Aug. 1."

Mr. Charles R. Lindsay, Jr., president of the Lindsay Light Company, is less optimistic in a letter on the same subject and hints at increased prices. He says:

"I do not see any reason at the present time why the Lindsay Light Company should not be in shape to take care of our regular trade.

"It is true we use considerable material, such as glassware, thorium, chemicals, etc., part of which has heretofore been purchased in Germany, but I believe that it is only a question of a short time when we shall be in position to make practically all of our material here; but the cost of labor here will undoubtedly add considerably to the cost of these materials."

### Progress in Accident-Prevention Work

Mr. M. W. Alexander, of Boston, engineer for the General Electric Company, delivered an instructive address at a joint meeting of the American Foundrymen's Association and the American Institute of Metals in Chicago on Sept. 8. His subject was "Safety in Foundry Operations," but much that he said was of general application. Speaking of the safety-first movement, Mr. Alexander stated that personal caution is the most important element in the prevention of accidents. Next to it comes order, which makes for safety. Directions to employees should be given as a guidance and not as an injunction. Warning signs are necessary. The speaker recommended the one word "Danger" on a red background, red being universally recognized as the color indicating danger. With this word perhaps one or two others might be added, as "High Voltage" or "Railroad Crossing." An arrow may be added to the sign to point to the source of danger.

Mr. Alexander displayed a new and very compact and complete first-aid outfit, the packages, bottles and appliances being contained in a glass jar provided with a handle. An ingenious device shown was material for a splint, consisting of a strip of woven "chicken wire" about 30 in. long and perhaps 6 in wide. This strip of woven wire is rolled up into a small package, but when needed as a temporary splint can be manipulated to the shape desired and is said to possess the strength and rigidity required.

### End of Trust Legislation in Sight

The conferees on the Clayton bill have practically finished consideration of that measure, and it is expected that it will be presented to the House and Senate early next week. The measure, which passed the Senate on Sept. 2, was amended by the Senate in no less than ninety-five instances. These ninety-five amendments have furnished a mass of work for the conferees.

The federal trade commission bill is at the White House, ready for signature, and President Wilson is expected to sign that bill and the Clayton bill at the same time. The signature will mark the carrying out of the administration's anti-trust legislation program at this session. It has been decided to abandon at this session of Congress the Reyburn stock and bond bill because of the changed conditions brought about by the European war.

It is stated in authoritative circles in Washington that the conferees on the Clayton bill have decided to put back into it Section 2, stricken out by the Senate, which prohibits discrimination in prices. With reference to Section 4, which was stricken out of the House bill by the Senate and completely rewritten, and which relates to exclusive contracts, the conferees on the part of the House expect to obtain the consent of the Senate conferees to the use of the original House language. Section 3 of the Clayton bill, which would compel own-



ers or transporters of products of mines, oil or gas wells, or hydroelectric plants, to sell to any bona fide purchaser, was stricken out by the Senate and those who are familiar with the work of the conferees during the past week say that this section will be left out of the bill.

One of the big fights in connection with the Clayton bill was over the provisions which prohibit interlocking directorates. The Senate struck out entirely the House provision which prohibits interlocking directors in banks. This also is expected to remain out.

The Senate amendments to the section of the Clayton bill which would exempt labor unions from the operation of the anti-trust laws will stay in the bill, under the report of the conferees, it is said, as well as the Senate amendments to the clauses relating to injunctions against labor organizations and farmers' organizations. The Senate amendments in these respects are not so broad as the language of the original House bill.

Toward the end of the debate almost all of the fight in connection with the Newlands federal trade commission bill revolved around Section 5, dealing with unfair practices. Instead of using the words "unfair competition," the bill as it went to the White House was made to read "unfair methods of competition," a distinction which the courts may eventually define.

The findings of the proposed federal trade commission, under the law creating that body, are to be conclusive evidence instead of prima facie evidence.

At the White House it is said that President Wilson does not intend to appoint immediately the members of the commission created by this measure. As the bill has not yet been published and will not be for public use until it becomes a law by the President's signature, the exact language of the much-debated Section 5, around which many of the duties of the proposed commission will revolve, is of interest. In part it is as follows:

"That unfair methods of competition in commerce are hereby declared unlawful. The commission is hereby empowered and directed to prevent persons, partnerships or corporations, except banks and common carriers subject to the acts to regulate commerce, from using unfair methods of competition in commerce.

"Whenever the commission shall have reason to believe that any such person, partnership or corporation has been or is using any unfair method of competition in commerce, and if it shall appear to the commission that a proceeding by it in respect thereof would be to the interest of the public, it shall issue and serve upon such person, partnership or corporation a complaint stating its charges in that respect and containing a notice of a hearing upon a day and at a place therein fixed at least thirty days after the service of said complaint.

"If upon such hearing the commission shall be of the opinion that the method of competition in question is prohibited by this act, it shall make a report in writing in which it shall state its findings as to the facts, and shall issue and cause to be served on such person, partnership or corporation an order requiring such person, partnership or corporation to cease and desist from using such method of competition. Until a transcript of the record in such hearing shall have been filed in a circuit court of appeals of the United States, as hereinafter provided, the commission may at any time, upon such notice and in such manner as it shall deem proper, modify or set aside, in whole or in part, any report or any order made or issued by it under this section."

The court shall have power to affirm, modify or set aside the order of the commission. The decree shall be reviewable by the United States Supreme Court.

## Report of Massachusetts Industrial Accident Board

The first annual report of the Massachusetts Industrial Accident Board, covering the year ended June 30, 1913, has been issued. It includes a statistical digest of 89,694 accidents, a statement of causes and injuries, and estimates of the cost of insurance under the workmen's compensation act. A large number of illustrations of approved methods of safeguarding machinery are printed. A valuable section discusses the accident-prevention work of various casualty companies, with an extended outline of the principles of safety engineering. The offices of the board are at 1 Beacon Street, Boston, Mass.

## Commission Recommends Consolidation of Los Angeles Telephone Companies

The Public Utilities Commission of California has recommended that the Pacific Telephone & Telegraph Company and the Home Telephone Company, both of Los Angeles, be consolidated in 1916 so that any telephone user may communicate with any other without being compelled to use separate telephone systems. A consolidation will also eliminate any duplication in equipment which now exists. The commission's annual report dealing with the telephone situation shows that both systems are employed in 3.44 per cent of the residence stations and in 22.5 per cent of the business stations. It also indicates that 56,050 telephones belong to the Home system and 65,159 instruments to the Pacific system. The reason for setting the date of consolidation as 1916 is that the Pacific Telephone & Telegraph Company's franchise expires at that time.

## Electrical Data Compiled by Chicago Department of Electricity

The department of gas and electricity of the city of Chicago now has nearly 450 employees and last year expended for various purposes \$1,725,624, according to the annual report of Mr. Ray Palmer, commissioner of gas and electricity. Its revenues (inspection fees, receipts from construction work, sale of old material etc.) amounted to \$351,321, leaving a net cost of \$1,374,303.

Under the jurisdiction of the department there were reported to be in Chicago 829 electric generating stations, of which 793 are isolated plants and thirteen are central-station plants. From these plants 53,891 arc lamps and 6,428,092 incandescent lamps are supplied. The central stations also supply electricity to motors having a total rating of 318,569 hp. The average rating of the motors inspected in 1913 was 6.8 hp. The number of electric signs inspected in 1913 was 7396 totaling 508,724 incandescent lamps, or an average of sixty-nine lamps to a sign.

There were 242 electrical accidents to persons during the year, and of these twenty-eight were fatal. The number of electrical fires in 1913 was eighty, the total loss being \$34,403.

On Dec. 31, 1913, the city was operating from its municipal stations 17,493 arc and 3549 tungsten lamps for street lighting, and 282 tungsten lamps in railroad crossing subways. The number of subway lamps has been increased largely since then. The city also rented 1056 arc and fifty-eight tungsten lamps from the Commonwealth Edison Company.

Mr. Palmer says that the average cash cost of operating and maintaining each city arc lamp was \$31.31 per year. The total cost, including depreciation and investment charges, is estimated to be \$56.13.

### Convention of Edison Illuminating Companies

Brilliantly representative of the electric-lighting industry, the attendance of nearly 300 at the thirty-fifth annual convention of the Association of Edison Illuminating Companies, held at White Sulphur Springs, W. Va., Sept. 14 to 17, included a large number of the leading executives and engineers of the fields of both electricity supply and electrical manufacturing. Present as guests of the association to share in its valuable proceedings were also men of prominence in their lines associated with central-station work, and, following the departure in convention policy instituted several years ago, the 1914 meetings of the licensed companies were attended by invited representatives of the Westinghouse and other electrical manufacturing companies. Although the sessions themselves were held behind closed doors and the free discussion there indulged in by members remained strictly confidential, President Arthur Williams appointed a press committee to release for the benefit of the industry at large much of the invaluable information and data presented in the reports and papers. A number of ladies graced the convention and enjoyed the elaborate entertainment program of indoor functions and outdoor sports, the latter including golf, tennis, riding, driving, archery, etc., on the broad fields and wooded hills of the Greenbrier Hotel estate.

Tuesday morning's session was opened with the presidential address of Mr. Williams. He touched on the effect of the war in Europe in developing electrical and other industries of America and expediting industrial opportunities. Although in the industries human labor has already been almost entirely replaced by electric power, the fatiguing work of the home yet remains to be electrified to a corresponding degree. This substitution of electric for human power wherever possible in home work should be a primary and not a secondary consideration, declared President Williams. The important fields of the electric vehicle, electric ice-making and electrotherapeutic applications were also discussed briefly in the address, which closed with an appeal for broader education of the public in the uses of electricity in every department of human activity.

The report of the committee on the National Electrical Code was read, and Mr. S. G. Rhodes then presented the report of the committee on meters, alluding to several new types now being developed by the manufacturers. Prof. Elihu Thomson also spoke briefly, explaining his recent work on the design of a small commutator meter which it is hoped will cheapen the cost of small meters. A considerable portion of the meter committee's report was given over to the topic of maximum-demand meters and their proper selection for the service required. Several new demand meters employing thermal and electromagnetic principles will shortly be marketed, it was announced.

#### Employees' Welfare Topics

In a paper on "Workmen's Compensation" Mr. J. B. Murray discussed European and American employees' compensation laws and recommended the physical examination of employees as not only tending to reduce accidents to unfit workers but also speeding the recovery of those who have already suffered accidents.

At the first evening session Mr. Gerald Stanley Lee, author of the psychological study "Crowds," spoke on "The Changing Attitude of the Employer." Mr. Lee especially emphasized the growing interest of the modern employer in the men working for him, and their corresponding response in greater usefulness and increased productiveness. In their paper, "Safety in the Electric Lighting Industry," Messrs. J. L. Murrie and F. C. Robinson described the safety work of the New

York Edison Company and pointed out the importance of the general health and welfare of the employee as a factor in eliminating accidents through improving the employee's alertness of mind and his clear-headedness. In any large group of employees a considerable percentage is, the report declared, in need of medical care without knowing it.

#### Report of the Lamp Committee

Of chief interest among the papers presented each year at the Edison conventions has come to be the report of the committee on incandescent lamps as read by its chairman, Mr. John W. Lieb. Among the interesting information contained in this year's report was an analysis of lamp manufacture in the United States which showed that 100,000,000 tungsten units are now produced annually in this country, whereas, exclusive of miniature lamps, only 3,000,000 tungsten lamps are being imported from abroad. In view of the European war, it is also significant that American lamp manufacturers find themselves practically independent of European raw materials. A curve also exhibited showed that had the early commercial tungsten lamps of 1907 been operated at specific consumptions close to 1 watt per cp, as are the present lamps, they would have had achieved lives of but 300 hours, whereas the modern units, burned at the same efficiency, show lives well above 1000 hours. Another table showed that the average variation in a well-made batch of tungsten lamps does not exceed plus or minus 5 per cent in candlepower and plus or minus  $2\frac{1}{2}$  per cent in wattage. Multiple-type gas-filled high-efficiency lamps are now being marketed in 200-watt and 300-watt sizes, the committee announced. These units consume approximately 0.75 watt per cp. Considerable laboratory and service data on the new gas-filled lamps were also presented. In the arc-lamp section of the report the statement was made that by substituting an improved electrode arrangement on magnetite lamps it had been found possible to effect an increase in efficiency amounting to 30 per cent. Spectro-photometric tests of artificial daylight equipment were included in the report, and adaptations of intensified-arc, tungsten and gas-mantle apparatus were displayed. For the projection of the lantern slides shown with the report a 110-volt, 20-amp gas-filled tungsten lamp was used in the stereopticon lantern. This lamp had a rated candlepower of 3500 cp to 4000 cp and provided illumination equal to that of a 30-amp arc lamp. A 12,000-cp "targon" incandescent unit illuminated the grounds in front of the hotel during the convention.

Mr. J. W. Cowles, chairman, presented the advanced progress report of the committee on street lighting, supplementing the first report, which was read at the recent National Electric Light Association convention in Philadelphia. In addition to the usual photometric tests a number of novel visibility and psychological tests have been applied to study the effects of surface irregularities and the presence of large objects on the street surface. The influence of different street-lighting systems on the mental state was also investigated. At the session of Wednesday evening Mr. W. D'A. Ryan delivered his lecture on the lighting of the Panama-Pacific Exposition, illustrating his remarks with lantern slides, sketches and models.

Hon. Edward E. McCall, chairman of the Public Service Commission of the First District of New York, spoke on "The Regulation of Public Utilities." A plan was also announced for a complete system of reporting the decisions of public service commissions.

A report of the closing sessions of the convention, together with the abstracts of the convention papers released for publication by the Edison association, will appear in a later issue.



### Metallurgists Discuss the Use of the Electric Furnace for Brass Melting

At the annual convention of the American Institute of Metals, held in Chicago on Sept. 8-11, the interest taken in the possible use of the electric furnace for brass melting was shown by the fact that no less than five papers bearing on the subject were presented. One of these, read by Mr. H. M. St. John, of the Commonwealth Edison Company, Chicago, discussed "Electric Brass Melting from the Central-Station Viewpoint." This paper related to the cost of electrical energy for the operation of electric furnaces in brass foundries. At the rates of the Chicago company estimated costs were given per ton of metal melted, both for lift-out and tilting furnaces, for ten-hour, "special ten-hour," twenty-hour and twenty-four-hour operation. The "special ten-hour" plan is where sufficient energy is used during the night to keep the furnace hot. The twenty-hour plan contemplates the use of the off-peak schedule during the winter months. The author did not say that an absolutely reliable electric melting furnace was available.

In the discussion Mr. G. H. Clamer, of the Ajax Metal Company, Philadelphia, said that proprietors of small brass foundries could not think of installing electrical generating plants to supply energy for electric furnaces; they would be apt to buy the energy, if needed. The electric-service companies are greatly interested in this subject. It sounded like a foundryman's dream, said Mr. Clamer, to have the heat come into the establishment over a few wires. Mr. Frank Schutz, foundry foreman of the H. Mueller Manufacturing Company, Decatur, Ill., gave it as his opinion that it is only a matter of a short time when all brass founders will be using electric furnaces. He said that difficulties were encountered when the oil-fired furnace was first used, but these have been overcome. Similarly, the electric furnace will make its way.

#### A Government Expert's Favorable Report

The government Bureau of Mines is studying the metal losses which are encountered during the melting of brass and other non-ferrous alloys, in the effort to find methods of reducing these losses. Dr. H. W. Gillett is the alloy chemist of the Bureau of Mines, and he presented a paper on the subject "Melting Losses in Electric Brass Furnaces," prepared by himself and Mr. J. M. Lohr. In summarizing his investigations, Dr. Gillett said that unless the electric furnace can show a saving in metal losses in the melting of brass it will probably be a long time before it will be introduced. However, he expressed his belief that the electric furnace will reduce metal losses very materially. Indirect-arc furnaces cause local overheating, resulting in undue losses. Where the resistor is placed over the metal but where the heat is not concentrated, as in the indirect-arc type, better results are obtained. However, most of the work of the authors was done with crucible lift-out furnaces. The authors made many tests to determine if the use of the electric furnace resulted in cutting down metal losses in the melting of brass. The bulk of the work was done on brass having 16 per cent of zinc, which was poured at about 1200 deg. C. The net result was that it was found that the losses were reduced to one-half or one-third of what they would be in good practice with fuel-fired furnaces. Dr. Gillett remarked that to get good efficiency the electric furnace must be run pretty fast. In his judgment, it is going to pay the brass founder to buy electrical energy, because the resulting saving will show in economy. Co-operation between the founders, the electric-furnace builders and the central-station people is needed and is, indeed, in evi-

dence. But it is to be remembered that the electric furnace of the brass foundry has not yet been sufficiently tested so that the savings mentioned in the paper may be obtained under foundry conditions. There is still much experimental work to be done. Manufacturers are wisely holding back electric furnaces until they are perfected. The advent of the electric furnace in the brass foundry will be slow but sure. However, it will never compete with fuel-fired furnaces where metals are now melted down without loss or with losses of less than 1 per cent. But where, as with many of the non-ferrous metals, the losses in melting are a large factor, the electric furnace gives promise of effecting a saving. In fact, the electric furnace in brass melting is no longer a wild hope, but may be regarded as a certainty.

#### Electric Brass Melting with the Hering Furnace

Mr. G. H. Clamer, of Philadelphia, gave, in brief abstract, a paper written by himself and Dr. Carl Hering on "Electric Brass Melting." The Hering furnace, sometimes called the pinch-effect furnace, was described. The authors believe that 10 lb. of metal can be cast for each kilowatt-hour input of electrical energy. It is calculated that a large saving will be effected by using the electric furnace. The furnace described will soon be in regular twenty-four-hour operation at the foundry of the Ajax Metal Company in Philadelphia. It is rated at 120 kw and operated by two-phase alternating current purchased from the electric-service company. Some difficulty has been experienced in getting the proper electrodes, but this trouble has been overcome.

#### The Arc Furnace

The paper by Mr. Ernest M. Schmelz, of Detroit, on "An Electric Furnace for Medium Temperature," was read by Secretary Corse. A recently patented improved Stassano arc furnace was described. Dr. Gillett said in the discussion that it was probable that greater uniformity of metal could be obtained by using the electric furnace than in the case of the fuel-fired furnace. One use of the electric furnace is in the melting of cathode copper as produced by electrolytic copper refining. While open to conviction, the speaker expressed himself as skeptical in relation to arc furnaces for melting iron and zinc. The arc-furnace people should produce their figures. As to frequency, Mr. Corse said that he understood that twenty-five-cycle energy was all right for melting copper. Mr. Corse added that he understood that Mr. N. Petinot, of Niagara Falls, one of the patentees of the furnace described by Mr. Schmelz, had had some trouble with the rapid destruction of his electrodes. Dr. H. G. Dorsey, of Dayton, said that so far as he had learned arc furnaces are not adapted to brass melting.

#### Helberger Furnace Said to Be a Failure

Dr. Herbert G. Dorsey, of the National Cash Register Company, Dayton, described a "Test on Electric Furnace for Brass Foundries." The furnace under test was that of the Helberger type, made by the Allgemeine company of Germany. Dr. Dorsey described the tests made with this furnace under operating conditions. He said the furnace was a failure. It might be used for work in laboratories of small size but was not a success as a foundry furnace. The speaker could not recommend it for commercial brass melting. Dr. Gillett said that this paper gave the first account of commercial work with the electric furnace in a brass foundry. Because the Helberger furnace did not succeed under the conditions of the work at Dayton, it does not follow that all electric furnaces are inefficient. Dr. Gillett also pointed out that in considering electric-furnace operation the energy needed to heat the furnace before work is begun must be taken into account.

## Convention of Pennsylvania Electric Association

The seventh annual convention of the Pennsylvania Electric Association, state branch of the National Electric Light Association, was held at Forest Inn, Eagle's Mere Park, Pa., Sept. 8, 9, 10 and 11, the registered attendance being 286. The association was fortunate in having present during the convention the chief engineer of the Public Service Commission of Pennsylvania, the secretary of the commission and three other members of the engineering staff, who took part in the deliberations and, mingling with the various managers and operating men, obtained a clearer insight into the problems confronting central stations in Pennsylvania and how the companies are solving them. In addition, the association listened to an inspirational address from the Hon. Frederic W. Fleitz, who had much to do with the framing of the public utility law in Pennsylvania and who dwelt at some length on the merits and the future of regulation. For the guidance of member companies also, Prof. L. H. Harris, of Pittsburgh, consulting engineer for the Public Service Commission of Pennsylvania, sent a communication interpreting the various requirements of the commission and elucidating some points which in the working of the commission law proved to be obscure.

### President's Address

Mr. Duncan T. Campbell, of Scranton, in his presidential address reviewed the year's work and urged the appointing of a general special committee with sub-committees representing the Pennsylvania Electric Association, whose duty it would be to meet with and confer with the Public Service Commission when called on. For the promotion of mutual confidence and welfare, this committee should have immediately available all data and information requested. President Campbell suggested that the sub-committees should have delegated to them some special branches of work, such as line construction, accounting, etc.

According to the report of the membership committee, the Pennsylvania Electric Association has now 1600 members as compared with 1367 a year ago. There are eighty Class A members, 1407 Class B members, twenty-eight Class D members, eighty-four Class E members and one honorary member.

### Report of Accounting Committee

The report of the committee on accounting, of which Mr. H. R. Kern was chairman, contained a classification and description of accounts employed by electric-service organizations. The classification, which is intended to admit of practical and universal application, conforms quite closely with the practices and recommendations of commissions and other associations. The number of controlling or indicant accounts has been reduced as far as possible to make the classification applicable to both large and small properties. It was recommended that all companies, regardless of size, follow the controlling accounts, although only the larger organizations need employ the subdivisions. In general the accounts were divided into thirteen general classes, containing a total of 170 sub-accounts, some of which were further classified.

### Safety and Welfare Committee Report

Conditions which tend to better the relations between an electric-service company and its employees will also improve the corporations' relation with the public. The report of the committee on safety and welfare, of which Mr. Henry Harris was chairman, indicated that 25 per cent of the member companies are engaged in welfare work. It also called attention to the work of various associations and societies along the same lines. The committee submitted a method of classifying acci-

dents and emphasized the importance of securing such data in order that efforts might be made in the right direction to prevent repetitions of these accidents. By promoting the good health of employees it was pointed out that their minds would be kept alert and accidents prevented. An investigation made by this committee of various compensation plans in effect in Pennsylvania showed that employees can be liberally compensated during disablement not exceeding 261 weeks in duration at a cost of 2.75 per cent of the payroll. The employees' lives can be insured in proportion to their annual wage or salary at slightly over 1 per cent of the payroll. Compensation and insurance can be provided still more inexpensively by establishing mutual-risk organizations. Service annuities based on payments of 1 or 2 per cent of the wages for each year's service can be maintained for 1 or 2 per cent of the payroll. Suggestions were also made for conducting savings and loans bureaus and providing vocational education and opportunities for physical improvement.

### Discussion

Messrs. W. H. Johnson of the Philadelphia Electric Company, E. H. Davis of the Lycoming Edison Company of Williamsport, and M. G. Kennedy of the United Gas Improvement Company of Philadelphia took part in the discussion on the report of the safety and welfare committee. The desire was expressed to have the committee submit a plan in detail in keeping with its recommendations as made in the report, and the discussion indicated that the member companies are beginning to appreciate the value of welfare work among their employees and are prepared to extend their present efforts in that line.

### Lighting of Interurban Highways

The type of equipment employed by the Harrisburg (Pa.) Light & Power Company to light interurban roads and the cost of installing this equipment were given in a paper on "Interurban Lighting" by Mr. R. W. Hoy. As poles have to be erected to support the wires feeding the road lamps anyway, the author suggested that with very little more expense additional conductors can be strung on the same poles and business solicited from persons living along the highway. A combined highway-lighting and service circuit for supplying energy to persons living on the right-of-way was constructed by the Harrisburg company at a cost of \$933.62 per mile, including material and labor. A single-phase, 2300-volt circuit supported on 35-ft. poles spaced about 120 ft. apart was employed. Twenty-one 100-cp nitrogen-filled lamps equipped with shades and prismatic refractors were used per mile. The erection of ten-mile sections reduces the cost of installation to \$901.16 per mile.

### Meter-Testing and Voltage-Regulation Requirements of Commission

In his paper on "Requirements of the Public Service Commission Covering Meter Testing and Voltage Regulation," Mr. E. H. Tyson interpreted the rules of the Pennsylvania commission regarding the testing of meters and regulation of voltage. He suggested that a company should subject meters made by several different manufacturers to a test as prescribed in the "Meter Code" before adopting any type of instrument as standard. Methods of filing meter-test records and description and illustrations of forms on which to keep data were given. The author pointed out what characteristics should be required in primary standards and discussed the care and use of rotating-element and indicating instruments used for meter testing. The equipment of a laboratory in which to conduct tests was also described. In closing the paper, the author



said that the commission rules regarding voltage regulation are reasonable and should necessitate no changes in the operation of an up-to-date utility.

#### Discussion

The paper was discussed in a general way by Messrs. P. H. Bartlett of Philadelphia, G. E. Wendle of Williamsport, A. W. Burke of Wilmington, E. H. Davis of Williamsport, M. G. Kennedy of Philadelphia, E. D. Dreyfus of Pittsburgh, and F. M. Noecker of Renovo. The consensus of opinion was that standard records are desirable and that the association should confer with the commission as to their form.

#### Interpretation of Public Service Law

Prof. L. H. Harris, of Pittsburgh, consulting engineer for the Public Service Commission of Pennsylvania, was unable to be present, but sent a communication answering the various questions which had come up before the commission during the year. The rules were reduced to simple terms and commented on. Among the suggestions made by Professor Harris were the following: that the Pennsylvania State Association get up a standard card-record system for meters tested, and that in view of the large variety of lighting contracts existing between corporations and municipalities and of the standard service rendered a standard form of contract be got up for municipal street lighting. The suggestion was also made that better book-keeping systems be used so as to enable the companies to get at the actual costs of various classes of service. He urged the frequent use of graphic instruments so as to show the voltage variations in various sections of the systems.

Immediately following the reading of Prof. Harris' communication, Dr. Herbert Snow, chief engineer of the Public Service Commission, made an address in which he urged the appointing of an engineering committee whose duty it would be to confer with the commission on all engineering questions pertaining to the lighting industry. Mr. George Wilson, who has charge of all rate matters coming before the commission, and Mr. A. B. Millar, secretary of the commission, also spoke.

Mr. Holton H. Scott, president of the National Electric Light Association, being unable to attend the convention, Mr. S. A. Sewall, assistant secretary, extended the greetings of the national body and made a plea for increased membership in company sections. He also dwelt on the usefulness of the "Question Box" and asked the hearty co-operation of all members of the association in contributing to this department of the *N. E. L. A. Bulletin*. Mr. G. B. Muldaur told of the work done by the Society for Electrical Development, which now has 1400 members.

#### Public Utility Interconstruction

At the executive session on the afternoon of Sept. 10 Mr. E. H. Davis, reporting for the committee on public utility interconstruction, told of the action taken at the Philadelphia convention of the National Electric Light Association in eliminating from the overhead-line specifications all references to voltage limitations, and said that the committee of the American Electric Railway Association had pursued a similar course. He submitted the new joint-pole agreement which the Bell Telephone interests are asking the electric-light companies to sign, and said that the member companies in Pennsylvania had found it undesirable to sign the agreement.

#### Commission Regulation

Hon. Frederic Fleitz, in an address at the executive session, told of the advantages of the get-together spirit manifested in the convention of the Pennsylvania

Electric Association, especially to the men of the smaller plants who are necessarily shut off from daily contact with the other members of the profession and hence do not have the advantages of frequent consultation and advice. He reiterated that regulation by commission is here to stay, and said that it should be a matter of public concern that the commissioners themselves should possess intelligence, tact and be men of sterling integrity. The Pennsylvania Commission law, he maintained, was the most drastic in the United States because of its completeness and its thoroughness. General Fleitz showed the distinction between a natural consolidation based on economic considerations and an unnatural consolidation brought about by competitive conditions. Regulation, he said, is predicated on monopoly. The most important question now before the country, according to General Fleitz, is the question of rates, and he maintained that it is a mistake to try to simplify schedules too much. There is a difference in service as to cost, relation to peak, continuity, regularity, etc., and special rates applying to special service can be justified by law. He spoke of the necessity of watching all decisions of the commission, whether they apply to the electric lighting industry or not, since the germ of a principle enunciated in any regulatory matter is applicable to the electrical industry as well. He suggested that the lighting companies make every effort to win public confidence by being honest, frank and fair to their patrons. A company possessing the confidence of the public will seldom have occasion to appear before the commission. The lighting companies should also possess the confidence of the commission. If commission regulation fails, municipal ownership will follow and bring with it repression. Contrasting the municipally owned utilities of Europe with the privately owned utilities of the United States, General Fleitz said if a change of the latter to the former is made it will be a blight on the development of American progress.

#### Methods of Securing and Value of Small-Residence Consumers

Aside from the direct financial gain secured through small consumers' business, it has been noticed that persons of the middle class are automatically attracted to the use of electricity on seeing their poorer neighbors employ it. In the paper on "Securing the Small-Residence Business," by Mr. E. W. Osborne, it was pointed out that to make small-residence consumers profitable business should be secured on existing lines at a flat rate. The author suggested charging 1 cent per watt per month. Special inducements, such as premiums, are also effective in securing this class of business. It was further recommended that contractors be induced to quote a flat rate per outlet on small installations. Carefully prepared newspaper advertisements, solicitation, courtesy, enthusiasm and service were also suggested as being effective in obtaining small consumers.

#### Discussion

Mr. E. B. Greene, of Altoona, said his experience did not differ from the author's. His company starts a flat-rate campaign every fall and the change from a current-limiting device to meter is made in order to enable the use of heating devices. The Tuesday day ironing load in Altoona is 1400 kw greater than the Monday load.

#### Flat-Rate Meters

In a paper by Mr. H. F. Hatch, of Wilmington, Del., dealing with flat-rate meters for heating and lighting loads, the author rehearsed the unsatisfactory experience of the central station of Wilmington with current-limiting devices. These current-limiting devices were

finally discarded and all customers placed on a meter basis. There is at present in use on certain motor circuits in Wilmington an excess watt-hour meter. This comprises a standard watt-hour meter, a ratchet device to prevent negative registration, a small shunt transformer, and a compensator consisting of a special series transformer with a saturated core and an adjustable resistance. The special transformer used in Wilmington takes less than two watts from the line, although a standard bell-ringing transformer can be used. The object of the meter is to allow a predetermined load to pass through the instrument without recording, all excess beyond the predetermined load being indicated. The meter contains no contact-making device; its operation is noiseless and the cost of the attachment is slight. It was suggested that a meter of this type might be used in place of a current-limiting device because it possesses all the advantages of the latter, enables excess energy to be used when desired by the consumer, and does not entail the installation of an entirely different instrument should a customer desire to change from a flat rate to a meter basis.

#### Discussion

A rather spirited discussion followed the presentation of the paper, Messrs. A. T. Holbrook of Pittsburgh, H. H. Ganser of Norristown, R. W. Hoy of Harrisburg, E. W. Osborne of Scranton, J. W. McKelvie of Pittsburgh, F. M. Noecker of Renovo, P. H. Bartlett of Philadelphia, M. H. Watkins of Mount Carmel, W. L. Loeb of Pittsburgh, and A. W. Burke of Wilmington, Del., taking part. The manufacturers of current-limiting devices told of the advantages of these instruments and maintained that the experience of the Wilmington company with a limited flat-rate system was not the experience of other companies and that the contention of the author that flat-rate business is undesirable to the customer and central station alike was refuted by Mr. S. E. Doane, in his paper before the recent convention of the National Electric Light Association, and could also be refuted by members of the Pennsylvania Electric Association using a current-limiting device. According to Mr. Holbrook, more central stations in Pennsylvania have adopted a flat-rate system than in any other state in the Union. Messrs. Hoy, Osborne and McKelvie defended the use of current-limiting devices and told how widely they were employed by their respective companies. Harrisburg has 800 in use, Scranton 3500, and Pittsburgh 4000. The system of charging appeals particularly to foreigners, and by means of the current-limiting device business otherwise not procurable can be obtained. The revenue is on a par with that received from meter customers. In a town of 6000 connected to the Scranton system 1200 customers are fed through current-limiting devices. The rate is \$1.25 a month, or about \$120 a kw-year. The Duquesne Light Company has a gross income of \$70,000 a year from flat-rate business, and tests indicate that the rate for energy varies from 2.3 cents to 7 cents per kw-hr.

#### Insulator Design

A paper on "Insulator Design in Relation to Lightning and Other Static Disturbances" was prepared by Mr. A. O. Austin, of the Ohio Brass Company. In it the author referred to a large system with moderate rating and small conductors and showed how such a system can withstand surges from switching and arcing grounds better than a large system backed by large power houses and conductors. The latter system should be equipped with insulators commensurate in size with the size of the load and its importance. He suggested that inasmuch as surges affect the insulat-

ors more than lightning, interconnected systems can obtain some measure of protection and be enabled to localize trouble by using steel conductors in tying in the various branches of the system, thus increasing the impedance and lessening the disturbances caused by surges. Routine tests are preferable to design tests, and according to the author there is a growing tendency to discard the oil puncture test and give more attention to routine tests which eliminate all the weak members. The manufacturers have brought out a better design of insulator providing more strength to resist thermal stresses set up by uneven heating or by cement expansion, which tends to crack the insulators in time. This cracking may so weaken the insulator that the slightest surge causes trouble.

#### Election of Officers

At the final session, on the recommendation of the nominating committee, the following officers were unanimously chosen: President, Mr. Walter E. Long of Philadelphia; vice-president, Mr. Stephen C. Pohe of Bloomsburg; secretary-treasurer, Mr. H. N. Müller of Pittsburgh; members of the executive committee for two years, Messrs. W. R. Kenney of Connells-



W. E. LONG

ville, H. Harris of Wilmerding, and J. S. Wise, Jr., of Hazleton; member of the executive committee for one year, Mr. F. M. Noecker of Renovo.

Mr. Walter E. Long, the newly elected president of the Pennsylvania Electric Association, was born in Philadelphia, Pa., Aug. 16, 1879. He started his business career at the age of fifteen in the iron and steel business, with the Cambria Steel Company and the American Bridge Company. Ten years ago he resigned his position as assistant statistician of the American Bridge Company and entered the employ of the Philadelphia Electric Company, in the accounting department. He was advanced to the position of assistant auditor and about four years ago assumed his present position as assistant to the first vice-president, Mr. W. H. Johnson. Mr. Long has been connected with the Pennsylvania Electric Association since its inception. He was elected secretary-treasurer in 1910, and served as such until last year, when he was elected vice-president. Mr. Long has been largely instrumental in the marvelous growth of the Pennsylvania branch of the National Electric Light Association. He is a member of the National Electric Light Association, the Illuminating Engineering Society and the American Statistical Association.



# Domestic and Foreign Trade Conditions

Statements from Electrical Interests Show the Steps Taken to Minimize Industrial Effects of War and Promote Normal Activity

## MR. J. G. WHITE ON WAR RESULTS

Conditions of London House Improved Over Situation After Beginning of Conflict

Mr. J. G. White was asked by the *Electrical World* for a statement in regard to the direct effects of the war upon the affiliated London house of J. G. White & Company, Ltd. The London house conducts all of the business of the organization in South America and the Orient and, in fact, in all parts of the world excepting North America, Cuba, Central America and the Philippines. The business in North America is conducted by J. G. White & Company, Inc., of New York. The London house was established in 1900. It is connected with the New York organization through the fact that Mr. J. G. White, the active head of the organization in this country, is the largest stockholder of the English company. Since the London house was established, while it has operated in Great Britain, Australia and New Zealand, India and various other parts of the world, its business recently has been mainly in South American enterprises of the kind that have been financed principally in England.

Mr. White said that general business conditions, so far as the London house was concerned, have improved over the situation just after the beginning of the war. Necessarily the operations of the London house have been curtailed to some extent. Work on some of the enterprises in which it has engaged has been deferred until after the close of the war, but on others steady progress is still being made. Mr. White said that Great Britain has largely restored normal facilities for overseas shipments and that advices have been received from the London house that English manufacturers are prepared to make prompt deliveries of all of their usual products. The London house is prepared, notwithstanding the continuation of war, to procure and ship promptly, subject to government exemptions and restrictions, any materials or supplies that can be secured in Great Britain or any of the countries with which that nation now maintains commercial relations.

Regarding American business, Mr. White stated that financial conditions preceding the declaration of war were unfavorable to the undertaking of new enterprises, and that these conditions have been tremendously emphasized by the war, with the result that very little new engineering or construction work is proceeding. At the moment the most active part of the J. G. White Engineering Corporation is understood to be its purchasing department. Recently important purchasing commissions have been received from Porto Rico, Cuba, the Philippines and other parts of the world. This department undertakes commissions to purchase in America any kind of machinery, materials or supplies for clients in the United States or, in fact, in any part of the world. This department does not attempt to secure orders which otherwise might go to its allied London company or others in Great Britain, realizing that it is of primary importance, and believed to be for the best interests of the world, that the industrial population there should be kept employed so far as is possible. On the other hand, the department takes orders from any part of the world for any purchases, whether emergency or usual, which existing world's conditions make it advisable to procure in the United States.

## OPPORTUNITIES TO EXTEND OUR EXPORTS

American Electrical Productions Have Excellent Reputation, but Knowledge of Export Conditions Is Needed

BY FRANCIS B. CROCKER

In May, June and July of 1889 the writer contributed a series of articles to the *Electrical World* on the "Electrical Trade Conditions in the Far East," including India, Japan and China. The ideas expressed in those articles were gathered during a trip around the world. A second series of articles on this subject were contributed by the writer to the *Electrical World* during March and April, 1910, following a second globe-circling tour.\* Both series of articles were from the point of view of American trade possibilities in electrical lines.

Most of the present attention to American export development has been directed toward South America, which undoubtedly presents great opportunity. The writer is not familiar with South America, but he has had personal experience and has given much thought to the Oriental conditions, also to those existing in the West Indies. It is timely, therefore, to call particular attention to the fact that the field for American electrical trade in those directions is also very large.

### Excellent Reputation of American Goods

Electrical machinery, supplies, etc., of American manufacture already have a most excellent reputation throughout eastern countries and in the West Indies. It is no boastful exaggeration to say that the superiority of American goods of that kind is generally admitted. What prevented or interfered with the larger sale of our products was, first, the low prices quoted by German and English competitors, and, second, the long credits of six months or a year which are, or were, given to their customers by European manufacturers. Such long terms for payment are not customary in American business. During the present war, and probably for some time afterward, the German, English and other European manufacturers will not be able to supply the goods. There seems to be every prospect, therefore, that American electrical products of all kinds, having a first-class reputation already established, will be bought, almost to the exclusion of non-American competition, on terms reasonably suited to American conditions and customs. Not only have American electrical productions acquired the very best reputation, but our manufacturers—for example, the General Electric and Westinghouse companies—are already well represented by local agencies or branch offices in charge of experienced business men and engineers fully competent to handle the trade immediately and effectively now that the bugbear of European competition is eliminated.

### Europe's Better Prices and Longer Credits

The writer knows of many actual cases where much electrical apparatus was bought from German and English sources simply because of better prices and longer credits. The total volume of the electrical business done by German, English and other European manufacturers is very great; for example, the Allgemeine Elektrizitäts and Siemens-Halske companies had total sales of almost \$180,000,000. It is generally true of German

\*As Oriental conditions do not change rapidly, these observations are still timely.—Eds.

manufactures that 80 per cent of them are exported and only 20 per cent used at home. This does not hold good in the electrical business, but the fraction of such goods sold abroad is a large one. Actual statistics show that Germany's electrical exports were at the rate of about \$70,000,000 per year for the first half of 1914. Large exports of electrical goods were also made by other European manufacturers. Of course, the war will produce financial conditions all over the world that will partly paralyze trade. Nevertheless, affairs will not stand still in all countries, and there is certainly an opportunity for America to secure what business there is, thereby occupying a field which she should continue to hold when business revives, however slowly or rapidly that occurs after the war is over.

#### Our Small Export Trade

To illustrate how very different conditions have been heretofore in this country compared with those in Germany, it is interesting to note that the United States has been exporting only about 10 or 15 per cent of its manufactures, the rest being used within itself. Hence we see that the export trade of the Germans has amounted to 80 per cent and was therefore of predominant importance, while it has been a mere incident in the United States, being only 10 per cent or thereabouts. In foodstuffs American export has been relatively larger than in manufactures, but it is only a small fraction of the total production. For example, only about 25 per cent of the grain that we raise is shipped abroad, and a still smaller proportion of other food produce is exported.

While American electrical products have already gained a first-class reputation and the two large companies are already established in many Oriental cities, the fact remains that Americans in general have had little experience and correspondingly little knowledge concerning export business. The mere sending of traveling salesmen, equipped with photographs, is absolutely futile in dealing with the ultra-conservative Asiatic, or even West Indian. It is necessary to have, first, personal representation on the spot, maintained sufficiently long to become well established locally and obtain the good will and confidence of the customers, which is a slow process in those countries. Second, the representative must have the experience and temperament to deal with and humor the peculiarities of the Oriental mind or the Spanish-American mind. American natural-born tendencies and our whole business training are exactly in opposition to their points of view.

Fortunately, the American consular service is largely composed of intelligent and energetic men who have gained their positions by passing severe competitive examinations. Judging from personal experience with dozens of our consular officers, they are well acquainted with the conditions existing in their respective cities and countries. This omnipresent consular service is not only ready but anxious to render much assistance in starting and developing American export trade.

#### Obstacles Being Overcome

Newspapers and politicians, whether from ignorance or because there is some axe to grind, have talked a great deal about the lack of merchant ships to carry American exports abroad. Of course, it is true that there are very few vessels flying the Stars and Stripes that are engaged in foreign trade. Nevertheless, there are plenty of available merchant vessels under the flag of Norway, Sweden and other neutral countries, and still more under the flags of Great Britain and France, that can be chartered for carrying American grain and other products abroad. Moreover, the freight rates, while they have increased considerably, are not much

higher now than they were two years ago and are not at all prohibitive. Considering the higher prices obtained for our grain and other commodities, the prices far more than offset the increase in freight. In short, the scarcity of ships is not now acting as a serious handicap in maintaining or extending American export trade. The real and very serious difficulty is the present chaotic condition of international banking and exchange. This condition will gradually improve as methods are devised and put in operation for handling these important matters.

### BUSINESS OUTLOOK FOR MANUFACTURERS

#### Opinions from Various Branches of the Industry Show Reasonable Confidence

Replying to the request of the *Electrical World* for opinions as to the effect of the war on business, manufacturers have expressed opinions as follows:

#### Believe Financial Condition Will Improve

Mr. H. T. Dyett, treasurer Rome Wire Company, Rome, N. Y.: "All lines of business have been more or less upset, and it is difficult even now for our customers or ourselves to look forward with any degree of certainty for more than a few weeks at a time. Finances seem to bother some of our customers, but we believe that conditions will steadily improve in this respect. August orders with us have been quite satisfactory, and in our most important department we are running full time and are several weeks behind our orders. We hardly think this reflects general conditions in our line of business, however, as we know that many of our competitors are exceedingly slack. Orders received during the past week were better than during the first or second week in August. If the wise measures taken by the administration and by our bankers meet conditions this fall and money becomes a little easier, we look for increased business in many lines. Two of the world's largest electrical manufacturers situated in Germany, whose sales amount to \$170,000,000 per year, cannot fill their export orders, and this business should naturally come to America. We have had many inquiries during the past two or three weeks from all parts of the world and believe this an opportune time to establish an export trade. It should be borne in mind, however, that the amount of export business we can get is small as compared with our own business in the United States. We are operating somewhat better than sixty hours a week on an average in all departments, with our normal number of employees, both in the factory and in our office. While we are dependent to a certain extent upon the Far East for rubber, Germany for dyes and Austria for wax, yet our requirements, we believe, are fully covered, and we do not anticipate any cessation of manufacturing in our plant due to lack of raw materials."

#### Effect on Platinum

Mr. A. M. Williams, Baker & Company, Inc., Newark, N. J.: "The chief source of platinum production being in Russia, the European war has had an important effect on the platinum industry, the extent of which will be naturally somewhat dependent on the duration of the struggle. At present all marine shipping has been badly crippled, and, owing to the increased cost of transportation, insurance, war risk and exchange, prices have advanced materially (approximately from 10 per cent to 15 per cent on all platinum productions). There are many demands for platinum which hardly permit of a substitute, owing to the peculiar and noble qualities of the metal, and in some instances where manufacturers



have attempted to make use of a substitute the results have been found unsatisfactory. We cannot at this time forecast how serious the situation may become, as there are so many factors which will affect matters one way or another. But for the present our stock is such that we are in a position to fill our customers' reasonable requirements."

#### Developing Export Trade

Mr. Ronald Crawford, vice-president Oven Equipment & Manufacturing Company, New Haven, Conn.: "Our export business is limited. We feel, however, that we should obtain considerable business with South American countries in the near future. The difficulty, however, seems to be from the lack of direct banking facilities with the United States. Most of the inquiries that we have received from South American countries have stated that payment would be made through their English or German banks, and when we asked for payment through their branches in the United States the sale usually fell through. Our business is being affected at the present time by the European war, probably through the hesitation of manufacturers in extending their business. We are taking steps at the present time to develop our export trade, especially with South American countries. We are not dependent on European countries to any extent for raw materials. Mercury happens to be one of the materials which we call to mind at this time. The quantity used is not important, and we understand it is obtained in California in limited quantities."

#### Increased South American Trade Expected

Mr. Charles P. Roundy, Hope Webbing Company, Providence, R. I.: "Our export business is a very small part of our total, and the war should hardly inconvenience us in this respect. There will undoubtedly be increased demands from South America and other countries which we would suppose would offset any reduction in the call from European countries. Our domestic business should hardly be injured, except as probable difficulty in raising capital will retard extensions. We have not changed our organization materially with regard to either domestic or foreign trade, nor have we ever been dependent upon European countries for such raw materials as are used in the electrical department of our business."

#### Somewhat Conservative Basis

Mr. J. F. Selby, Beardslee Chandelier Manufacturing Company, Chicago: "Inasmuch as we do practically no export business and buy very little material from the European market, we are not in a position to answer most of your questions. It is to be expected, we believe, that domestic purchases will be made on a somewhat conservative basis under existing conditions, which will probably prevent the increase in sales we might expect were conditions normal."

#### War Felt to Some Extent

Mr. M. P. Maxwell, sales manager for Messrs. Hickey & Schneider, New York: "We have been very much interested in the articles appearing in the *Electrical World* issues recently setting forth some of the effects of the war upon the electrical industry. We have felt the effect of the war to some extent, owing to the fact that we have been working on several new propositions that would no doubt have taken definite shape by this time and have placed in our hands orders that would have necessitated increasing our working force and covered two or three months' work. We cannot say that we have felt the effects of the war to any great extent as regards our regular standard material, which embodies mostly lines that have been built for some time past and extensions that are going on just the same as heretofore.

We do not depend upon European countries for raw materials to any great extent, and therefore we feel no effect this way, except through some of our sources of supply that have found an excuse for advancing prices. We anticipate an increased demand for our materials from South American and other countries. Probably the reason for our not feeling the effects of the war more seriously at this time is our having received several large orders prior to the time war was declared which have not been canceled or held up, and our customers will doubtless receive the benefit inasmuch as we shall be able to make better deliveries than we anticipated, owing to our being able to use our entire force on these orders alone."

### SOUTH AMERICAN TRADE OUTLOOK

#### National Foreign Trade Council Says Business Men and Government Must Co-operate on a Definite Policy

To correct misconceptions regarding trade with South America and opportunities for its extension, the National Foreign Trade Council has issued a statement calling attention to certain fundamental conditions surrounding that trade which must be improved in order to accommodate existing trade, to say nothing of future business.

At the outbreak of the war a standing committee of New York members was appointed to consider foreign trade problems. As a result of the committee's observations a statement has been issued which follows in part:

#### Trade Independence Vital

"Our greatest opportunity lies in the establishment of those direct financial relations and the American steamship connections necessary to assure the economic independence of the trade we already have and of that which we hope to gain. With increased banking and steamship facilities of our own it should be possible to pay for a greater proportion of our imports in merchandise of our own production and to retain in the United States a greater proportion of the funds due for imports.

"While individual opportunities will offer themselves to our exporters, the general security and prosperity of the South American trade can be guaranteed only by the formulation of a definite policy upon the part of business men as well as the government and by co-operation among all elements. Increased South American trade founded on anything less substantial will remain vulnerable to the changing fortunes of European finance and business."

### ENGLAND SEES TRADE OPPORTUNITY

#### Board of Trade Issues Pamphlet to Assist Electrical Manufacturers in Extending Foreign Business

The London Board of Trade has issued a pamphlet to assist electrical manufacturers in quickly extending their foreign and colonial export trade. Particular comment is made on the South African trade, which in 1912 was \$2,525,000 from the United Kingdom and \$2,050,000 from Germany and Austria. England was foremost in all articles but machinery, in which Germany practically doubled her. Emphasis was laid on the fact that English manufacturers had been in the habit of rating their goods too high. Also it is said that foreign merchants by carrying good stocks and making prompt deliveries to the mines have been even more successful than the British firms.

## PUBLIC SERVICE COMMISSION NEWS

### New Jersey Commission

The Board of Public Utility Commissioners of New Jersey has dismissed the complaint of Mr. Joseph B. McBride, Hoboken, against the Public Service Electric Company, in which it was held that the company should provide necessary service switches and cut-outs, and also that ground connection as installed by the company was not of the size called for in rules governing such installation. In its decision on the first point the board holds that necessary service switches and cut-outs within the building are part of the building equipment and form no part of the installation which must be furnished at the expense of the company. In this the board states that the wiring inside of a building is as much a part of the building as is the piping required for the distribution of gas or water.

On the contention of proper ground connections the board renders the following decision: "The question arises as to the reason for making the ground wire larger than the service wire, as will be the case where a No. 10 or No. 8 service wire is in use. There appear to be two reasons for providing a ground wire as large as No. 6 where the service wire is smaller: (1) for purely mechanical considerations to protect against an interruption, and (2) because in case of a rush of current which would be sufficient to fuse any portion of the circuit the service wire would be interrupted first, without causing a break in the continuity of the ground wire itself. Therefore the ground wire referred to in the National Electrical Code, Rule 15, includes only so much of the ground circuit as extends from the main service cut-out to the point where attachment is made to the water pipes. For these reasons the complaint is dismissed."

### California Commission

The Railroad Commission has rendered a decision reducing the general lighting rates charged by the Coast Valleys Gas & Electric Company in the city of Salinas, Monterey County, from 10 cents for the first 50 kw-hr. to 8 cents for the last 20 kw-hr. The commission also fixed a minimum meter charge of \$1 per month and a service charge of \$1. The latter charge will be required of all applicants for service but will be refunded if the consumer remains for twelve months in one location.

The rates for municipal street lighting were also declared to be excessive. Henceforth the city will pay 10 cents per year per watt connected instead of the present rate of \$7.50 per month for each arc light. The commission made no changes in motor-service rates but established a rule that the consumer should have the option of combining power of less than 3 hp with lighting at the lighting rates or of requiring separate motor-service and lighting meters for each class of service. The company received the privilege of supplying either single or three-phase current to motor installations of less than 3 hp.

### Ohio Commission

Messrs. Nau, Rusk & Swearingen, public accountants of Cleveland, have submitted to the commission a system of accounting for utility companies. The plan covers all sizes of plants. The companies may keep any other accounts desired, either for the purpose of recording other ideas they may wish to preserve or explanatory of the figures contained in the fixed system of accounting.

The system contemplates the division of properties into four general classes. The smallest class, D, includes all those companies having an annual operating

revenue of \$5,000 or less; class C comprises those having an annual operating revenue exceeding \$5,000 but not more than \$25,000; class B, those having a revenue of over \$25,000 but not exceeding \$75,000, and class A all those whose annual revenue exceeds \$75,000. Any company may use the system prescribed for the next higher class and may subdivide the accounts, as given in the system, to any extent that may best suit operating conditions.

When the system is printed it will be distributed to all the companies interested for their suggestions and criticisms. At present the plan is in tentative form.

This system will provide for municipally owned as well as privately owned plants. In applying the plan to municipal plants, the city owning a plant will be charged with an investment which will compare with the stock of a private corporation. An accounting will be made for a return on this. Accounts will also show the free service rendered and the free service received in the same manner as if such services had been sold or purchased. Taxes also will be shown, as if the plant were paying the same rate demanded of a private corporation. A balance sheet will be prescribed.

### New York Commissions

The Second District Commission has granted permission for two extensions of its plant and the exercise of two new franchises by the Central Hudson Gas & Electric Company, one in the town of Wappingers, Dutchess County, and the other in the town of Hamptonburg, Orange County. In the case of the extension in Dutchess County the commission allows the new extensions only where they do not interfere with the already established business of supplying electrical energy to the public by the Garner print works and bleachery in Wappingers Falls, Hughsonville and certain other communities in the southwestern part of the town.

## Current News Notes

**BURNING YOUR BRIDGES, AND THE ENEMY TOO.**—Reports from Petrograd, the renamed capital of Russia, declare that the Germans when retreating mine the bridges in such a way that the weight of a large body of pursuers, by causing a depression of the bridge, brings wires into contact, completing an electric circuit which sets off powerful explosives and blows up the structure. This and other electrical devices have been used by the Germans to advantage in the present conflict.

**JOVIAN DISPLAY AT TENNESSEE STATE FAIR.**—The entire lower floor of the Agricultural Building at the Tennessee State Fair to be held at Nashville will be occupied during fair week by an elaborate electrical exposition which is to be arranged and conducted by the Jovian League of Nashville. An extensive demonstration of household electrical appliances will be made to show the public that electricity is available for use at moderate rates. Semi-indirect lighting fixtures will be employed and an electric fountain is projected. The Jovian committee which is working out the details of the exhibit is composed of Messrs. James A. Cayce, chairman; J. P. Lawrence, of Herbrick & Lawrence; James Shingleton, Nashville Machine Company; J. W. Pentecost, Municipal Lighting Company; J. E. Carnes, sales manager of the Nashville Railway & Light Company; J. P. W. Brown, superintendent of the Nashville Railway & Light Company, and Robert C. Leonard, statesman of the Jovian Order.



**PROPOSED ELECTRIFICATION OF CAUCASUS RAILROADS.**—A committee of Russian railroad men, headed by M. Vosnejienski, has been in the Caucasus investigating the water-power available to furnish electricity for the operation of the government and private railroads of that region, which are now operated by steam.

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**MUNICIPAL PLANT AT SOUTH STILLWATER TO BE SUPPLIED FROM CENTRAL STATION.**—Following the recent destruction by fire of the municipal electric plant at South Stillwater, Minn., the village authorities have entered into a fifteen-year contract with the Consumers' Power Company which provides for the purchase of electricity for street lighting, water-works pumping and commercial and domestic use. The village will distribute the energy over its own lines.

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**ELECTION IN COMMONWEALTH EDISON COMPANY SECTION.**—The election of officers of the Commonwealth Edison Company Section of the National Electric Light Association in Chicago is proceeding by letter ballot. There appears to be no great opposition to the "regular" ticket, and it seems likely that the men on this list will be elected. The list is as follows: President, Mr. George B. Foster, assistant to vice-president; vice-president, Mr. J. T. Mountain, assistant to chief operating engineer; secretary, Mr. R. H. Williams, assistant auditor; treasurer, Mr. William A. Fox, vice-president.

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**PORTLAND (MAINE) COMPANY'S OFFICE STAFF HOLD OUTING.**—An all-day outing was given to the entire office staff of the Cumberland County Power & Light Company, Portland, Maine, on Aug. 28 by Mr. A. H. Ford, the manager. Delegates from Portland and Biddeford left Portland in the morning on the Lewiston, Augusta & Waterville Street Railway and were joined at Lewiston by the rest of the party. From that city the excursionists rode to Tacoma Inn (about 16 miles from Gardiner, between two lakes), where they enjoyed a shore dinner, music, boating, baseball games, etc. In the afternoon the cars were boarded for Gardiner, where a boat was waiting to take them to Bath, a sail of 25 miles down the Kennebec River. Arriving there, the party returned to Portland on interurban cars.

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**THUNDERSTORM DETECTOR TO WARN OF INCREASED DEMANDS.**—An electrical device which will indicate the approach of a thunderstorm several hours before any clouds appear is being used successfully by an electric-service company in New York City to give ample time to provide for increased illumination when the thunder clouds darken the sky. The storm-detector apparatus, which resembles wireless receiving equipment, is operated by faint impulses from electrical disturbances in the vicinity. Receiving antennas intercept the impulses, which cause a relay to close an alarm-bell circuit. At first the signals are far apart, but as the electrical disturbance approaches the bell rings more frequently. From an hour to half an hour before the storm breaks, depending on the intensity thereof, the bell will ring continuously. In the meantime steam may be raised to operate generators which are placed in readiness to supply additional energy when the demand increases.

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**FIRST LUMBER MILL IN OREGON TO BE ELECTRIFIED.**—The new Booth-Kelly lumber mill which has been completed recently at Springfield, Ore., is the first sawmill in that State to be operated by electricity. The inauguration of electric drive at this mill was consid-

ered such an epoch in the lumber history of the State that the people of the locality celebrated the event with a parade. Mill Day was heralded by the distribution of four-page folders describing the mill equipment. The plant is designed to handle 150,000 ft. of lumber in a ten-hour day. Sixty-five motors, ranging from 0.5 hp to 350 hp and totaling 2150 hp, are installed. Lumber for the kilns is piled by an automatic stacker; lumber is conveyed about the yards by monorail cars or trucks hauled by electric tractors, and heavy timbers are handled by machinery instead of men. Energy for operating the mill is furnished by the Oregon Power Company. All refuse from the mill is delivered to the central station for firing the boilers.

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#### SOCIETY MEETINGS

**NO CHICAGO SHOW THIS YEAR.**—Announcement is made by the Electrical Trades Exposition Company that this year's Chicago electrical show, which was scheduled to be held in that city from Oct. 31 to Nov. 14, has been postponed. The dates for the holding of the future show have not yet been determined.

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**JOVIAN ANNUAL MEETING.**—Mr. Martin J. Wolf, of St. Louis, chairman of the nation-wide promotion committee for the annual meeting of the Jovian Order to be held in St. Louis on Oct. 14, 15 and 16, is doing great work. He is telling the Jovians in each state how many men they ought to have at the convention and contrasting one state with another in friendly rivalry. He says: "Don't feel that the other fellow will do the work, will work up enthusiasm. You do some." An interesting and elaborate convention program is in preparation.

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**INSTITUTE OF RADIO ENGINEERS.**—The first meeting of the Institute of Radio Engineers for this season was held Sept. 2 at Columbia University, New York, when Mr. David Sarnoff, of the Marconi Wireless Telegraph Company, presented a paper on "Radio Traffic." The passage of a wireless-telegraph message from sender to destination over interlinked line and radio telegraphs was traced and the difficulties in traffic handling imposed by the present radio laws were discussed. A brief description of the traffic methods to be used in operating the Belmar-New Brunswick transatlantic stations followed. Messrs. V. Ford Greaves, George S. Davis, Robert H. Marriott, Emil J. Simon and John L. Hogan, Jr., discussed the paper at some length, taking up more particularly the need of radio legislation designed to meet modern conditions of radio engineering. The next meeting will be held on Oct. 7.

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**MEETING OF EMPIRE STATE GAS AND ELECTRIC ASSOCIATION.**—The annual meeting of the Empire State Gas and Electric Association will be held on Oct. 2, beginning at 10 a. m., at the Engineering Societies Building, New York. Mr. J. W. Lieb, vice-president New York Edison Company, and Mr. R. M. Searle, vice-president Rochester Railway & Light Company, will open the general discussion at the morning session on the subject of the supply and renewal of incandescent lamps. The main topic in the afternoon will be gas rates. The Empire Gas & Electric Company, of Auburn, N. Y., has differential gas rates in effect, and Mr. E. H. Palmer, president of that company, will speak on this subject. Mr. E. E. McCall, chairman of the New York Public Service Commission, First District, and Mr. Seymour Van Santvoord, chairman of the Second District Commission, will probably speak at a luncheon which will be served in the Engineers' Club.



## Electricity in the Hotel Statler, Cleveland

**I**T is a significant commentary on the success of central-station service to other great hostelries of the country that when the electricity-supply problem of Cleveland's handsome new Hotel Statler came before the owners and architects for decision the business was awarded to the Cleveland Electric Illuminating Company. And now, after nearly two years' experience with the convenience and reliability of central-station service, it is gratifying to learn that the management of the hotel feels well satisfied with its selection of purchased service as against the annoyance, dirt and expense of operating its own plant.

Probably no other type of customer, all things considered, offers the central station such a large revenue per customer or per kilowatt of connected load as does the hotel, unless it be certain classes of industrial plants. From the standpoint of publicity for the central-station, too, the hotel load must be regarded as valuable, particularly as an example of the varied character, the economies and the conveniences of modern electric service.

With a connected load of nearly 800 hp in motors and about 7500 tungsten lamps of sizes ranging from 5 watts to 250 watts, the Hotel Statler at Cleveland represents an electrical load which would be attractive to any electric-service company. Typical load charts show that the average maximum demand for the entire equipment is about 380 kw, the peak coming on at about 8 p. m. The smallest load of the twenty-four-hour day generally occurs during the early morning hours, when the use of the general lighting equipment is at a minimum and the demand on the various pumps is light. An average of the monthly readings of the totalizing watt-hour meter shows that the hotel uses approximately 150,000 kw-hr. a month.

To secure pleasing illumination of the lobbies, dining-rooms, ballrooms, corridors and other public places, elaborate chandeliers and concealed lighting effects have been employed. An especially handsome effect has been obtained in the Pompeian dining-room by concealing 200 tungsten lamps in reflectors behind a frosted-glass cathedral dome. In order to obtain long life in these



FIG. 1—LIGHTING OF THE GRILL ROOM



FIG. 2—USE OF CANDELABRA FIXTURES IN PARLOR



60-watt tungsten lamps, which are rather difficult of access for making renewals, 130-volt units are used on 115-volt circuits. Above the dome a 0.25-in. rough-wire-glass skylight has been so arranged that during the hot summer months chilled water runs over it in a con-

room, the remainder coming from lamps concealed behind the skylight. Eight-watt round tungsten lamps are used in the wall candelabra fixtures.

In the guest rooms and in the corridors all lamps are inclosed in diffusing bowls. The largest lamps in the



FIG. 3—SPECIALLY DESIGNED LIGHTING FIXTURE

tinuous sheet, cooling the dining-room to a temperature several degrees below that of the outside air. In addition to the general illumination of this room, portable lamps harmonizing with the decorative scheme of the room are placed on the tables near the wall and on the mezzanine floor.

In the main lobby massive but graceful fixtures hung at 20-ft. centers diffuse the light from 200 40-watt lamps, supplying a soft and even general illumination which in the alcoves is supplemented by smaller diffusing bowl units of similar design. Additional light for the clerks' desks and the hotel register is afforded by small lamps in the molded-metal trough shown at the right of the title-piece illustration. These lamps also give prominence to the signs telling patrons to which clerk to apply for "Information," "Rooms," and the



FIG. 5—LIGHTING OF THE GREAT BALLROOM

building are the 250-watt units used to light the barber shop, and the smallest lamps are the 5-watt units outlining the electric sign on the roof.

Situated as it is in the down-town direct-current district, the hotel is furnished with electrical energy from the 115-230-volt Edison system of the Cleveland Electric Illuminating Company. The Edison-service switchboard and the house-service board, although both composed of marble panels, are constructed as separate units, the latter being surrounded by an ornamental molding.

The number of electric motors in the building is about 110. To supply ice and artificial refrigeration, three motor-driven Frick refrigerating machines have been installed. Two of these units, 60-ton machines, are used to make ice and are operated alternately for

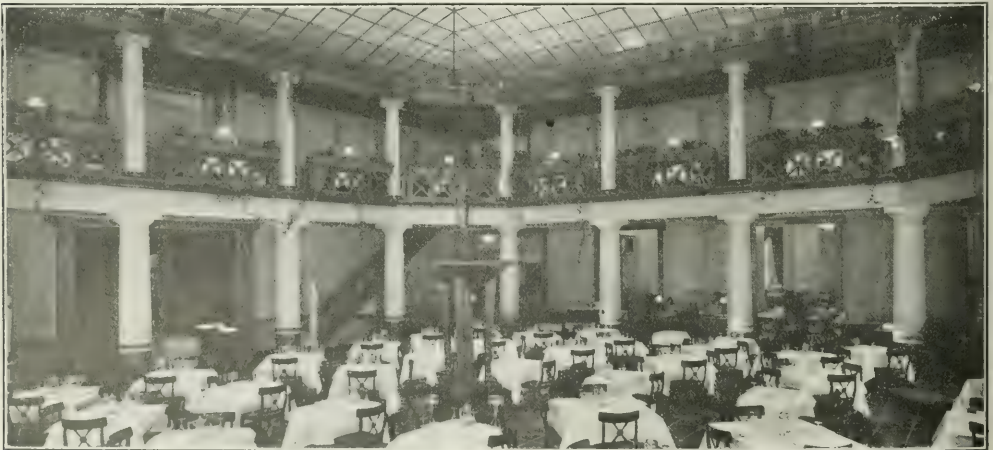


FIG. 4—INTERIOR OF POMPEIIAN DINING-ROOM

like. The lobby is 30 ft. in height, 31 ft. wide and 200 ft. long.

Still another type of hanging fixture has been used in the ballroom. However, the few 25-watt lamps in these fixtures supply but a part of the lighting for the

two-week periods. The third and smaller machine is used exclusively for ice-cream manufacture. Behind the large unit shown in Fig. 8 may be seen the driving motor connected to the large gear by means of a silent chain. To the right and in the rear of the same illus-

tration are two 5-hp motor-driven, brine-circulating pumps serving as auxiliaries to the refrigerating system. Behind these is the large tank used for cooling drinking water circulated to the guests' rooms.

The control apparatus for the three refrigerating

with washing, ozonizing and cooling the air supplied for ventilating purposes.

Washing and drying of clothes, together with ironing, is performed electrically in the laundry operated in the hotel. The accompanying table shows the ma-



FIG. 6—SWITCHBOARD, SHOWING EDISON SERVICE ENTRANCE

machines is grouped on a square marble column. Leads enter and leave this unique panelboard from the top, so that all live connections, rheostats and starters are concealed. The two small panels at the right of the picture control the operation of vacuum pumps working on the steam-heating system and producing a "vacuum" of 12 in. to 14 in. of mercury column. Steam enters the heating system from the central-station mains at approximately 1 lb. pressure.

Two 30-hp, 220-volt motors, directly connected to top-discharge pumps, lift water from the city mains to three tanks on the roof of the thirteen-story building.

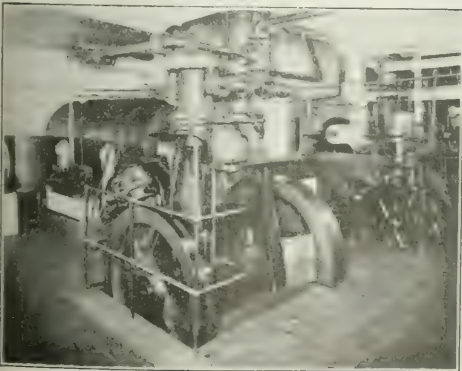


FIG. 8—REFRIGERATING COMPRESSORS

Water for house service is then fed by gravity to the various parts of the hotel. Automatic starters attached to floats in the tanks control the operation of the pumps and hence the water level in the tanks. Other installations of motor-driven pumps are used in connection



FIG. 7—WATER CURTAIN FOR COOLING AIR

chines used and gives the sizes of the driving motors. MOTOR-DRIVEN MACHINES IN LAUNDRY

Two 6-in. steam-roll collar ironers	Motor hp.
16-in. steam-roll collar ironers	3
No. 24 show collar shaper	Fractional
Bishop seam dampener	Fractional
Point dampener	Fractional
Shirt-bosom press	2
Two electrically heated reverse body irons (3 hp each)	6
40-in. by 60-in. dry tumbler	3
Eight washing machines (3 hp each)	24
Five extractors (5 hp each)	25
120-in. six-roll Hagen irons (66 ft. per minute)	5
48-in. steam Annihilator iron (angles)	5

The Hotel Statler in Cleveland has now been in operation about twenty-four months, giving Mr. John



FIG. 9—CONTROL PANELS FOR REFRIGERATING MACHINE

H. Graham, chief engineer, and his assistant, Mr. Emmet J. Graham, an opportunity to confirm the claims made for the economy of central-station service and to realize its convenience, reliability and efficiency in an establishment of this kind.



## Pole and Tower Transmission Lines

**Width of right-of-way and its relation to line construction details—Constituents of factor of safety for wires—Conditions governing length of span. By R. D. Coombs**

THE simplest manner of providing a right-of-way for a transmission line is to obtain a franchise from the municipality to set poles along streets or lease or purchase the right to erect poles or towers on private property. Although this method is by far the more common, it seems probable that in the future there will be a marked increase in the number of rights-of-way for both pole and tower lines purchased outright. Private rights-of-way, while naturally more expensive in point of original cost, permit the most economical construction, are unaffected by restrictive regulation, and eliminate the necessity of making excessive expenditures for increased transmission facilities. The abnormal expense involved in hurried construction and the excessive payments often required to complete a right-of-way (sometimes amounting to a species of blackmail) are perhaps not always fully realized. Such expenses would be greatly reduced if a private right-of-way were held, particularly when subsequent lines are to be constructed thereon. It may be argued that excessive prices will be demanded for continuous rights-of-way, as usually happens when railroad companies attempt to acquire land for their purposes. While the unit prices usually asked are unquestionably excessive for land which may be serving no purpose at all, yet they may not be excessive for a right-of-way, as has been proved in the case of the railroad rights-of-way. Heretofore private transmission-line rights-of-way have been purchased chiefly where land was very cheap and when an important line on wide-base towers had to be constructed. It is probable, however, that equally effective reasons may be advanced for purchasing private right-of-way in more settled communities, where it is necessary to build a series of pole lines.

### Width of Right-of-Way

There seems to be no general standard or set of rules by which the width of a right-of-way may be determined. The two factors which appear to have had the greatest influence on the width of existing rights-of-way are the probable ultimate number of pole or tower lines to be erected thereon and the height of adjoining timber. There are several other conditions which should affect the width, among which are the total desired security of the lines, the character of the country traversed, and the character of the construction.

Where the nature of the ground permits, some consideration may be given to patrol and transportation facilities between the lines of supports. Apart from any question of cultivation or possible railway facilities, the remaining controlling conditions are all involved in the general one of protection from interruptions. Interruptions may originate either within or without the limits of the right-of-way. Those from within are generally caused by mechanical or electrical failure and are best minimized by separating the lines. Those from without may be caused by fires, malicious mischief, falling trees, limbs, straw or other objects blown by the wind, etc. Interruptions from these causes

can be minimized by allowing sufficient marginal clearance. As interruptions are generally caused by disturbances outside the right-of-way, more consideration should be given to marginal clearance than to internal clearance. Some engineers declare that the distance from the base of the towers to the nearest boundary of the right-of-way should equal or exceed the height of the tallest neighboring trees. If this rule were applied literally, the width of the right-of-way would have quite variable limits and in some localities would assume excessive values. While some degree of consideration may properly be given to the average height of timber, it must not be forgotten that the effective range of wind-blown branches is greater than can always be allowed for economically. It is advisable to cut down or trim the taller trees and to remove dead branches, since

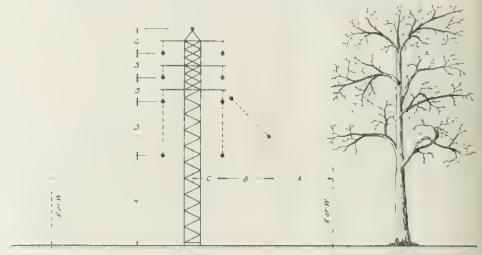


FIG. 1—DOUBLE-CIRCUIT, SINGLE-TOWER-LINE RIGHT-OF-WAY

storms would presumably blow these onto the line before the smaller and live timber was affected.

### Relation Between Tower Design and Clearance

The width of a right-of-way and the location of the towers thereon depend to a great extent on the character of the construction, as the clearance must be sufficient to prevent wind-blown conductors coming in contact with each other or with the towers and the trees. Long-span construction will therefore require greater clearances than short-span construction. Steel poles or narrow-base towers permit the closest spacing of lines, both on account of their narrow spread at the ground and because they are usually employed with shorter spans and smaller sags. If the supports are staggered—that is, if the poles in one line stand opposite the mid-span points of the adjoining lines—less clearance is required to prevent swinging contacts. The general security desired also affects the width of the right-of-way and the location of the poles or towers. One line in the middle of a wide right-of-way has the maximum possible security. In wild, treeless country two lines near the edges of the property are more nearly immune against service interruptions than in positions with a smaller separation. One tall and one short line are more secure than two tall lines, because the short one can rarely affect the other. All things considered, the lines should be constructed so as to permit the great-

est freedom of future construction, a reasonable separation between lines, and a maximum clearance from the side lines.

In order to facilitate the study of right-of-way clearances, three types of installations are shown. One represents a two-circuit steel pole or narrow-base tower, erected in the middle of a private-right-of-way; another

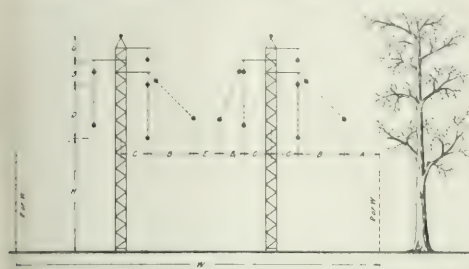


FIG. 2—CLEARANCES FOR TWO SINGLE-CIRCUIT TOWER LINES

shows two one-circuit poles, while the third shows two one-circuit wide-base towers.

In each case it is assumed that suspension insulators are used. To modify the diagram for pin-type insulators it is necessary only to adopt slightly smaller values for the conductor deflection and the clearance between the tower and the wires in their normal positions. The windward-deflected sag  $B$  in the two-tower rights-of-way is shown as one-half that of the leeward-deflected sag  $B_1$ . The assumption is, of course, arbitrary and would vary for different sizes of wires, spans and sags. The table gives the probable ranges of the various clearances, the summation of which determines the width of the right-of-way. The probable range of the width  $w$  is also shown for three (assumed) minimum marginal clearances of 6 ft., 15 ft. and 25 ft. The presence of tall trees overhanging the right-of-way line is undesirable, but it cannot always be avoided. The accompanying diagrams indicate the limiting clearances which should be allowed.

#### Factor of Safety

As in all construction work, the mechanical factor of safety should receive by far the most important consideration. Indeed, the factor of safety will not only affect the selection of the details of construction but will practically determine the general type of line to be used. In actual practice, however, this fact seems to be lost sight of, for the factors of safety are almost always the last values to be definitely determined, whereas they should be the first and governing features. In other words, the method in general use at present is a cut-and-try method, in which several designs based on different factors are first worked out and the final selection too often left to one individual's judgment or to the suggestion of the salesman.

It is extremely doubtful whether competitive designs received by most purchasers have been really comparable in so far as their true mechanical factors of safety were concerned. In addition to the vagaries of competitive bidding it may be claimed, with considerable justice, that comparative designs as ordinarily made by the purchaser are not truly comparative.

For an accurate survey of the conditions influencing the selection of the proper factors of safety for the various members involved, it is essential that consideration be given to the desired length of service of the line, as well as to the characteristics of the parts and materials involved in their construction. Included in

the term "length of service" are many items difficult of accurate determination; hence considerable engineering judgment must be employed in selecting the design of tower or pole to be used. Changes in the load on the line itself, a possible future increase in voltage, or the entire elimination of the line from an operating standpoint, may be assumed with some degree of accuracy, but the probable life of the materials of construction and the possibility of restrictive public regulation are extremely difficult to determine, either for a given line or for future developments as a whole.

The factor of safety, or, as it is sometimes termed, the "factor of ignorance," is a much-abused and generally misunderstood expression. In reality it is a combination of the allowances for error. The amount of the total factor depends, or should depend, upon the

APPROXIMATE RANGE OF RIGHT-OF-WAY CLEARANCES EXPRESSED IN FEET

	One- Double-Circuit Tower Line	Two Single-Circuit Tower Lines	Two Double-Circuit Tower Lines
Span.....	300 to 500	300 to 500	500 to 800
B.....	20	20	20
B <sub>1</sub> .....	3 to 12	3 to 12	10 to 25
C.....	.....	1 to 6	6 to 12
C.....	3 to 6	3 to 5	1 to 8
C.....	.....	3 to 5	3 to 6
If A = 6 ft., W =	25-50	35-60	65-135
If A = 15 ft., W =	40-65	55-95	85-155
If A = 25 ft., W =	60-85	75-120	105-175

accuracy with which the condition of service and the characteristics of the members and material can be foretold. If the possible variation of all individual elements except one is known, then the allowances for the known elements entirely eliminate any necessity for further considering "safety." An increase in the total factor results in a disproportionate increase in the one unknown.

#### Constituents of Factor of Safety

For example, the factor of safety in wires may be subdivided as follows: (a) increased loading; (b) uncertain strength of the material; (c) injuries during erection; (d) errors in erection (improper sag), and (e) deterioration in the material. While the factors of safety allowed for each of these constituents should vary for each installation, their relative values might be expressed as follows: a, 30 per cent; b, 20 per cent; c,

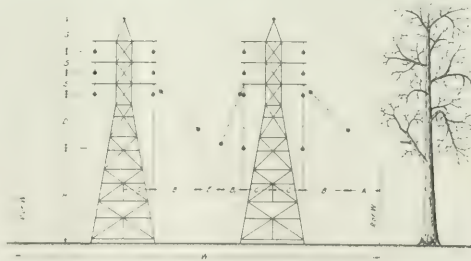


FIG. 3—SPACING OF TWO DOUBLE-CIRCUIT TOWER LINES

10 per cent; d, 30 per cent, and e, 10 per cent, making the total 100 per cent. Adding to this the breaking strength, which is assumed as 100 per cent, a total factor of safety of 200 per cent is obtained. In other words, the commonly used factor two permits the loading and breaking strength to be underestimated 30 per cent and 20 per cent respectively, the strength to be decreased 10



per cent by small injuries, the stress to be increased 30 per cent by improper stringing, and the conductor to deteriorate 10 per cent before the span is theoretically at the point of failure.

Omitting for the moment any consideration of the elastic limit and the fact that stresses in excess thereof will necessitate pulling up slack (with or without undesirable results), it is evident that any further increase in the factor of safety must result in greatly increasing the most uncertain element. On the other hand, if the strength of the wires assumed in the design corresponds closely with the material as purchased, and the wires are strung with care and with sags approximating those in the design, it is apparent that the spans will safely withstand a very considerable increase in the assumed loading. It is highly probable that in many instances inaccurate wire stringing has increased the stress more than 30 per cent above that allowed for, thereby entirely changing the actual strength of the wires in relation to external loads.

The above analysis is, in the writer's opinion, a fairly accurate statement of average actual conditions, and does not give the correct values for the elements of the factor of safety of wire spans designed and constructed under competent supervision.

#### Length of Spans

Since the cost of the material between supports—i.e., the wire—is practically constant, except for the slight increase in length due to the sag, the supports should be spaced far apart. With long spans the number of insulators is reduced, together with the probability of interruption originating at the supports. Other considerations usually prevent the adoption of the theoretically economic span length, however. The conductors must be spaced so as to provide sufficient clearance between adjoining wires and between the wires and the pole. Therefore with an increase in span length, with its consequent increase in sag, it becomes necessary to spread the wires further apart, thus lengthening the cross-arms and increasing their cost. With comparatively few wires in the line, it is possible to arrange them so that long spans can be used without excessively long or heavy cross-arms, but on heavy lines carrying many wires this is not practicable without unduly increasing the height of the poles.

Long spans are not always practicable when lines are situated on highways, as the length of cross-arms may have to be restricted, or the wooden poles available may be unable to withstand loads due to long span lengths. The matter is further complicated by the mechanical limitations of standard, or stock, cross-arms, pins and insulators. On steep hills the spans must be decreased or the supports lengthened to maintain the overhead clearance.

The size of conductors has more of a determining effect upon the proper or possible length of span than any other condition. The large sags required for small wires necessitate excessive wire spacings and pole heights for long-span construction.

No exact economic span length has been determined either for one type of support or for one section of country. In fact, it is extremely probable that for any particular line there will be two designs of nearly the same estimated cost, and that the possible error in estimating the field work will far exceed any difference between the estimates.

Serious error may be made in estimating the probable replacement cost of high, long-span, wooden-pole installations. In view of the present prices and scarcity of long poles, it may be possible that such lines cannot be rebuilt with timber at any reasonable cost. The wooden-pole transmission line is an entirely proper type

of construction in many cases, and it is also true that for one or two circuits the spans could often be lengthened to advantage, but such lines should be protected against decay and a high replacement expense assumed in estimating the cost of the line.

While the economic construction for traversing hilly country is undoubtedly to cross ravines and small valleys by means of long spans, it is possible that this practice may be injudicious unless ample clearance is provided between the wires. There is little exact knowledge of the dependence to be placed upon the parallelism of swinging wires, particularly if their horizontal spacing is 5 ft. to 10 ft. and the sag 15 ft. to 30 ft. Besides the accidental contact of wires in the same horizontal plane, there have been instances of the lower wires being lifted by the wind into contact with those above.

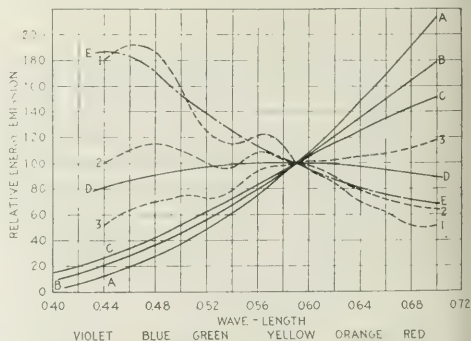
In cases where it will be necessary to pay rent for pole rights on foreign property it may prove economical to use long-span construction, as the rent saved might more than pay interest on the increased cost of the supports. In ordinary country the economic span is probably between 400 ft. and 500 ft. for narrow-base supports and between 600 ft. and 800 ft. for wide-base towers.

## REALIZATION OF ARTIFICIAL DAYLIGHT

Practical Methods Developed for Reproducing North Sky-light and Noon Sunlight

By M. LUCKIESH

The development of artificial light is the result of man's desire to become independent of daylight. To a considerable degree this desire has been realized, but complete independence can be enjoyed only after daylight has been produced artificially. If the tungsten filament could be operated at about 5000 deg. C. absolute, the resultant quality of light would be near that of noon sunlight. Unfortunately this cannot be done, so that the most practical method of producing artificial



A, tungsten lamp (vacuum) operating at 7.9 lumens per watt.  
B, tungsten lamp (gas-filled) operating at 15.3 lumens per watt.  
C, tungsten lamp (gas-filled) operating at 22.0 lumens per watt.  
D, clear noon sunlight. E, north blue skylight. 1, 2, 3, three kinds of artificial daylight produced with glass screens.

FIG. 1.—SPECTRAL DISTRIBUTION OF ENERGY

daylight at present is found in the use of a colored screen which alters the tungsten light to a daylight quality. The possibility of producing artificial daylight by this method has long been known. One of the chief obstacles has been the inefficiency of the artificial light sources available for the purpose. A light source radi-

ating all the rays found in daylight—that is, one having a continuous spectrum—is quite desirable as a producer of artificial daylight. Other desirable characteristics are steadiness, unvarying quality and high efficiency. The tungsten lamp has been looked upon with favor for this purpose and several attempts have been made to produce artificial daylight therefrom, some of which have been successful while others have not been sufficiently exact to warrant their adoption. However, the colored screens used for altering the artificial light to a daylight quality have usually included a perishable dye. None of the successful units has warranted adoption for general lighting owing to a low efficiency, and hence they have been chiefly of scientific rather than of practical interest.

Among the early experiments in the production of artificial daylight by means of the tungsten lamp and a colored screen were those carried out by Ives and

also bearing in mind the particular demands for daylight indoors. It was decided that three kinds of daylight, and therefore three classes of glassware, were desirable. The first when used with the high-efficiency tungsten lamp should reproduce north skylight; that is, the light from an average north sky. This would find its use in arts requiring accurate discrimination of colors.

The second class was designed to reproduce clear noon sunlight. This could be taken as an average daylight because it represents approximately the mean of all phases of daylight out of doors during ordinary daylight working hours. This unit would find a field in the general lighting of industrial plants, such as those engaged in lithographing, color printing, manufacture of paints and wall-papers; also in paper mills, paint shops, cigar factories, art galleries, etc.

A third class was considered as a compromise be-



FIG. 2—VIEW IN LITHOGRAPHING PLANT, SHOWING PROPERLY TINTED GLASSWARE

Luckiesh\* in the Nela Research Laboratory with the old (vacuum) tungsten lamp. As in other units devised for the purpose, a perishable organic dye was found necessary for obtaining the final correction. There was little incentive to develop the scheme further, owing largely to the inefficiency of the old tungsten lamp as a producer of artificial daylight. With the advent of the new high-efficiency tungsten lamp greater possibilities were recognized. The writer therefore began the development of glassware which would meet many requirements where light of a daylight quality is desired.

In the first place, it is necessary to obtain standards of daylight. These were chosen from available data,

tween daylight and ordinary artificial light. From another viewpoint this class might be considered as a compromise between wattage and quality of light. With these three classes in mind the problem of obtaining colored glass was attacked.

Considerable spectrophotometric data obtained by various observers on sunlight and skylight are available. Ives collected these data and combined them with his measurements made in the Nela laboratory. The means of these results are shown in Fig. 1. The distribution of energy in the spectra of three tungsten lamps, as determined by Mr. F. E. Cady, is shown in comparison with the data on skylight and sunlight. The method of obtaining artificial daylight from the tungsten lamp involves the problem of obtaining a

\*Electrical World, May 4, 1911



colored glass of such character that the transmitted light contains the various colored rays in the same proportions as they are found in the particular daylight to be imitated. A number of coloring elements are found to be necessary in order to produce a glass which fulfils the requirements.

In order to learn the efficiencies which can be obtained in producing artificial noon sunlight or skylight, computations were made. A light source which radiates all visible rays can be said to have a certain daylight efficiency. For instance, the light from a tungsten lamp can be considered as being composed of light of a clear noon sunlight quality plus a certain amount of yellow light. The ratio of the amount of light of a clear noon sunlight quality to the total amount of light can be taken as the sunlight efficiency of the light source. A similar consideration applies to skylight efficiency. The old tungsten lamp operating at an output of 7.9 lumens per watt is found to have a noon sunlight efficiency of 14 per cent and a north skylight efficiency of 4 per cent. The gas-filled tungsten lamp operating at 22 lumens per watt (0.5 watt per horizontal candle) is a much more efficient producer of daylight, its noon sunlight efficiency being 25 per cent and its north skylight efficiency 13 per cent. These values are for very accurate production of the daylight considered. In many cases in actual practice the imitation of daylight need not be so accurate as that considered in the foregoing computations. This would mean higher daylight efficiencies. However, it is seen from the foregoing figures that with the new high-efficiency tungsten lamp accurate noon sunlight can be produced at 5.5 lumens per watt and accurate skylight at 3 lumens per watt. Thus artificial noon sunlight can now be produced at an efficiency not far from that of the old tungsten lamp, and artificial skylight can be produced at an efficiency near to that of the old carbon-filament lamp. No more striking illustration of the progress in the efficiency of tungsten lamps can be given.

A glass may be of a proper color to alter the tungsten light to a daylight quality and yet have a transmission coefficient much lower than that of the theoretically ideal screen. In mixing colors into the glass the tendency is always toward black, so that a glass might correspond to the ideal glass combined with a smoke glass. There is therefore the problem of transparency besides the purely spectral problem. After considerable experimenting a glass has been obtained which is quite satisfactory as viewed both from the spectrophotometric data and from actual trials in competition with natural daylight. It is found to approach the ideal screen quite closely both in efficiency and transmission characteristics when used with the high-efficiency tungsten lamp operating at 0.5 watt per horizontal candle. It can be used with gas-filled lamps of lower efficiency, but there is a decrease in the quality of light. It can hardly be hoped to produce an efficient colored glass which is theoretically ideal, so that the effect of variations from the ideal can be ascertained only by practical tests. Owing to the variability of daylight due to atmospheric conditions and reflection from surroundings such as trees, buildings, walls, etc., some variation in artificial daylight is permissible.

In Fig. 1 are also shown the spectral analyses of the light from a tungsten lamp (22 lumens per watt) after passing through glasses of correct tint. The glass (1) which produces artificial skylight when used with the gas-filled tungsten lamp operating at a high efficiency produces artificial noon sunlight when used with the vacuum tungsten lamp. By decreasing the thickness and slightly altering the composition of the

foregoing glass, artificial noon sunlight is produced by means of the high-efficiency tungsten lamp at an efficiency not far from that of the older type of tungsten lamps. Thus the second class of glassware (2) mentioned earlier in the paper is realized. By further reducing the thickness of the glass and combining it with opal glass by casing or intimately mixing the two the third class of units (3) is realized. These units are satisfactory for store lighting, producing a quality of light between noon sunlight and the original tungsten light; that is, a better quality of light than is obtained at present from any unaltered source available for general lighting.

It is thus seen that daylight can be made artificially at an efficiency sufficiently high for general lighting purposes. Up to the present time the great preponderance of illuminating engineering procedure has been chiefly along the lines of distribution of light. This side of lighting problems has reached a fairly well-developed state. Proper distribution by means of scientifically designed and properly located reflectors conserves light and produces good results. Attention to scientific distribution of light began in the days when artificial light was produced at relatively low efficiencies. With the greater efficiencies of light production of the present day the other great factor found in lighting problems—quality or color-value of light—can be considered. In other words, we can now afford to sacrifice light to obtain results long desired but heretofore impracticable. The importance of quality of light in lighting problems is very great from both esthetic and utilitarian considerations. When considering the uses for artificial daylight one needs only to indulge in a little retrospection in order to realize the importance of light of a daylight quality. The color values of artificial light sources are quite accidental, while daylight is a part of the scheme of creation. Artificial light sources are of recent origin while daylight has been with us always. Our color vision has evolved in daylight and many arts have been standardized under daylight illumination. Daylight, of course, varies very much both indoors and out of doors, yet notwithstanding this great variation during working hours, daylight in general is of a quality far different from that of the light derived from ordinary artificial sources. Daylight can now be produced efficiently with the new high-efficiency tungsten lamp, and the desire for it can be satisfied. Thus the possibilities in artificial lighting are continually widening.

Fig. 2 shows an installation of glassware of proper tint in a lithographing plant. Each unit consists of a 1000-watt tungsten lamp in a 12-in. ball which is supported by a white-enamel steel reflector. The installation is highly satisfactory owing to the steadiness and daylight quality of the light. These are necessary conditions for satisfactory color work under artificial lighting.

### Salaries of Technical Graduates

In collecting data in regard to a class of mechanical, electrical and chemical engineers four years after graduation from a large Eastern college, plain envelopes were distributed, in which the men returned anonymous slips stating the number of firms or corporations they had worked for since graduation and their present monthly salaries. The average number of employers was 2.5, and the average salary was \$161.63 per month. The salaries of the sixty-three men were divided as follows: Thirteen men had salaries up to and including \$100 per month, thirteen to \$125, ten to \$150, eight to \$200, four to \$300 and five above \$300. Ten men did not report.

# Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods and Current Practice Among Successful Utilities

## Electric Vehicles and the Central Station

At the Narragansett Pier convention of the New England Section of the N. E. L. A., Sept. 2 to 4, the committee upon the recognition of electric-vehicle interests in New England, of which Mr. W. H. Atkins, Boston Edison Company, is chairman, submitted a report on the state of the electric vehicle, based upon replies to questions sent to seventy-five representative central stations, sixty-seven of which responded to the request for information. Of these companies, thirty-one make use of an aggregate of 78 passenger and 179 commercial "electrics" in their own business, while thirty-six make no use of electric vehicles. In the territory covered it is estimated that over 757 passenger and 341 commercial electrics are in use aside from those in central-station work, or a total of 814 passenger and 520 commercial cars. (The total number of electric vehicles in use in New England at present is not far from 1500.)

Nineteen companies have a department or representative to follow this class of business; twenty-eight claim to co-operate with electric-vehicle agents in promoting sales; thirty-three companies maintain garages or provide charging stations, and twenty of the companies are members of the Electric Vehicle Association of America. Thirty-six companies expressed themselves as willing to provide or promote a charging station in their cities, while five expressed themselves as unwilling. Seventeen of those not already using electric vehicles signified their willingness to endeavor to employ at least one in their business. The data received indicate that the possibilities of the electric vehicle as an off-peak revenue producer are not yet appreciated by many central stations in New England, and the committee emphasizes the desirability of adopting a more progressive attitude. Of the 236 electrics in use by the sixty-seven companies, ten of the companies use 66 per cent of the total, five companies use 57 per cent, four 53 per cent, and one 34 per cent. The work thus far done has been accomplished by a comparatively small number. The committee recommends the purchase by each central station of any size of at least one electric vehicle, membership in the national organization, the equipment of each plant with charging facilities, and reductions by manufacturers in the first cost of electric vehicles. At its last meeting the committee discussed the advisability of forming a company made up of central-station representatives for the manufacture of low-priced electric vehicles, but decided that the matter should be tabled for the present. Closing, the report points out that if 300 New England central stations should each buy one vehicle and cause one to be sold to a customer, assuming a daily consumption of 15 kw-hr. per machine, there would be a total commercial income of \$225 per day added to the existing revenue of these companies.

### Discussion

Mr. Frank J. Stone, Electric Storage Battery Company, Boston, Mass., presented data upon the income possibilities of electric vehicles. A 700-lb. delivery wagon will consume 3526 kw-hr. in a year of 312 days'

work, giving the central station an income of \$105 at a 3-cents-per-kw-hr. rate. This size of machine has a connected load of 4.4 hp and thus turns into the central station a revenue of \$24 per hp of connected load, without requiring any particular increase in generating equipment. A 5-ton truck consumes 11,100 kw-hr. per year, pays the central station \$333, has a connected load of 7.2 hp, and yields an income of \$46.30 per hp of connected load. The average annual revenue of the central station for all sizes of electric vehicles, including the foregoing, is \$208.81. Other figures presented by the speaker illustrated the reliability of electric-vehicle service. Tower wagons of the Philadelphia Electric Company made 17.1 miles per day for 328 days, trimming from 170 to 200 lamps daily per wagon. One of these wagons made a maximum of 190 stops per day. The winter record of a 1000-lb. delivery wagon in New York department-store service was an average of 24.5 miles and fifty-four stops per day, with a maximum of 42 miles and 102 stops per day.

Mr. R. B. Daggett, Commercial Truck Company of America, Boston, stated that if the price of a two-thousand-dollar chassis was cut in half only 6.6 per cent of the annual cost of operation would be saved. Cutting the charging rate from 5 cents to 3 cents per kw-hr. is equivalent to cutting the price of the chassis in two, and it is as important that a reduction of 4 cents per kw-hr. be made from a maximum of say 6 cents as it would be to supply the chassis free. Mr. W. H. Bolewine, Springfield, Mass., described the electric-vehicle applications of the United Electric Light Company, pointing out that delays by manufacturers in furnishing supply parts hampered development of this class of service. He did not feel that the national advertising of the Electric Vehicle Association of America had made much impression locally. Mr. Walter Kirk, Lynn, Mass., favored private charging stations compared with installations in gasoline garages.

In a trenchant discussion Mr. L. D. Gibbs, Boston, told his hearers that the electric vehicle cannot be stopped by the central station, no matter what the attitude of the latter may be, and urged every central station to take a hand in the movement and derive profit from it without waiting to trail along behind. The day is close at hand when the companies will be forced by the public to give the electric vehicle its proper service and when the companies themselves will have to use this class of equipment or become hopelessly out of date. Mr. F. Nelson Carle, General Vehicle Company, urged central stations to adopt these machines in their own service and "cash in upon the confidence of their customers." Albums of photographs of installations are among the most convincing aids to the sale of trucks. Mr. W. H. Blood, of Stone & Webster, Boston, past-president of the Electric Vehicle Association of America, appealed to all the central-station men present to take advantage of their opportunities and at least make a beginning by purchasing a truck for company service. With the Stone & Webster properties the use of "electrics" is now general. Mr. Day Baker, General Vehicle Company, Boston, paid a tribute to the co-operation of the central stations and described a number of the



representative installations in New England. More charging stations are needed. In mill-yard service the electric truck shows a saving over horse traction even on runs only 200 yards long. Other speakers were Messrs. H. H. Skinner, Providence, R. I.; W. M. Thayer, Hartford, Conn.; D. W. Beaman, New Bedford, Mass., and George W. Holden, Edison Storage Battery Company, Boston. Mr. Thayer said that the battery-exchange system has now been developed at Hartford so that fifty-seven trucks have been sold. The trucks supplied by the company on this system have run 810,611 miles since the service was inaugurated in 1910, the mileage in August, 1914, being 42,359.

### Encouraging Consumers to Verify Meter Readings

The Topeka (Kan.) Edison Company marks customers' service-meter readings on tags permanently attached to the meters so that the consumer may verify his readings at any time or check the amounts of energy

## To the Customers of The Topeka Edison Company

Commencing with the August meter reading, you will find attached to each meter, a tag similar to the one here shown.

These tags are for convenience of the customers, so that they can know the consumption for the month, before receipt of the bill, and readily verify the reading at any time they may desire.

As these tags are placed on the meters for your convenience, we hope you will take care that same are not destroyed.

The company will be pleased to inspect and, if necessary, have to read the meter. The meter will not be removed from the premises.

**The Topeka Edison Company**  
PHONE 4080. 808 Kansas Ave.

**The Topeka Edison Company**

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# Illumination and Wiring

## Grounding of Lighting Circuits

The final session of the Narragansett Pier convention of the New England Section of the National Electric Light Association, Sept. 2 to 4, was devoted to a discussion of the report of the committee on overhead-line construction as presented at Philadelphia this year. Mr. W. H. Blood, insurance expert of the association, addressed the meeting upon the grounding of secondaries up to 250 volts, as called for in the latest National Electrical Code. In this country 325 companies are now grounding secondaries. Water-works companies should be informed as to the entire safety of this practice and the impossibility of electrolysis from alternating-current circuits. The best practice is to ground to the water pipe at each individual consumer's installation. In a personal appeal to the membership, the speaker pictured the dangers of ungrounded service in their own homes and pointed out that unless companies adopt this practice they are liable to be found criminally negligent in case of accident.

Mr. C. A. Dean, Cambridge, Mass., said that his company will not supply service unless the installation is properly grounded. There is probably no place on the company's system where a ground is more than 500 ft. from the consumer's premises. Mr. A. D. Colvin, Hartford, Conn., said that in that city no ground made with an adjustable clamp is acceptable. Unusually thorough grounding is practised at Providence, R. I., according to Mr. W. H. Oviatt, both inside and outside grounds being established with a white-covered wire for the pipe connection.

Mr. Alexander Macomber, Boston, stated that the practice of grounding secondaries is to be standardized in all the Tenney companies. He questioned if the cost of grounding at each consumer's service is justified, favoring grounding at the transformer, using a brass plug in the water pipe. Mr. W. H. Bolewine, Springfield, Mass., stated that the city authorities propose to charge the company \$1 per year per attachment to the water system, so that the policy will not be determined until more favorable terms can be obtained. The United Electric Light Company believed thoroughly in grounding. Mr. A. F. Townsend, Woonsocket, R. I., said that in cases where a group of houses owned by a single party is supplied with water through one meter the

service pipe is grounded outside the meter, a jumper is placed around the meter, and each house pipe is utilized as an interior ground in addition. Mr. Ralph Sweetland, New England Insurance Exchange, Boston, paid a tribute to the work of Mr. Blood in securing the establishment of the grounding rule. He said that fourteen years' experience showed that in 99 per cent of the cases grounding will prevent all trouble when primary and secondary circuits get together. The speaker condemned grounding at the transformer and advocated service-pipe grounding on account of the inspection facilities. Others who spoke briefly were Messrs. M. G. Haight, Worcester, Mass.; W. B. Kirk, Lynn, Mass.; W. S. Wyman, Augusta, Maine; A. E. Burland, Boston; D. W. Beaman, New Bedford, Mass., and H. T. Sands, Malden, Mass. The session closed with a brief discussion of the importance of periodical examinations of oil in transformers and switches and comments of several central-station men present upon the proper separation of high-tension and low-tension circuits when carried on the same pole line. A minimum separation of 6 ft. between cross-arms was advised, with the grounding of cross-arms and pins at railroad and other crossings. Mr. Percy Wilson, Lowell, Mass., cited the excellent results of oil filtering through two tins of unslacked lime and sand in the order given, and Mr. C. A. Mixer, Rumford Falls, Maine, said that the break-down test of oil increased from 4000 volts to 70,000 volts after filtering. The use of better grades of insulators than those normal to a line was advocated at crossings. Mr. Macomber said that transformer oil should be filtered at least once in two years and switch oil yearly, depending on the service conditions. Mr. W. H. Cole, Boston Edison Company, said that the use of wire nets in crossing protection has been abandoned.

## Ornamental Magnetite-Arc Lighting at Dallas, Tex.

The business section of Dallas, Tex., is lighted by 425 4-amp magnetite-arc lamps suspended from ornamental cast-iron posts placed at intervals of 70 ft. along the curb on both sides of the street, the lamps on opposite sides being staggered with respect to each other. The installation was made by the adjoining property owners, who paid an assessment per front foot covering the cost of the underground construction, the lamp-posts and the electrical energy for the first year's



FIG. 1—MAGNETITE-ARC ILLUMINATION OF COMMERCE STREET, DALLAS, TEX.



operation. The electric company furnished the plant equipment, lamps and overhead construction necessary to supply the service. The rate for this lighting is \$45 per lamp per year, the units being extinguished at midnight. An unusual feature of the rectifier equipment is a cooling tower which is employed to reduce the tem-



FIG. 2—TYPE OF ARC-LIGHTING POST USED AT DALLAS, TEX.

perature of the water circulated through the cases containing the transformers and rectifying tubes. Energy for the Dallas ornamental street lighting is furnished by the Dallas Electric Light & Power Company, of which Mr. Edward T. Moore is general manager.

### A Striking One-Letter Electric Sign

"Longue Vue," a famous restaurant overlooking the stately Hudson River near Hastings-on-Hudson, N. Y., has a novel electric sign which never fails to attract the attention of passengers on passing night boats. The restaurant building is on a high eminence and at a little distance back from the water, so that to have erected an electric sign making the whole name visible from the river would have required a sign structure almost as large again as the restaurant building itself. The difficulty was solved, however, by installing a single very large universal box letter, arranged with a flasher to spell out successively "L-O-N-G-U-E V-U-E." After a few seconds' intermission, the letter-box again spells through the name. As the sign is mounted on the very peak of the roof of the building, 200 ft. above the river, its regular flashes, like the loom of some distant lighthouse, are visible for miles up and down the stream and serve to arouse the curiosity of travelers long before the letters themselves are near enough to be read.

## Letters to the Editors

### Municipal Ownership Facts

*To the Editors of the Electrical World:*

SIRS:—Municipal ownership has again assumed national importance by the reporting to Congress of the bill for government purchase and operation of the street railways in Washington. The pending congressional election affords an opportunity to public utility representatives throughout the country to state their case fully and frankly to the men who will constitute the next Congress. It is a duty which the public utilities owe to themselves as well as to their associates to take advantage of this opportunity. When they are seeking votes candidates for Congress usually are glad to listen to their constituents. The public utilities in each congressional district from Maine to California and from Texas to Minnesota should arrange to present to the candidates of both parties, in definite and concise form, the facts about municipal ownership in general, the Washington situation and the bearing of the latter on local conditions. If the facts regarding municipal ownership were known by the representatives of the public, the numbers of its adherents would wane. Now is a good time to get a hearing from the members of the next Congress. Public utilities should seize and make the most of the opportunity.

WILLIAM D. KERR,

*Director Bureau of Public Service Economics.*

New York.

### Moving Pictures That Create the Wrong Impression

*To the Editors of the Electrical World:*

SIRS:—Under the title "An Innocent Delilah," there was recently shown in Chicago a motion-picture film depicting incidents of a damage suit instituted by Western ranch owners against an electric-service corporation for usurping water rights. The hero of the picture play was the bright young rancher representing the interests of the land owners, the villains were the president of the water-power company and his staff of lawyers, and the heroine "Delilah" was the daughter of the principal villain, the president. In the course of the play the president of the power company is seen using nothing but unlawful and devious methods of securing certain deeds and titles to waterfalls, and in his nefarious scheming he is aided by his daughter, who is at the time innocent of what she is doing. Eventually she learns of the true situation, returns the deeds to their rightful owner, the hero, and with him occupies several feet of film at the end of the picture, giving the public that thrill it always enjoys at seeing the play end with the hero and heroine in fond embrace.

Entertaining as this film may be, it abounds in incidents sure to leave the spectators with wrong impressions concerning the character of executives of hydro-electric enterprises. Such a company is a benefit to adjacent communities rather than a grabbing, grafting octopus. At a time such as this, when water-power legislation is pending, popular sentiment ought not to receive such misleading impressions, and if the *Electrical World*, the Society for Electrical Development, or any other interest or body desiring that all parties get fair play, can influence motion-picture syndicates to adhere more strictly to truthful situations in their plays, the effort will be well worth while in the interest of the public as well as in that of the water-power companies.

Chicago, Ill.

J. R. DUNHAM.

# Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects Questions and Answers

## Connections That Insure Flexible Feeder-Circuit Regulation

Switching apparatus employed in the Commerce Street station of the Milwaukee (Wis.) Electric Railway & Light Company permits of very flexible voltage regulation of feeder circuits. Each feeder has its individual voltage regulator, and a spare unit is installed to furnish regulation when any of the other sets become inoperative. Each regulator is equipped with the same design of switch, the entire set being connected by a common spare bus. The construction of the switches and their connections to the regulators and spare and energizing buses for different conditions of operation are clearly shown in the accompanying diagram.

The lower jaws of each switch are led to its regulator, the upper left-hand jaw to the spare bus, the upper right-hand jaw to the left-hand hinge and feeder circuit, and the right-hand hinge to the energizing bus through an oil switch. The left-hand hinges and jaws

upper position and the twin blades open, the circuit is unregulated. By connecting the upper and lower left-hand jaws of the spare regulator switch with the twin blades and placing the right-hand blade in the lower position any feeder circuit can be regulated by connecting it to the spare bus.

To control several feeder circuits from the spare regulator, the left-hand blades of each feeder switch are

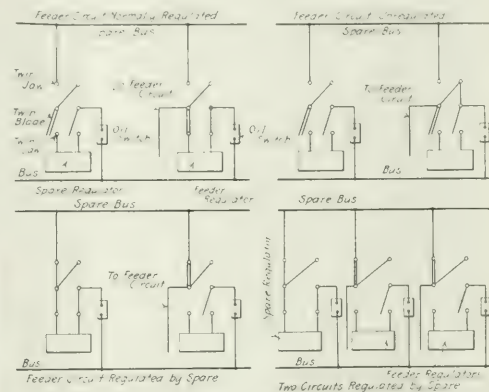


FIG. 2—DIAGRAM SHOWING SWITCH CONNECTIONS FOR DIFFERENT OPERATIONS

placed in the upper position, connecting them to the spare bus, and the spare bus switch is connected as previously described. The scheme described was devised by Mr. G. G. Post, the company's electrical engineer, and proves useful also for isolating the feeder regulators and oil switches when it is necessary to inspect them without de-energizing their respective feeder circuits. Because of the uniformity of the connections of these switches it is possible to reverse the operations described and to make any regulator take the place of the spare one.

## Danville Company Decides Against Deep Condenser Pits

Improvements under way in the station of the Danville (Ill.) Street Railway & Light Company will make that power house when completed one of the most up-to-date plants owned by the Illinois Traction System. Two 4000-kva, 2300-volt, sixty-cycle, three-phase General Electric turbo-generators will be installed in an addition to the present building. These machines are among the first 4000-kva units ever manufactured to operate at 3600 r.p.m. The old reciprocating-engine sets, which have been acting as reducing valves on the heating system, will be retained in their present positions and operated during the steam-heating season. The condensing turbines will carry the load during the summer months. To supply draft for the additional boilers

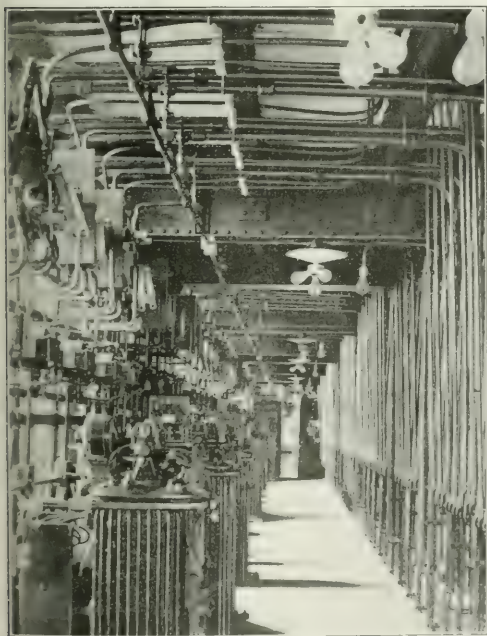


FIG. 1—FEEDER REGULATORS AND SPARE BUS SWITCH IN COMMERCE STREET STATION, MILWAUKEE

are designed to accommodate twin blades separately operable. All of the blades are provided with slots in which hooks can be inserted to move the blades.

With all three blades of a switch in the lower position the particular feeder circuit is regulated by its respective regulator. With the right-hand blade in the



which will need to be operated with the increased station rating, an 18-ft. by 250-ft. brick-lined steel stack is being erected on a 32-ft. steel structure, having its base in the present boiler.

One of the chief engineering problems in the design of the plant was that of condenser arrangement. Two surface condensers with approximately 8000 sq. ft. of surface will be purchased and installed beneath the turbines, the bottom of the hot-well being about 24 ft. beneath the engine-room floor. At first the advisability of digging a 60-ft. pit beneath the engine-room floor for these condensers was considered. This plan would have reduced the necessary lift of condensing water from the river to about 18 ft. However, after some consideration it was decided that the saving from reduced pumping cost would not capitalize a sufficient amount to build the pits and tunnels. It was also thought that the work of caring for condensers in such an inaccessible position would be unduly difficult and would probably be less satisfactory, as workmen do not like to stay in hot subterranean pits any longer than necessary. It was also thought that with the condensers at this low level sufficient circulating water might not be available in periods of drought. The company intends building a concrete dam, and with the condensers at their present level the circulating water can be returned to the upstream side of this structure, cooled, and used again.

With the present arrangement the engine-room floor stands about 78 ft. above the river, and by placing the condensers at their present level the circulating pump will act against a head of about 47 ft. Mr. J. E. Johnson is local manager at Danville.

### A Pneumatic Water-Level Indicator

In its hydroelectric plants on the Chattahoochee River the Columbus (Ga.) Power Company employs a novel pneumatic method for indicating at the switch-board the water level in the forebay outside. If an excess of compressed air be admitted to a tube the free end of which is immersed below the water line, the air pressure within the tube can rise only until it just equals the head of water over the pipe opening, after which any further air pumped into the tube will escape in the form of bubbles. The air pressure everywhere in such a tube will then be at all times exactly equal to the height of the water over the pipe opening. A pressure gage attached to the upper end of the pipe may therefore be calibrated to read directly in feet of water level.

As actually constructed by the Columbus company, the apparatus is extremely simple, consisting of a recording gage connected with a hollow-wire tube one end of which is immersed to a point below low-water level. Air is admitted to the tube through a reducing valve, for it is important that the pipe be kept filled with air lest the accuracy of the device be destroyed. To maintain the surface of separation between the air and water at the mouth of the submerged tube, air is fed into the hollow wire just fast enough to allow bubbles to escape slowly from the opening. Constant agitation of the water at the mouth of the tube also prevents the accumulation of sediment which might clog up the tube.

Air is supplied to the tube from a high-pressure tank through a reducing valve, needle valve and sight-feed receptacle. Pressure gages are connected in the air-supply line on each side of the reducing valve to indicate the storage-tank and feeder-pipe pressure. The rate at which air is fed into the hollow wire is regulated by the needle valve and indicated by the sight feed.

The latter consists of a glass receptacle partly filled with water through which the air is allowed to bubble freely.

As the hollow wire presents resistance to the flow of air, the air-supply tank should be placed as near the outlet of the tube as possible. The tube leading to the gages, however, transmits only static pressure, hence it may be of any moderate length, as friction need not

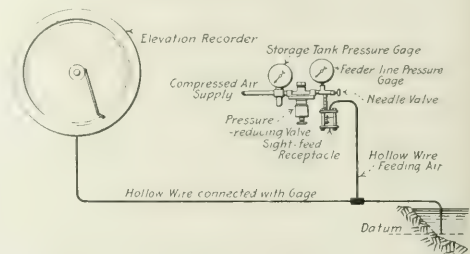


DIAGRAM OF APPARATUS FOR RECORDING WATER ELEVATION

be allowed for. The tube may be buried in the ground or supported by a messenger wire strung on poles with electrical conductors.

Changes that may occur in temperature do not affect the accuracy of the records as heat only causes the air in the tube to expand and escape in bubbles at the mouth until the hydrostatic and air pressures are equalized.

### Effect of Furnace Design and Method of Firing on Efficiency and Smoke Production

How should the furnace of a return-tubular boiler be designed to give the best efficiency and prevent the production of smoke when low-grade slack coal is being burned? What method of firing is recommended for this type of boiler? M. A. P.

Experiments have been conducted recently by the Bureau of Mines to determine the effect of furnace construction, methods of firing and auxiliary air supply on the efficiency and smoke production of return-tubular boilers, using the fuel mentioned in your question. Among the conclusions drawn from the results of these tests are the following: Prevention of smoke can be accomplished more easily by employing the coking method of firing than by using the alternate spreading method; by supplying supplementary air to a furnace immediately after firing the production of smoke can be reduced and the over-all efficiency increased; a brick arch placed directly over a grate and underneath the boiler shell lowers the over-all efficiency and tends to produce more smoke; screening the heating surface in the combustion chamber from direct radiation from the brick-work lowers the combined efficiency. Furthermore, a gas-deflecting arch placed back of the bridge wall produces better combustion by mixing the gases more thoroughly. The same effect may be obtained by dividing the space back of the bridge wall into two parallel passages having wings to deflect the gases. The following conclusions hold for the conditions under which the tests were conducted but may not be true under different conditions: Devices for admitting air to the combustion chamber through apertures above the furnace doors and in the bridge wall appear to be equally effective in reducing smoke and increasing the efficiency. Steam jets installed above the furnace doors and directed at the rear end of the grates failed to show a sufficient gain in efficiency or reduction in smoke to make their use desirable.

# Digest of Current Electrical Literature

## Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

### Generators, Motors and Transformers

**Limitations of High-Tension Direct-Current Machines.**—ARTUR SCHERBIUS.—The construction of high-tension direct-current machines is in principle possible for very high voltages, but practical limits are set by the cost and weight of such machines. The author discusses the relation between weight, cost, speed and voltage of high-tension direct-current machines and emphasizes that all means which facilitate and improve commutation permit an increase in the voltage limit. This is especially true for machines of very small output and for machines of which the cost is of small importance, so that, for instance, high-tension machines for 0.2 amp or 0.1 amp with sufficiently large dimensions can be built for voltages many times those of standard machines for larger outputs. The author refers to the 3600-volt direct-current six-pole machine design of Thury and gives the following table which shows how other designs for 3600 volts, but with a different number of poles, can be deduced from it if the armature length, the pole pitch on the commutator, the circumferential speed of the commutator and the current per brush arm remains the same:

Poles	Kw	Amp	Revolutions per Minute
2	90	25	900
4	180	50	450
6	270	75	300
12	540	150	150
20	900	250	90

It will be seen that the maximum speed becomes 900 revolutions per minute, and for this speed the output is reduced to 90 kw. The current and the output of such machines can be increased in proportion to the length of the armature and the armature diameter. For the machine in question the total armature length is 32 cm and the circumferential speed of the armature is 19.4 m per second. Both figures could be increased. At the same time the commutator would have to be lengthened. This would be easy mechanically, since its useful length is only 7.5 cm, but on the other hand any increase of the current would have a bad effect on the commutation. Nevertheless, it would be possible to increase somewhat the figures in the second and third columns. From theoretical formulas developed by the author and from the data of the Thury machine, the author concludes that with a rotary converter a voltage of 3600 can be obtained only for frequencies not higher than fifteen and three-tenths cycles per second; with a frequency of fifty cycles per second the maximum voltage is 1100. The generation of high-tension direct current by means of converters at frequencies of fifty cycles or so is therefore possible only within narrow limits.—*Elek. Kraftbetriebe u. Bahnen*, July 24, 1914.

**Rotary Converters.**—G. MATTAUSCH.—The first part of an article on rotary converters. The author gives

formulas for the ratio of the electromotive forces for single-phase, three-phase, four-phase and six-phase converters, and shows how the ratio of the emfs depends on the wave-form of the alternating current, on the load and on the excitation. He then takes up the armature current and the heating of the armature of the converter. The article is to be continued.—*Elek. Rundschau*, July 29, 1914.

### Lamps and Lighting

**Tube Lamps with Noble Gases.**—A note on a paper read by Dr. Lederer at the recent annual meeting of the Association of Austrian and Hungarian Central Stations at Cracow. The lecture dealt with "recent improvements in electric lighting," and at the end of the lecture the author reported on experiments with "a new form of tube lamps." The tubes are similar to the Moore tube lamps and are filled with noble gases, such as argon, neon, helium, xenon and krypton. The feature which distinguishes these tube lamps from the Moore tube lamp is that they are filled with monatomic gases and are operated at the normal voltage of the city supply networks, such as 220 volts. The alleged advantage of the use of monatomic gases over gases the molecules of which have several atoms is as follows: In order to be brought to luminescence the molecules containing several atoms must first be decomposed into their single atoms, since only then will they be able to conduct the electric current and give out light simultaneously. In order to produce light with a gas the molecule of which has several atoms a much greater energy supply is, therefore, necessary than with monatomic gases. Hence, from the viewpoint of illuminating engineering, tubes filled with monatomic gases must be far more economical than the Moore tube filled with gases the molecules of which contain several atoms or with gas mixtures. The experiments with the noble-gas tube lamp were made in the laboratory of the Westinghouse metallic-filament lamp factory in Vienna and gave good results.—*Elek. Zeit.*, Aug. 13, 1914.

**Train Lighting.**—An illustrated description of a pressure-reducing motor-generator for delivering high-pressure direct current for use in the Amsler train-lighting system.—*London Electrical Review*, Aug. 21, 1914.

### Generation, Transmission and Distribution

**French Distribution System.**—J. REYVAL.—An illustrated description of the electric distribution system of the Bassin de Briey, which is one of the liveliest industrial districts of eastern France and in which mining and metallurgical industries are developing with rapid speed. A portion of this district is supplied with electric energy from the network of the Energie Eclairage, which supplies now 1725 kw against 950 kw a year ago.—*La Lumière Elec.*, July 25, 1914.

**Speed Control of Three-Phase Induction Motors.**—J. SCHMIDT.—An illustrated article on three-phase induction motors with six different speeds obtained by changing the number of poles, and on their use in textile printing plants. The article is to be continued.—*Elek. Anz.*, July 30, 1914.



### Traction

**Direct-Reading Instrument for the Measurement of the Resistance of Rail Joints.**—J. REYVAL.—At the recent exhibition of instruments of the French Physical Society an apparatus was shown which had been developed by J. Carpentier in connection with the electrical laboratory of the French State Railways, and which permits the direct measurement of the resistance of rail joints in terms of the length of jointless rails having the same resistance as the joint. Two

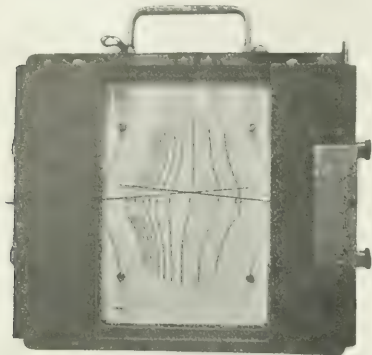


FIG. 1—APPARATUS FOR MEASURING RESISTANCE OF RAIL JOINTS

millivoltmeters are combined in one apparatus, as shown in Fig. 1, so that the needles of the two instruments cross each other. One of the millivoltmeters is shunted in parallel with a length of one meter of jointless rail; the other millivoltmeter is shunted in parallel with the same length of rail containing a joint. Evidently from the two deflections thus obtained it is possible to determine by simple formulas the resistance of the joint, but the particular advantage of this apparatus is that curves are plotted on the scale by means of which it is possible to read directly the resistance of the rail joint by observing the point at which the two needles cross each other. In the development of the apparatus particular attention has been paid to the construction of the millivoltmeter leads so as to get a very firm contact of the leads with the rail.—*La Lumière Elec.*, July 4, 1914.

### Installations, Systems and Appliances

**Storage Batteries Versus Isolated Plants.**—BECK-MANN AND J. HEISIG.—An article pointing out that in large buildings such as hotels, etc., it is often better to install a storage battery and buy energy from the city mains than to have an isolated plant. In Berlin fifty-four such batteries are connected to the electric system with a daily aggregate storage of 14,400 kw-hr. In Munich there are eighty such batteries capable of giving 4500 kw-hr. per day. The batteries are so dimensioned that at least the total energy required during the hours of peak load in the central stations can be supplied from the batteries. During the hours at which load in the central station is low and during which energy can be bought at a low rate from the central station energy is taken from the mains both for charging the batteries and for immediate uses for motor service or lighting. Details are given of the battery installation in the Kaiser Hotel in Berlin, which is equipped with 7000 incandescent lamps and fifty arc lamps, three passenger elevators, fourteen freight and food elevators, and with a total of seventy motors for driving various kinds of machines. Originally the

energy was supplied from an isolated plant containing four suction-gas engines of an aggregate rating of 190 kw. This was replaced ten years ago by a storage battery, and energy is now being bought from the Berlin Electricity Works. The space requirements are one-third less than those of the isolated plant. The battery consists of 240 cells with a rating of 1596 amp-hr. at a discharge current of 399 amp. The maximum consumption during peak-load hours was 170 kw for four hours. When metallic-filament lamps were substituted for carbon lamps, the consumption decreased to 100 kw, and now energy is supplied to another large building in the neighborhood, which needs a maximum of 75 kw. The voltage of the network is at present  $2 \times 110$  volts, so that 130 cells would have been sufficient. But, as it was intended to increase the voltage if necessary to  $2 \times 220$  volts, the double number of cells was chosen from the very start, two cells always being connected in parallel. Two boosters of 14 kw each are also installed. The following comparison is given: The useful energy consumption during the year was 400,000 kw-hr., of which 133,000 kw-hr. was consumed between 10 p. m. and 7 a. m. at the rate of 4 cents per kw-hr., while for the remaining 267,000 kw-hr. a charge of 10 cents per kw-hr. was made, with a discount of 20 per cent. These are the rates of the Berlin Electricity Works. The total yearly cost of the energy bought from the Berlin Electricity Works without storage battery is, therefore, \$26,680. On the other hand, when the storage battery was installed the first cost of the installation was \$24,500, so that the yearly expense for interest and amortization at 12.5 per cent is \$3,063. The expense for attendance, insurance and maintenance is \$925; the rent is \$900; the total cost of energy for 428,000 kw-hr. (including the battery losses), charged at a rate of 4 cents per kw-hr., is \$17,120. Hence the total cost per year with the battery is \$22,008, against \$26,680 without the battery. This represents a yearly saving of \$4,672, or 16.6 per cent of the original cost of the battery installation. Within six years the battery is therefore paid for out of the savings. In this comparison, however, the fact that part of the available energy is now being sold to another building in the neighborhood is not yet taken into consideration, since the total energy consumption during the year is not yet exactly known. If it is estimated from the present daily energy consumption, the final results of the above comparison would be changed as follows: The total yearly cost without battery is \$43,250 and with battery \$35,025, representing a saving of \$8,225, or 33.5 per cent of the original cost of the battery, so that the latter is paid off in two or three years. For hotels or other buildings of this kind the availability of the battery is further of great importance as it insures continuous operation.—*Elek. Zeit.*, July 30, 1914.

### Electrophysics and Magnetism

**Selenium.**—F. C. BROWN.—An account of an experimental investigation of the crystal forms of metallic selenium and some of their physical properties. In this research a large number of new crystals of metallic selenium were formed, some of very large size. All of these forms except one are very transparent selectively to light, a large amount of light penetrating to a greater depth than 0.2 mm. All the forms tested are conducting, showing a specific conductivity varying between 200 and  $10^4$ . All the crystal forms but one have been observed to be doubly refracting. All the crystal forms increase in conductivity when illuminated. The action of light is in the selenium itself and not at the contacts. Mechanical pressure produces a genuine change in the selenium which may alter the conductiv-

ity more than a thousand times. The absolute change of conductivity in one crystal by constant illumination was proportional to the conductivity in the dark, when that conductivity was altered by pressures between 1 atmosphere and 180 atmospheres. The temperature at which the crystals sublimate in mass influences the character of the wave-length sensibility curves. The production of individual crystals of metallic selenium of large size opens up a large field of investigation, which promises to be free from some of the possible complexities in selenium cells.—*Phys. Rev.*, August, 1914.

#### Units, Measurements and Instruments

**Determination of a Rotary Field with a Wattmeter.**—A. KLEINSTÜCK.—In polyphase plants an exact knowledge of the direction of the rotary field, or of the sequence of the phases, is often necessary when meters or relays are to be connected. The easiest means are the use of a rotary-field indicator or the observation of the successive lighting up of star-connected incandescent lamps. If such means are not available, the wattmeter may be used as follows: The three-phase transformer is loaded with incandescent lamps and choking coils connected in star, as shown in Fig. 2. The current coil of the wattmeter is in one phase. The leads to the voltage coil are connected successively to the phases 1 and 2, then to 2 and 3, and finally to 3 and 1. In this way three deflections  $A$ ,  $A_1$ ,  $A_2$  are obtained, and the ratio  $A_1 : A_2 : A = \cos(30^\circ + \phi) : \sin \phi : -\cos(30^\circ - \phi)$ . If the deflections  $A$  would have the values of  $0^\circ$ ,  $30^\circ$ ,  $60^\circ$ ,  $90^\circ$ , the method would yield no results, but it is easy to adjust the deflections so as to get convenient values by connecting several incandescent lamps in each circuit in parallel. The determination of the power-factor  $\cos \phi$  is carried out in the well-known manner by measuring the real and the apparent power in one phase, an ammeter being connected in series with the wattmeter and the voltage coil of the wattmeter being connected between the phase in question and the zero point. The execution of the method is shown by the following example: Let the three phases be indicated by red, yellow and black colors respectively and assume that red is phase 1, yellow phase 2, and black phase 3. The ammeter and the current coil of the wattmeter are in the red phase. The measurement gives an emf of 111 volts and a current of 0.72 amp. The three deflections of the wattmeter are as follows: With the voltage coil between red and yellow,  $-13.8$  or  $+13.8$ ; with the voltage coil between

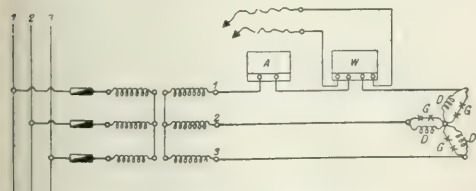


FIG. 2—WATTMETER METHOD OF DETERMINING SEQUENCE OF PHASES

yellow and black,  $+74.4$  or  $-74.4$ ; with the voltage coil between black and red,  $-60.6$  or  $+60.6$ . The real power of one-phase is 29.4 watts, hence the power-factor,  $\cos \phi = 29.4 \times \sqrt{3} \div (111 \times 0.72) = 0.64$ , or  $\phi = 50^\circ$ . Hence the ratio of the three deflections of the wattmeter should be  $A_1 : A_2 : A = \cos(30^\circ + 50^\circ) : \sin 50^\circ : -\cos(30^\circ - 50^\circ) = 0.174 : 0.77 : (-0.94)$ . If this ratio is compared with the wattmeter deflections really obtained, it will

be seen that no agreement can be obtained in this way but that agreement is obtained if two phases are reversed. This means that the successive phases in the rotary field are not, as assumed, red, yellow, black, but red, black, yellow.—*Elek. Zeit.*, July 30, 1914.

#### Telegraphy, Telephony and Signals

**Production of a Single Wave by Coupled Oscillation Circuits.**—EMILE GIRARDEAU.—In comparison with direct excitation of the antenna, the indirect excitation by means of coupled circuits has the advantage that it permits the utilization of a considerable amount of power, but it has the disadvantage that two waves of different frequencies and different amortization are produced. In connection with the former work of others, the author shows first theoretically that it is possible to realize a system of coupled oscillation circuits by which only a single oscillation is produced. In the second part of the paper are described the results of experiments made in the Central Laboratory of Electricity in Paris, which show that this single-wave arrangement gives a better efficiency than the usual methods of coupling.—*La Lumière Elec.*, July 11 and 18, 1914.

#### Miscellaneous

**Photographing Electric Sparks.**—JOS. A. DETONI.—An illustrated article giving some hints upon how to photograph electric discharges or sparks.—*Elek. Kraftbet. u. Bahnen*, July 4, 1914.

## Book Reviews

THE "MECHANICAL WORLD" POCKET DIARY AND YEAR BOOK FOR 1914. A Collection of Useful Engineering Notes, Rules, Tables and Data. Manchester, England: Emmott & Company. Baltimore, Md.: The Norman-Remington Company. 442 pages, 65 illus. Price, 25 cents.

This is a companion volume to the *Mechanical World Electrical Pocket Book* for 1914, and is the twenty-seventh issue of this book. The book, in the main, treats of British practice, but American standards and American practice are frequently introduced or referred to. By the use of a large number of pages and fine print it has been possible to include a great deal of material, a large part of which should prove useful to the designer and builder of machines. About one-half of the text is devoted to prime movers, including a section on the oil engine.

THE "MECHANICAL WORLD" ELECTRICAL POCKET BOOK FOR 1914. A Collection of Electrical Engineering Notes, Rules, Tables and Data. Manchester, England: Emmott & Company. Baltimore, Md.: The Norman-Remington Company. 310 pages, 129 illus. Price, 25 cents.

This little book is issued yearly and is a volume similar to the *Mechanical World Pocket Diary and Year Book*. It contains a great deal of the useful electrical information, based on British standards, which is ordinarily published in handbooks or pocket books. Some of the sections, notably "Notes on Accumulators" and "Transformers," are quite complete, considering the space allotted to them, while other sections, for example, "Telephones," present only an introduction to the subject. The book could be improved by exercising more care in the arrangement of the material, there being apparently no regular order of the topics treated. Different items referring to the same general topic are often widely separated in the text.

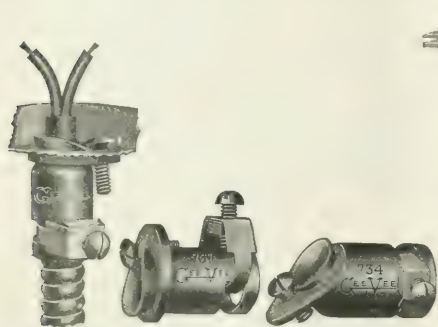


# New Apparatus and Appliances

## An Illustrated Descriptive Record of Recently Developed Manufactured Products of Interest to Electrical Readers

### Outlet-Box Connectors

The outlet-box connectors shown herewith are being placed on the market by the Gillette-Vibber Company, New London, Conn. In Fig. 1 is shown one of these devices connected to a box. The features of these connectors are the screw which fastens the connector to the box and the clamp which holds the cable in place.

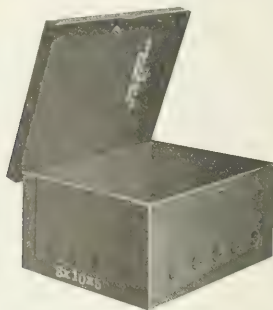


FIGS. 1, 2 AND 3—CONNECTORS FOR OUTLET BOXES

The screw is in a position where it is easily accessible. Three types of these connectors are being made. In Fig. 2 is shown a straight connector of galvanized cold-rolled steel. In Fig. 3 is shown a galvanized cast-iron connector bent at an angle of 45 deg. Another connector is bent at an angle of 90 deg.

### Steel Switchbox

The switchbox illustrated herewith is made of a single piece of metal with corners folded and with the

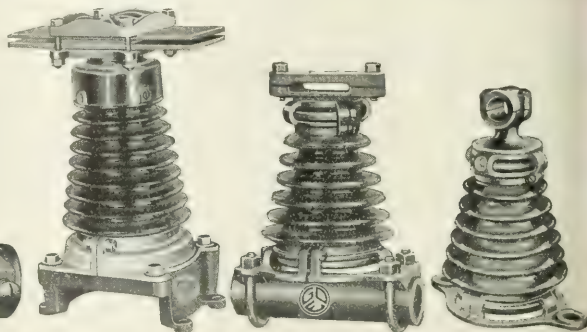


WEATHERPROOF METAL SWITCHBOX

sides and hinges electrically welded. In size the box measures 8 in. by 10 in. by 5 in., and it is finished in glossy black enamel. This box is being made by the Berry-Glosser Company, Marion, Ohio.

### Busbar Supports

Various kinds of pyramid-type porcelain busbar supports are being placed on the market by the General Devices & Fittings Company, Chicago, Ill. At the narrow end of these supports the corrugations are small and thin; at the other end, which is connected to the ground, they are wider and deeper. Fig. 1

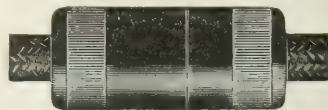


FIGS. 1, 2 AND 3—PYRAMID-TYPE BUSBAR SUPPORTS

shows a busbar support, which, although designed for 22,000 volts, will, it is said, withstand a test pressure of 112,000 volts. This support is set on an insert which may be fixed into the concrete floor of a compartment. All the metal parts except the insert are of hard bronze. The manufacturers declare that this support will hold up under a strain exceeding 1200 lb. per sq. in. Fig. 2 shows another type of busbar support equipped for holding flat buses horizontally and for mounting on a pipe frame. The support shown in Fig. 3 is designed for round buses and has a base for mounting on flat surfaces.

### Insulating Cover for Connector

An insulating cover for a mechanical-conductor connector is being made by Dossert & Company, 242 West Forty-first Street, New York. The connector can be arranged to take any size of conductor from No. 4 to No. 14 inclusive, solid or stranded. A 21 per cent saving in cost is effected, the manufacturers declare, with this

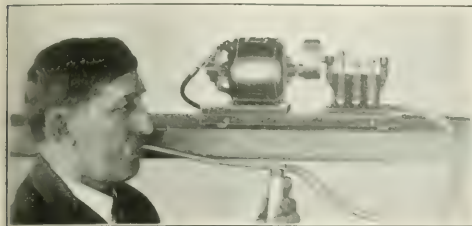


CONNECTOR WITH INSULATING COVER

connector and cover in place of the insulated connectors heretofore used for the sizes of conductors enumerated. The illustration shown herewith is approximately full size.

### Motor-Driven Vacuum Pump for Dentists

A device which, it is claimed, aids considerably in the preservation of teeth and in counteracting the ravages of pyorrhea is shown in the accompanying illustration. The apparatus consists of a small vacuum pump driven by a 1.30-hp motor. A rubber vacuum



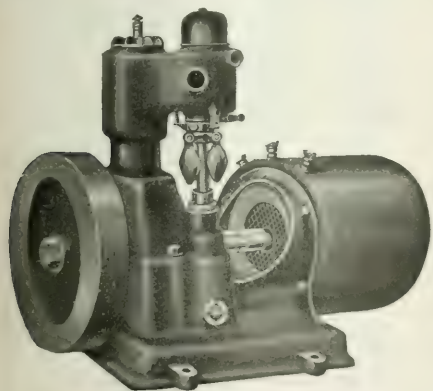
DENTIST'S VACUUM PUMP

cap fits over the teeth and gums, and an intermittent suction is created. This little machine is being made by the Sanitor Company, Chicago, Ill., and a Westinghouse motor is used in its operation.

### Self-Contained Generating Unit

A so-called "silent-valve" lighting and charging outfit is shown herewith. The set is adapted for use on farms and other places where central-station service is not available. The engines employed in these outfits are of the four-stroke-cycle type and are equipped with one, two or four cylinders according to the size. The engine is directly connected to a high-speed 40-volt generator.

Tapered rotary valves with large ports for the rapid ingress and egress of gas, placed in a valve seat of corresponding taper, are used on the engine. To compensate for the variation in the size of the valve and valve seat due to heat and wear, automatic adjustment is provided. One valve is used to operate the inlet and ex-



DIRECTLY CONNECTED LIGHTING OUTFIT

haust of one or two cylinders according to the size of the engine.

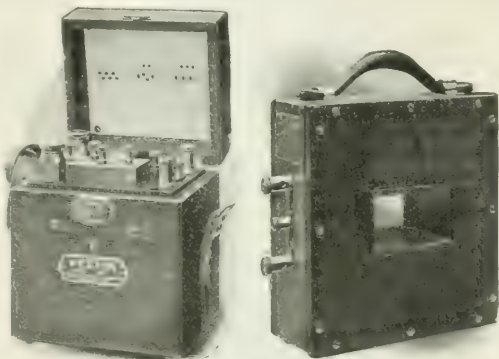
The outfit illustrated is rated at 1.5 kw with a 20 per cent overload range. The dimensions are 22 in. by 31 in. by 15 in. Engine and generator are mounted on a common base. The outfit is started from the battery, the generator acting as a motor. As soon as the engine is started the generator starts automatically to charge

the battery. When the battery is charged the engine is automatically stopped.

Outfits of this type are being made in ratings of 0.75 kw, 1.5 kw and 3 kw. The E. L. Russell Company, Indianapolis, Ind., is the manufacturer of the engine of this equipment, and the generator is the product of the Robbins & Myers Company, Springfield, Ohio.

### Instrument Transformers

The Weston Electrical Instrument Company, Newark, N. J., which manufactures transformers for use with its alternating-current measuring instruments, has brought out a portable series transformer of the self-contained type, in which both the primary and secondary windings constitute an integral part of the structure. On the primary side the connections are so arranged that three series of current readings are possible as follows: 10 amp, 20 amp and 40 amp; 25 amp, 50 amp and 100 amp, and 50 amp, 100 amp and 200 amp. A 5-amp secondary is used throughout. To facilitate the changes in ratio, the terminals of the windings are connected to contact blocks forming a plug switch mounted on the insulated top. A maximum of six and a minimum of three plugs are required



FIGS. 1 AND 2—SELF-CONTAINED PORTABLE INSTRUMENT TRANSFORMER

for the various ratios, and holes are provided to hold the plugs when not in use.

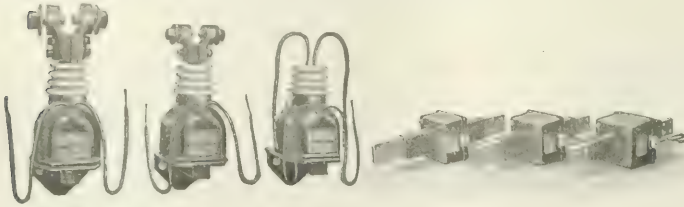
In Fig. 2 is shown a series transformer the secondary winding of which is alone an integral part of the structure, the primary being inserted in the transformer by the operator at the time of making a measurement. This transformer is employed for measuring currents of more than 200 amp. The rectangular box is provided with an opening as shown, through which the primary, made of a cable or busbar, may be passed. This transformer depends for its ratio upon the number of times the conductor passes through the core opening. The transformer is designed for the following ratios when the conductor passes through the opening once: 1200 amp to 5 amp, 1800 amp to 5 amp, and 2400 amp to 5 amp. When the conductor passes through the opening twice the ratios are respectively 600 amp to 5 amp, 900 amp to 5 amp, and 1200 amp to 5 amp. For any number of times  $N$  that a conductor passes through the opening the ratio is the ratio for one turn divided by  $N$ .

A current transformer for use with switchboard instruments is shown in Fig. 3. The secondary is rated at 5 volt-amp. The transformer is made in two sizes, one being suitable for use with a line potential of 2200



volts or under and the other for one of 6600 volts or under.

The transformer that is shown in Fig. 4 consists of a single copper busbar surrounded by a core and secondary winding inclosed in an aluminum case, which are insulated from the busbar by means of molded in-

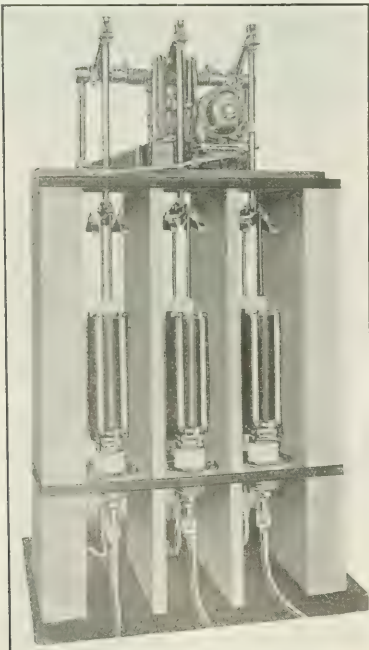


FIGS. 3 AND 4—TRANSFORMERS FOR SWITCHBOARD INSTRUMENTS

sulation. The busbars are drilled at the ends for connecting directly into the main circuit without auxiliary cables. The current rating of the primary ranges from 750 amp to 1600 amp. The secondary of this transformer has a rating of 5 amp.

### Motor-Operated Oil Switches

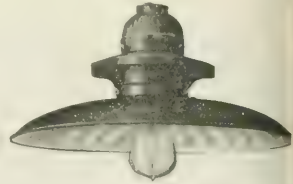
Structural changes have been made in oil switches of the motor-operated type manufactured by the General Electric Company, Schenectady, N. Y., to give readier access to the circuit-rupturing parts. The cap on the oil vessel and the lower oil-vessel clamp have also been changed so that metal straps can be bolted to the cap and the clamp. These straps hold the cap securely in place. For inspection of contacts and oil vessels switches with ratings up to 3500 volts have certain parts which are easily removable.



MOTOR-DRIVEN OIL SWITCH

### Fluted-Dome Reflector

A fluted-dome incandescent-lamp reflector for use in small cities or suburban districts is shown herewith. Although street fixtures as a rule are designed to secure a wide light distribution, the outer edge of this reflector comes down lower on the lamp than usual.

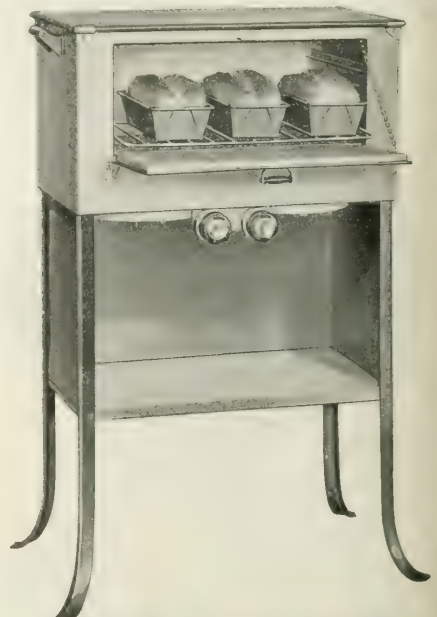


RESIDENTIAL-DISTRICT REFLECTOR

so that it re-directs the light above the horizontal. In this way the street and sidewalk surfaces are illuminated, while the buildings, with their sleeping occupants, are kept in darkness. This fixture is being made by the Wheeler Reflector Company, 156 Pearl Street, Boston, Mass.

### Two-Burner Electric Stove

To meet the demand for a low-priced electric stove the Hughes Electric Heating Company, of Chicago recently brought out the simple but well-built stove shown herewith. This stove is equipped with two burners, each taking a maximum of 1000 watts or high heat, 500 watts for medium heat and 250 watt for low heat. The oven is separated and in the illustration is shown in position on top of the stove. This oven is heavily insulated and is said to be highly efficient. It can be set aside easily when it is desired to use the burners for other purposes. The stove itself weighs



ELECTRIC STOVE WITH DETACHABLE OVEN

32 lb. and the oven weighs 28 lb. The total shipping weight is 75 lb. The inside dimensions of the oven are 18 in. by 8 in. by 11 in. The stove is finished in black enamel, and will, it is said, take care of the cooking requirements of a family of five persons. The low maximum demand of the stove (2 kw) should make it especially attractive from the central-station point of view. It is said that the price of the stove is well within the reach of people of moderate means.

### Small Extension Cord Connector

The extension cord connector shown herewith is being placed on the market by Harvey Hubbell, Inc.,



CORD CONNECTOR

Bridgeport, Conn. The brass parts are anchored to square brass inserts molded into the composition. The current-carrying parts are not exposed.

### Electric Washer

In the washing machine illustrated herewith the clothes are placed in a cylinder which, instead of revolving in the usual manner, oscillates on its horizontal axis. This motion drives the suds back and forward and subjects the clothes to a vigorous cleaning action. There is no tendency for the clothes to form into a ball, the manufacturers declare, and clothes tightly matted together when put into the cylinder become untangled. A perforated box runs along the bottom of the cylinder



ELECTRIC WASHING MACHINE

where the suds are practically quiet. All sand, grit and foreign matter tend to collect here and can be run off through the drain cock. The wringer is reversible and has a quick release. The cylinder is of copper and is heavily tinned inside. This washer is made by the Invincible Manufacturing Company, Pittsburgh, Pa., and is operated by a  $\frac{1}{8}$ -hp Westinghouse motor.

### Vacuum Cleaner

A vacuum cleaner of the outside-bag type is being placed on the market by the Western Electric Company, New York. The frame is equipped with a horizontal

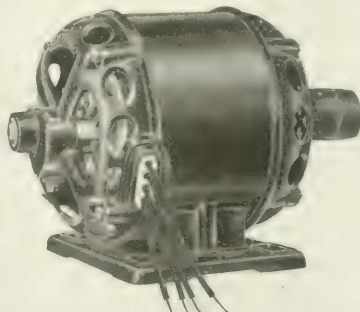


VACUUM CLEANER WITH HORIZONTAL HANDLE

handle which gives a convenient grip for pushing the cleaner and permits of hanging the device on the hook when not in use. The controlling switch is mounted on the handle directly beneath the normal position of the right hand.

### Small Single-Phase Motor

A  $\frac{1}{6}$ -hp single-phase motor of the repulsion-starting, induction-running type designed to start under full load with low starting current is shown herewith. The machine can develop, the manufacturers declare, a starting torque more than two and one-half times full-load torque with a starting current less than three times the full-load current, and it can also develop a maximum torque, when it is up to speed, of approximately 200 per cent of the full-load torque. The motor is equipped with phosphor-bronze ring-oiling bearings, and it is designed to operate on 104 volts or 208 volts. This motor is being manufactured by the Century Electric Company, St. Louis, Mo.



FRACTIONAL-HORSE-POWER SINGLE-PHASE MOTOR



# Jobber, Dealer and Contractor

## CO-OPERATIVE ELECTRICAL CONTRACTING

Handling a Number of Local Businesses in Illinois Towns from a Central Executive and Clerical Office

Beginning with a single electrical contracting and merchandising store at Macomb, Ill., a few years ago, the Home Electric Construction Company has grown to be an extensive co-operative business enterprise maintaining branches in seven cities in the central part of the State.

Originally the firm did business under a different name, but in January, 1912, the Home Electric Construction Company was incorporated for \$5,000. During the concern's first year an extension was made by adding a store at Bushnell, in the following year Colchester, Augusta and Rushville were included, and re-

All business in the outlying territories is handled by the local managers, each of whom reports directly to Mr. W. I. Savidge, president of the company. In addition to receiving daily reports from these men, Mr. Savidge keeps in touch with the local situations by making monthly visits to each property.

Even at first glance such co-operative business methods look attractive as revenue producers, but when it is

THE HOME ELECTRIC CONSTRUCTION COMPANY

	This month	At. Name	Last month	Since Jan. 1st Last year
Electricity				
Gas				
Water				
Telephone				
Post Office				
City Hall				
County Jail				
Public School				
Private School				
Church				
Temple				
Hotel				
Restaurant				
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accomplished by purchasing in standard packages, further economy is effected by purchasing disassembled fixtures and putting them together at the home office at Macomb. In addition to all this, it should be added that the plan offers opportunity for closer co-operation with central-station companies where the cities are interconnected by transmission lines, as are five of those mentioned above. In these five towns energy is supplied by the Central Illinois Public Service Company.

On account of the unique character of the business a bookkeeping system has been devised which meets the particular needs of the company. A separate set of ledgers is kept for each local store, and as "tickets"

office. At the end of each month the two recapitulation sheets covering contract work and merchandise sales for each town show in percentage what has been done during the period. The recapitulation sheet for contract work is pink and the one for merchandise is blue. From these sheets and other data there is prepared a monthly statement setting forth under general headings an itemized list of "resources, liabilities, gains, losses, sales and miscellaneous purchases and expenditures." Alongside this column are placed corresponding figures for the preceding month and for the same month last year, presenting data from which business conditions may be readily construed.

[illegible][illegible]

W. I. SAVIDGE, Pres. and Gen. Mgr.



W. I. KNOWLES, Sec'y.

**The HOME ELECTRIC CONSTRUCTION CO.**

FRED W. WEBER, MANAGER.

E. C. CLAY, V. Pres. and Treas.

**SOLD TO**

\_\_\_\_\_

**BUSHNELL, ILL.,**

\_\_\_\_\_ 191\_\_\_\_\_

**"DO IT ELECTRICALLY"**

ELECTRIC CONSTRUCTION

Dealers in All Kinds of

ELECTRIC SUPPLIES

**Terms**

\_\_\_\_\_ Interest at 6% after 30 days

Invoice No. \_\_\_\_\_

Ticket No. \_\_\_\_\_

476 EAST MAIN STREET

TELEPHONE 2 ON 116

FIGS. 5, 6 AND 7--RECAPITULATION SHEETS AND BILLHEAD OF HOME ELECTRIC CONSTRUCTION COMPANY

come in from the outlying towns they are numbered and copied in triplicate on forms such as are shown here-

### CITIES AND COUNTIES SERVED BY THE HOME ELECTRIC CONSTRUCTION COMPANY

City	Population	County	Local Manager
Macomb	5,774	McDonough	E. C. Clay
Rushford	2,916	McDonough	Fred W. Weber
Calhoun	1,445	McDonough	George Ripston
Augusta	1,140	Hanover	W. C. Wheeler
Rushville	2,422	Sumner	George Crampton
Lincoln	10,890	Linn	Herbert B. Hamline
Canon	10,433	Fulton	R. B. Wallace

with, two copies being mailed to the town from which the original came and the third being filed in the home

As an adjunct to the bookkeeping the company has also worked out a short cut for the classification of the time of the men. Besides being a great time and labor saver, this short cut permits of easy checking. The classification of time is itself of value in figuring the prepaid expense on pending contracts.

The officers and directors of the Home Electric Construction Company are: President, Mr. W. I. Savidge; vice-president and treasurer, Mr. E. C. Clay; secretary, Mr. William I. Knowles; directors in addition to officers, Messrs. Herbert B. Hamline, Fred W. Weber and George Rippetoe.

As an indication of the progressive spirit with which the business of the company is conducted it may be mentioned that the Home Electric Construction Company is said to be the first contracting firm to publish regularly a monthly bulletin for distribution to its trade.



# Industrial and Financial News

## Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

**New Equipment for Alloy Company.**—The Electrical Alloy Company, Morristown, N. J., is adding equipment in both its wire-drawing and rolling departments, materially increasing the capacity of its plant.

**Motor-Driven Polishers.**—Roth Brothers & Company, Chicago, Ill., have received an order from the Western Clock Company, La Salle, Ill., for twenty-seven electrically operated polishers, twenty of these machines being rated at 5 hp and seven at 1.25 hp. This equipment is an addition to thirty-two polishers already in operation.

**Electric Steering Gear on Greek Battleship.**—The first installation of electric steering gear made by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., in use on a foreign warship is that on the Greek battleship *Kilkis*. This ship was purchased from the United States and was formerly the *Mississippi*. The *Kilkis* is reported to have arrived safely at Athens.

**Electric-Vehicle Demonstration.**—A number of engineers and automobile and newspaper men were recently entertained by the Buffalo Electric Vehicle Company at Buffalo, N. Y., and were taken on a demonstrating trip over the country roads to Clarence, N. Y. A 1915-model, five-passenger electric coupé was driven up and down steep hills and over rough ground with satisfactory results.

**Washing-Machine Firm Adopts Motor Drive.**—The Meadows Manufacturing Company, Pontiac, Ill., which has been making washing machines for about five years, is now bringing out a motor-driven washer. Machines previously made by the company were mostly of the type operated by gasoline or steam engines, and consequently were arranged with a pulley for belt drive. The new machine is driven by a 1/5-hp motor.

**Platinum in Germany.**—In a report to the American Institute of Metals, presented at Chicago on Sept. 8, Mr. Carl F. Woods, of Boston, said that extensive deposits of platinum have been discovered in Germany during the last year. The platinum is present in the form of an alloy which, unlike pure platinum, is soluble in acid and therefore has been previously overlooked in the analysis and separation of the metals.

**Railroads' Retrenchments Bad for Bucket Manufacturers.**—On account of the general curtailment of expenses by the railroads, the Hayward Company, 50 Church Street, New York, manufacturer of motor-driven buckets, is finding business rather dull at present. Much of the demand for these buckets comes from the railroads and allied industries, and an improvement will depend, it is said, on an advance in freight rates.

**"South American Special."**—In order to educate the manufacturers regarding the possibilities of the South American market, the Lehigh Valley Railroad Company will, it is reported, make up a "South American special," which will stop at all the principal cities along its lines, and financial and commercial experts will distribute all available information concerning South American trade and the tariffs of the various countries.

**Motor-Driven Office Appliances Prevalent at Chicago Business Show.**—Of the many mechanical devices on display at the Chicago Business Show and Efficiency Exposition, Sept. 5 to Sept. 12, practically all were motor-driven, the old-line typewriter companies being conspicuous among the few remaining advocates of manual power. With the constantly growing array of office aids, office buildings should continue to rise in the list of desirable central-station loads, and increased attention will need to be given to securing ample wiring and outlet facilities.

**South American Demand for Sockets.**—A large number of sockets used in South America are of German make, but because of the present war supplies from Germany have been cut off, and it is expected that the manufacturers in this country will in large part make up the deficiency. A New York agent for a prominent maker of sockets declares that the German product has been much cheaper than American-made material, although of an inferior quality, and manufacturers heretofore have not been able to compete successfully with the Germans on that account.

**English Electrical Company Evincing Patriotic Spirit.**—The members of the staff and works of the British Thomson-Houston Company, Ltd., are answering the call of their country for volunteers. Up to the present 852 have answered the call. It is the company's intention to pay half wages to those of its employees who have enlisted. The company further promises wherever possible to reinstate returning employees in their former positions on the cessation of hostilities. Lord Kitchener has sent a letter through Major-General Rawlinson to the managing director expressing his appreciation of the company's attitude.

**Importer of German Products Well Stocked.**—The Kandem Electric Company, 49 East Twenty-first Street, New York, which has been receiving its material from the Koerting & Mathiessen Company in Germany, has on hand a stock of various types of flaming-arc lamps and accessories which, it is expected, will last nine months. It was stated incorrectly in the *Electrical World* of Sept. 12 that the stock on hand was practically exhausted. The company was contemplating introducing a new line of products, but on account of the war no shipments could be made, although a large amount of material was already packed and about to be sent out from Germany. The Kandem company is affiliated with an importing company in Canada handling the Koerting & Mathiessen products and can exchange supplies with this company in case of a shortage. The Koerting & Mathiessen Company is also connected with an English company which is rapidly completing a new plant and which will be able to supply the American companies with material in the near future.

**Electricity at Foundrymen's Show.**—Ingenious automatic electric control and numerous applications of motor drive marked the machinery exhibits at the conventions of the allied foundry association at Chicago, Sept. 8 to 11. Of the electrical equipment interesting to foundrymen, standard motor-driven machine tools, electric lighting, hoisting and welding apparatus occupied a large part. There were, however, several motor applications to sand mixers and riddles which were especially adaptable to foundry practice. Among the electric companies having displays were the Benjamin Electric Manufacturing Company, Chicago; the James Clark, Jr., Electric Company, Louisville, Ky.; the Electric Controller & Manufacturing Company, Cleveland; the General Electric Company, Schenectady; the International Electric Tool Company, Milwaukee; the Shepard Electric Crane & Hoist Company, Montour Falls, N. Y.; the United States Electrical Tool Company, Cincinnati; the Westinghouse Electric & Manufacturing Company, Pittsburgh, and the Wisconsin Electric Company, Racine, Wis.

**Gear Manufacturers Busy.**—The New Process Gear Corporation, Syracuse, N. Y., is working overtime to keep up with a volume of business larger than any heretofore handled. Although the plant was doubled in capacity less than two years ago and was at that time said to be the largest in the world devoted exclusively to gear making, an additional building is now being erected, and the capacity of the case-hardening and heat-treating departments will again be doubled. Additional equipment already ordered

for fall delivery includes the following: Ten Fellows gear shapers, fifteen Gleason bevel-gear generators, three Bullard vertical turret lathes, three Heald grinders, one Landis grinder, two National "acme" automatic machines and numerous special machines built according to designs worked out by engineers of the company. The total production of the plant in spur, spiral and bevel metal gears and "New Process noiseless" gears and pinions will after Jan. 1, 1915, it is said, be in excess of 1,000,000 per year.

**Demand for Electrical Apparatus in Greece.**—According to Consul-General A. W. Weddell, stationed at Athens, there is a demand in Greece for electric motors, generators, fans, irons, toasters, etc. In many lines of trade, the consul-general states, the American exporter has not paid sufficient attention to the potentialities of the Greek market.

**Boston Edison Company Operations.**—A gain in income of about \$643,000, or more than 10 per cent, is reported by the Edison Electric Illuminating Company of Boston in its returns to the Massachusetts Gas and Electric Light Commission for the year ended June 30, 1914, in comparison with 1913. The company's total income from the sale of electricity was \$7,008,288, the principal items being commercial lighting, \$4,627,300; municipal arc lighting, \$592,004; municipal incandescent lighting, \$274,337; motor load, \$1,272,268; energy sold to street railways, \$165,708, and electricity sold to other companies, \$76,671. The number of customers on motor circuits increased from 8465 to 9201 in the thirty-nine municipalities supplied, and the total number of customers increased from 52,447 to 62,194. At the close of the fiscal year the company had 4803 stockholders compared with 4435 a year ago, and the total cost of all the plant was \$40,903,229, or about \$5,000,000 more than in 1913. The cost of plant exceeded the company's capital and loans by \$14,148,329. During the year dividends of 12 per cent on the par value of the stock were disbursed, these dividends amounting to \$2,252,319. The total liabilities on June 30 were \$43,864,270, the profit and loss balance (surplus) being \$146,577. There are now 1766 employees, as against 1475 last year. The principal operating expenses for the year were: Station expenses, \$1,242,062; distribution cost, \$845,178; office expenses and management, \$776,476; taxes, \$785,713, the total, including miscellaneous, being \$3,989,491. The operating ratio was 57 per cent. The company now owns seventy-nine boilers, all of the water-tube type, aggregating 38,088 hp; twenty-six steam engines and turbines aggregating 140,600 hp, and it has 10,400 kw in direct-current and 91,000 kw in alternating-current generators. The bulk of the generation is by steam turbines, there being nine available for service with an aggregate rating of 109,400 hp. The physical plant includes 45,890 wooden poles, 1,885,205 ft. of underground conduit, 5175 line transformers, and 67,098 meters. The company owns 101 motor-generator sets and has numerous substations in which these are operated. Fourteen storage batteries are listed. During the fiscal year the company generated 188,723,854 kw-hr., compared with 171,783,312 kw-hr. last year. It sold 130,653,669 kw-hr. to commercial customers, including 29,605,381 kw-hr. to motor users, 9,542,968 kw-hr. to street railways, 4,197,917 kw-hr. to other customers, and 73,050,219 kw-hr. to metered lighting and power installations. The maximum load was 63,131 kw, on Tuesday, Nov. 16, 1913, and during the year the company burned 179,364 tons of coal, the average cost per ton used and accounted for being \$3.92, as against \$3.80 last year.

#### NEW YORK METAL MARKET PRICES

	Sept 9	Sept 16
Copper.....	12.45 to 12.57	12.40 to 12.60
Frame Lake.....	12.20 to 12.30	12.10 to 12.20
Electrolytic.....	12.15 to 12.25	12.00 to 12.10
Casting.....	13.75 to 14.00	13.50 to 13.75
Copper wire.....	3.90	3.90
Nickel.....	40.00 to 45.00	40.00 to 45.00
Sheet zinc, f.o.b. smelter.....	8.50	8.50
Spelter, spot.....	to 5.80	5.40 to 5.50
Aluminum, 98 to 99 per cent.....	19.50 to 20.50	19.00 to 19.50

#### COPPER EXPORTS

Total tons to Sept. 15.....8,788

\*Nominal.

NOTE.—The New York Metal Exchange and the London Metal Exchange have been closed until further notice. No reliable quotations on old metals can be obtained for the present. There is no buying in this market.

## Corporate and Financial

**Federal Light & Traction Company's Bonds.**—The Columbia Trust Company, New York, as trustee, has called for proposals for the sale of \$27,123 of first-lien sinking-fund gold bonds of the Federal Light & Traction Company of New York at a price which shall not exceed 102 per cent and interest.

**New York Stock Exchange Listings.**—The New York Stock Exchange has listed the following securities: \$571,000 additional refunding and extension mortgage bonds of the Union Electric Light & Power Company, St. Louis, Mo., and \$429,000 additional of the same bonds upon official notice that they have passed beyond control of the company; \$1,305,000 additional Milwaukee (Wis.) Electric Railway & Light Company general and refunding mortgage bonds, series "A," and \$695,000 additional of the same bonds upon official notice that they have passed beyond the control of the company; and \$1,064,000 additional Portland (Ore.) Railway, Light & Power Company first and refunding sinking-fund mortgage convertible bonds, series "A."

**Augusta-Aiken Defers Preferred Dividend.**—The directors of the Augusta (Ga.)-Aiken Railway & Electric Corporation have sent the following letter to the stockholders announcing the deferment of the preferred stock dividend: "During the first six months of the current year your company's earnings showed a surplus of \$61,170, this being an increase of \$10,008, or 19.7 per cent, over that of the corresponding period of 1913. Careful estimates for the last six months of 1914 indicate a surplus of \$25,000. The total surplus for the year, therefore, is expected to be about \$90,000, which is the amount of the annual dividend on your company's preferred stock. It is estimated that the net earnings for the last six months of 1914 will be more by approximately \$38,000 than for the corresponding period of 1913, but the surplus will show a decrease of about \$40,000. This decrease is caused by additional taxes and fixed charges of \$78,612, due to the taking over the new hydroelectric plant of the Georgia-Carolina Power Company on the Savannah River, at Stevens Creek, on July 1, 1914, under contracts made in 1911. These additional charges are made up as follows: Taxes, \$7,106; interest on bonds of Georgia-Carolina Power Company, \$68,750; miscellaneous interest, \$2,756, totaling \$78,612. At the time this hydroelectric development was projected, some three years ago, your company was confronted with the necessity of providing additional power to supply its increasing business and for expected future growth, but the business depression prevalent in this country for many months past has led owners of cotton mills and other industries to postpone the equipment of their mills and factories for operation by electric power. Therefore your company's revenue from sale of energy will, for the current year at least, be less than anticipated. During the first six months of this year your company has expended for revenue-producing extensions and betterments the sum of \$51,404, and further expenditures for the same purpose will be necessary."

months of this year. Ordinarily these expenditures would be in large part financed by the sale of your company's bonds, but financial conditions render this impossible at present. For these reasons and because of the general disorganization occasioned by the unexpected outbreak of the war in Europe, your directors consider it necessary to conserve all available cash resources, and therefore deem it for the best interest of the stockholders to suspend payments of preferred stock dividends until financial and general business conditions are such that these payments can be resumed without weakening your company's cash position. The earnings of your company have steadily improved, and in the judgment of your directors the expected development of your property is only deferred, and they believe it to be only a question of time when the additional business will be secured for which the large investment in the new hydroelectric plant and in other new business extensions was made. Your company's property is in excellent physical condition, its relations with its employees are harmonious, and a general spirit of co-operation exists between the public and the company. Attention is called to the fact that dividends upon the preferred stock are cumulative at the rate of 6 per cent per annum."



## THE FAR WEST FOR JUNE

Returns from 70 Per Cent of the Central-Station Industry of the Pacific and Mountain States for June Show a Marked Falling Off in Business in Comparison with Previous Months

The returns which have been received by the *Electrical World* for the month of June from the central-station companies of the Pacific and Mountain States, while they show an increase over 1913, do not show such large increases for June as they did for May. And, as was shown in our issue of Aug. 15, the returns for May were behind those for April, so far as growth was concerned. However, this falling off has in no way been caused by the war. These results

TABLE I—JUNE RETURNS FROM COMPANIES IN SIX LARGE CITIES IN CALIFORNIA, WASHINGTON, OREGON, UTAH AND COLORADO, REPRESENTING OVER 60 PER CENT OF INDUSTRY OF PACIFIC AND MOUNTAIN STATES

INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
1914	June, 1913	Per Cent Increase	June, 1914	June, 1913	Per Cent Increase
\$1,329,041	\$1,251,956	6.2	110,466,824	102,761,475	7.6

happened before Austria-Hungary had sent her ultimatum to Servia. They were solely the results of local conditions. It is not to be inferred, however, that the Western companies are any weaker than the Eastern companies. It just so happens that the Western companies are more affected by local conditions than are the Eastern companies.

### Large Cities Gain, Small Cities Lose

Tables I and II were compiled to show the status of the large cities and the small cities. The six large cities are the six largest cities in this territory from which the *Electrical World* is receiving returns, and the six small cities are the six smallest in this region from which we receive returns. The large cities are mostly coast cities, and the small cities are inland cities. The large cities represent an output of 60 per cent of the total output of the Pacific and Mountain States, while the small cities represent less than 1 per cent. Five out of the six large cities showed growth, with an aggregate result for the six of approximately \$80,000 increase in income and 10,000,000 kw-hr. increased output. The one

TABLE II—MAY AND JUNE RETURNS FROM COMPANIES IN SIX SMALL CITIES IN NEW MEXICO, ARIZONA, WASHINGTON, WYOMING AND IDAHO, REPRESENTING LESS THAN 1 PER CENT OF THE INDUSTRY OF THE PACIFIC AND MOUNTAIN STATES

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
May	\$15,828	\$14,100	12.3	1,613,341	1,770,549	-9.7
June	\$14,750	\$15,596	-5.5	1,262,268	1,645,528	-23.0

large city to show a decrease has been showing a decrease for the last few months.

Four out of the six small cities showed a decrease both in output and income. One city showed a decrease in income but an increase in output, which was put down by the manager of the central station to development work in the fall of 1913. Of the other companies, one reported having sold part of its transmission line inasmuch as a certain large company which had previously bought wholesale energy had discontinued doing so, owing to improvements on its own property. The other companies were largely engaged in furnishing energy for irrigation work. The demand this year for energy for that purpose was not so great as it was in 1913. Last year was a very dry year and irrigation was the cause of a great growth with many a central station. The decreases, however, were not very large and show, therefore, an increase in other types of load.

## Pacific States Still Grow

The companies in the three States of California, Oregon and Washington, while they do not show such large increases for June as for previous months, nevertheless do show a state of strength. Irrigation loads have not been so heavy this year as last, owing to more rain. Moreover, during June business was particularly dull on the Pacific Coast.

TABLE III—JUNE RETURNS FROM OVER 60 PER CENT OF THE CENTRAL-STATION INDUSTRY OF THE PACIFIC STATES OF CALIFORNIA, WASHINGTON AND OREGON

INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
June, 1914	June, 1913	Per Cent Increase	June, 1914	June, 1913	Per Cent Increase
\$1,329,041	\$1,251,956	6.2	110,466,824	102,761,475	7.6

All of the industries had retrenched as far as was possible. The three Pacific States represent practically the entire industry of both Pacific and Mountain States. As is seen from Tables III and IV, 60 per cent of the industry of the Pacific States is almost triple 80 per cent of the industry of the Mountain States (excluding Montana).

The returns from the Mountain States show a small increase. In some cases, however, the increase would have been much more gratifying had the rates of 1913 been in vogue in 1914. No returns were received this month from

TABLE IV—JUNE RETURNS FROM OVER 80 PER CENT OF THE CENTRAL-STATION INDUSTRY OF THE MOUNTAIN STATES OF COLORADO, NEW MEXICO, UTAH, ARIZONA, WYOMING, NEVADA AND IDAHO (MONTANA EXCLUDED)

INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
June, 1914	June, 1913	Per Cent Increase	June, 1914	June, 1913	Per Cent Increase
\$565,846	\$539,962	4.8	44,859,631	39,074,902	14.8

Montana. This State has a monthly output in the neighborhood of 40,000,000 kw-hr.

### June Falls Behind May

With 70 per cent of the central stations showing an aggregate increase of approximately \$100,000 and an output increase of 15,000,000 kw-hr. for June, no fear need be shown for the stability of these companies. This would mean an increase in income for the whole industry of approximately \$125,000 and an increase in output of over 20,000,000 kw-hr. Turning to the returns for May from 60 per cent of the industry of this region, we find an increase in income of approximately \$100,000 and an increase in output of more than 15,000,000 kw-hr. Figuring on this basis, the whole industry

TABLE V—RETURNS RECEIVED BY THE ELECTRICAL WORLD FOR MAY AND JUNE FROM THE CENTRAL-STATION INDUSTRY OF THE PACIFIC AND MOUNTAIN STATES

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
May (60 per cent of industry)	\$1,525,729	\$1,426,855	7.0	144,839,552	129,357,915	11.9
June (70 per cent of industry)	1,894,887	1,791,918	5.8	155,326,455	141,836,377	9.6

for this region in May would have shown an increase of almost \$170,000 and an output increase of over 25,000,000 kw-hr. In other words, May was ahead of June in increased business by over \$40,000 income and over 5,000,000 kw-hr. output. While the two months are not so strictly comparable as we have assumed them to be, they are, however, close enough to make rough comparisons.

## Business Notes

**The Green Engineering Company** has transferred its main office from 28 East Jackson Street, Chicago, Ill., to East Chicago, Indiana.

**The Munning-Loeb Company**, Matawan, N. J., has appointed C. G. Backus to be in charge of its New York office at 30 Church Street.

**The Goulds Manufacturing Company**.—E. B. Gould is now connected with the Chicago office, 3801 South Ashland Avenue, of the Goulds Manufacturing Company, Seneca Falls, N. Y.

**The Waverley Company**.—F. Temple has taken over the business of the Waverley Company, Indianapolis, Ind., in Chicago, and the company's factory branch in Chicago has been closed.

**Blair & Nathan**.—R. S. Blair and A. F. Nathan have entered into partnership as counselors-at-law with offices at 55 Liberty Street, New York. The firm will confine its practice to the soliciting and litigating of patents and trademarks. D. G. Haynes will be associated with the firm.

**The Kermel Apparatus Company**, Cambridge, Mass., has appointed Charles A. Barker, formerly with the Westinghouse Electric Manufacturing Company, a district sales manager of New York State and contiguous territory, with headquarters at 708 Monroe Street, Brooklyn, N. Y.

## New Industrial Companies

**The Hammond Electric Bank Protection Company**, of Los Angeles, Cal., has been incorporated with a capital stock of \$500,000 by W. D. and B. N. Hammond, C. K. Berg, F. C. Mason and A. L. Brown.

**The Geyser Electric Water Heater Company**, of Brooklyn, N. Y., has been incorporated with a capital stock of \$10,000 by L. B. Funk, D. M. Cohn and David Horwitz, 719 Eastern Parkway, Brooklyn, N. Y.

**The Roehling Electro Steel Company**, of New York, N. Y., has been chartered with a capital stock of \$30,000 to deal in electro steel. The incorporators are M. Opp, M. A. Hills, of New York, N. Y., and R. T. Conahan, of the Bronx.

**The Finsen Electric Motor Manufacturing Company**, of Rochester, N. Y., has been incorporated by William Weyrauch, R. Corydon Cash and Henry R. Howard, of Rochester, N. Y. The company is capitalized at \$10,000 and purposes to manufacture, repair and deal in electric motors, machinery, etc.

## Trade Publications

**Reading Lamp**.—An electric floor-stand lamp is described in a leaflet published by the Federal Sign System (Electric), Chicago, Ill.

**Steel Cabinets**.—Steel cabinets and switch boxes are described and listed in a leaflet published by the Berry-Glosser Company, Marion, Ohio.

**Electric Washer**.—A so-called "safety power" washer is the subject of a leaflet published by the Meadows Manufacturing Company, Pontiac, Ill.

**Oil Engines**.—Heavy-duty oil engines are described and illustrated in a catalog issued by the Wygodsky Engine Company, 115 Broadway, New York.

**Electric Lantern**.—An electric lantern operated by four dry cells is the subject of a leaflet issued by the Federal Sign System (Electric), Chicago, Ill.

**Tungsten-Lamp Fixtures**.—A booklet entitled "Mazda Lighting Fixtures Multiple" has been issued by the General Electric Company, Schenectady, N. Y.

**Turbo Blower**.—Turbo blowers for undergrate draft are the subject of a booklet issued by the Coppus Engineering & Equipment Company, Worcester, Mass.

**Motion-Picture Machines**.—A motion-picture machine suitable for amateurs is described in a bulletin issued by the Patheoscope Company, Æolian Hall, New York.

**Outlet-Box Connectors**.—Three types of outlet-box connectors are described and illustrated in a leaflet issued by the Gillette-Vibber Company, New London, Conn.

**Galvanometer**.—A high-sensitivity galvanometer of the D'Arsonval type is the subject of Bulletin No. 228 issued by the Leeds & Northrup Company, Philadelphia, Pa.

**Lighting Fixtures**.—The Crown Electrical Manufacturing Company, St. Charles, Ill., has issued a catalog containing numerous illustrations and price lists of lighting fixtures.

**Reversible Split Knobs**.—A leaflet describing reversible split knobs of the round and square type has been put out by the Findlay Electric Porcelain Company, Findlay, Ohio.

**Electric Products**.—The Menominee Electric Manufacturing Company, Menominee, Mich., is distributing a 156-page catalog completely describing the products of the company.

**Lighting Fixtures**.—Bulletin 3210, recently issued by the George Cutter Company, South Bend, Ind., describes and illustrates Sol-Lux fixtures for nitrogen-filled tungsten lamps.

**Wireless Telephone**.—A short-distance radiotelephone set is the subject of a circular issued by the Marconi's Wireless Telegraph Company, Ltd., Marconi House, Strand, London, W. C.

**Lighting Fixtures**.—So-called "Sol Lux" fixtures for high-efficiency tungsten lamps are described and illustrated in Bulletin No. 3210 issued by the George Cutter Company, South Bend, Ind.

**Sectional Switch Boxes**.—Metal sectional switch boxes designed for use with non-metallic flexible and rigid conduit are described in a leaflet issued by the Chicago Fuse Company, Chicago, Ill.

**Lighting Outfit**.—A so-called "silent-valve" engine is described in two booklets issued by the E. L. Russell Company, Indianapolis, Ind., and the method of connecting it directly to a generator is given.

**Electric Ranges and Hot Plates**.—In circulars recently issued by the Copeman Electric Stove Company, Flint, Mich., various types of electric ranges and hot plates are described and illustrated.

**Storage Battery for Motorcycles**.—Bulletin Z issued by the Electric Storage Battery Company, Philadelphia, Pa., contains information on a small so-called "Exide" battery designed for motorcycle service.

**Rigid Conduit**.—List prices are given of rigid conduit, couplings and elbows in a leaflet issued by the Safety-Armorite Conduit Company, Pittsburgh, Pa., agent for the National Tube Company, Pittsburgh, Pa.

**Luminous Heater**.—A so-called "El Radio" luminous heater with a polished-copper reflecting surface is described and illustrated in a folder published by the Hotpoint Electric Heating Company, Ontario, Cal.

**Fixture Parts**.—Fixture parts and trimmings for electric and gas lamps are described and illustrated in a handsome 131-page catalog put out by the Plume & Atwood Manufacturing Company, Watbury, Conn.

**Small Lighting Plants**.—The Main Electric & Manufacturing Company, Pittsburgh, Pa., has issued a catalog containing information on gas-engine-driven lighting plants, lighting fixtures and cooking appliances.

**Big Creek Initial Development**.—The Stone & Webster Construction Company, Boston, Mass., has issued an attractively illustrated book describing the Big Creek initial development of the Pacific Light & Power Corporation.

**Electric Products for South America**.—Catalog No. 21 issued by Pass & Seymour, Inc., contains information in Spanish, Portuguese and English on the various products of the company, and has been printed primarily for South American trade.

**Street-Car and Store Lighting**.—Bulletin No. 43,404 issued by the Edison Lamp Works of the General Electric Company, Harrison, N. J., contains papers and discussions on street-car lighting read before a meeting of the New England Street Railway Club. Bulletin No. 43,403 published by the same company contains a reprint of an article appearing in the *Lighting Journal* entitled "Store Lighting with Edison Mazda Lamps."



## Personal Mention

Mr. B. F. Robbins has become vice-president and manager of the Hunterdon Electric & Power Company, High Bridge, N. J., relieving Mr. Knox Taylor, president of the organization, of managerial duties.

Mr. O. F. Whitehurst, formerly vice-president of the Capital Light & Power Company, Jackson, Miss., is now consulting engineer for the Chattanooga & Tennessee River Power Company, Chattanooga, Tenn.

Mr. F. M. Houston has been appointed commercial manager of the Lockport (N. Y.) Light, Heat & Power Company. Mr. Houston was formerly connected with the Elmira (N. Y.) Water, Light & Railroad Company.

Prof. Frank B. Wilson, for the past three years assistant professor of electrical engineering at the University of Illinois, has been appointed head of the electrical department at Wentworth Institute, Boston, Mass.

Mr. C. J. Edwards has superseded Mr. William Spaulding as treasurer and manager of the Coast Power Company, Tillamook, Ore., which formerly operated under the name of the Tillamook Electric Light & Fuel Company.

Mr. Fred Cats, formerly superintendent of generating stations for the Nevada-California Power Company and Southern-Sierras Power Company, Bishop, Cal., is now superintendent of patrol for these organizations.

Mr. A. Patterson, formerly electrical engineer with the Fort Smith (Ark.) Light & Traction Company, is now general superintendent of the Southwestern Gas & Electric Company, with headquarters at Texarkana, Tex.

Mr. J. W. Disbrow has been appointed to succeed Mr. M. V. Knapp as superintendent of the Pennsylvania Power Company at Ellwood City, Pa. He was formerly connected with the Union Electric Company of Pittsburgh.

Mr. L. L. Ferree, formerly foreman of the line department of the Harrisburg (Pa.) Light & Power Company, has been promoted to be superintendent of the same company to fill the vacancy left by Mr. Edgar Z. Wallower.

Mr. George B. Thomas has been appointed manager of the Interstate Public Service Company and the Franklin (Ind.) Water, Light & Power Company, subsidiaries of the Middle West Utilities Company, as successor to Mr. F. H. Miller.

Mr. M. V. Knapp, for a number of years superintendent of the Pennsylvania Power Company at Ellwood City, Pa., has been transferred to the plant of the Mahoning & Shenango Valley Railway & Light Company at Youngstown, Ohio.

Mr. William Mohr, who has been assistant to the late R. J. McCuen, superintendent of lamps and lighting in Baltimore, Md., will succeed his chief as acting superintendent. Mr. Mohr has been in this department for more than twelve years.

Mr. J. C. Sexton, formerly superintendent of the municipal water and electric plant at Grayville, Ill., is now operating a plant at Indianola, Miss., which he and his brother, Mr. J. M. Sexton, have purchased. Mr. J. M. Sexton was formerly connected with the Union Electric Light & Power Company, St. Louis, Mo.

Mr. W. J. Ferris, receiver for the Idaho-Oregon Light & Power Company, Boise, Idaho, has been confined to his home for some time with a broken leg, but he expects to be able to place the New Oxbow plant in operation before the receiver's sale on Sept. 30. Mr. Ferris was formerly president and general manager of the La Crosse (Wis.) Water Power Company, whose plant was burned last year.

Mr. Frank Wert, Philadelphia, Pa., has been made head of the department of public relations of the Mahoning & Shenango Railway & Light Company, Youngstown, Ohio, as successor to Mr. H. D. Mamington, who will now devote his entire time to his duties as assistant to the president. Mr. Wert has been engaged in newspaper work at Philadelphia, Baltimore and Harrisburg, and is particularly well equipped to handle that part of his new work which involves contact with the press.

Mr. W. L. Davis, formerly assistant secretary and assistant treasurer of the Texas Power & Light Company and affiliated companies, was recently appointed superintendent

of accounts of the Strickland-Goodwin Management Association, of Dallas, Tex., succeeding Mr. J. R. Wolfe, assigned to other duties. The Strickland-Goodwin Syndicate owns and operates the lines of the Texas Traction Company, consisting of the interurban lines between Dallas and Denison, Tex., and lines in McKinney, Sherman and Denison, and the Southern Traction Company, which operates the interurban system between Dallas and Waco and Corsicana, also city lines in Waco, Corsicana and Waxahatchie, consisting in all of about 300 miles of road through the "Black Belt" of Texas.

Mr. E. L. Franklin, formerly results engineer for the southwest district of the Doherty Operating Company, has been appointed manager of the Trumbull Public Service Company, of Warren, Ohio. Born at Wolfville, Nova Scotia, only two miles from the home of Longfellow's "Evangeline," Mr. Franklin received his common-school education in Canada and was graduated from McGill University at Montreal in 1902. The next ten years were spent at Easton, Pa., where he was successively chief engineer and superintendent of the Easton Power Company, secretary and superintendent of the Easton Gas & Electric Company and general superintendent of the Eastern Pennsylvania Power Company, as these companies succeeded each other. In 1912 he joined the staff of the Doherty Operating Company, being engaged in work at its various properties in Missouri, Oklahoma, Kansas and Nebraska until his recent transfer to Warren.

Dr. Edward Weston, although perhaps best known to the present generation of electrical men as the founder of the science of accurate electrical measurements and as a manufacturer of electrical instruments, has been a pioneer in



DR. EDWARD WESTON

many other branches of the electrical field, and is distinguished as a scientist, engineer and versatile inventor. Dr. Weston was born at Bryan Castle, England, May 9, 1850. In 1870 he left England and came to the United States. His first work of importance in America was with the American Nickel Plating Company, for which he developed many improvements. In 1872 Dr. Weston's experiments resulted in the construction of the first electroplating machine. He later improved the electric dynamo by introducing the laminated core. Dr. Weston has had much to do with the development of incandescent and arc lamps. He originated the method of squirting a filament from plastic carbonaceous material, and he was one of the first to advocate the rating of lamps upon their mean spherical candle-power. In 1884 he discovered a new resistance alloy which he called "manganin." Four years later he founded the Weston Electrical Instrument Company, which now has extensive manufacturing buildings and laboratories at Newark, N. J. The Weston cadmium cell was adopted by the International Electrical Commission in 1908 as the international standard of electromotive force. The honorary degree of LL.D. was conferred on Dr. Weston by McGill University in 1903. In 1904 he received the honorary degree of Sc.D. from Stevens Institute, and the same degree was conferred upon him by Princeton in 1910. Dr. Weston is a charter member and a past-president of the A. I. E. E. and is a member of many other scientific and engineering societies both here and abroad.

## Obituary

John J. Scheidel, Jr., for three years employed in the New York office of Henry D. Sears under Mr. C. L. Hight, died on Sept. 15, aged twenty-four. Mr. Scheidel was Mercury on the recent champion New York degree team of the Jovian Order. Prior to his connection with Henry D. Sears he was with the W. F. Irish Electric Company, New York.

## Construction

### New England

**DIXFIELD, MAINE.**—Because of the greater demand for energy than the Dixfield L. & Improvement Co. can supply, it will sell its plant to the Rumford Falls Pwr. Co. It is reported. The latter company furnishes energy to manufacturers in Rumford, Me.

**BURLINGTON, VT.**—The commissioners of this city have adopted resolutions to place street lamps between Fomeroy and Archibald Streets and on Spring Street between Walnut and Elmwood Avenues.

**FITCHBURG, MASS.**—The Putnam Machine Co. is making extensive additions to its electric supply plant. The Hubbard Bros. Co., Fitchburg, Mass., has been awarded a contract for \$20,000 to cover this work. French & Hubbard, Boston, are the architects and consulting engineers for the new buildings. Energy will be purchased from the Connecticut River Transmission Co.

**LYNN, MASS.**—Plans are being considered for extensions to the ornamental street-lighting system. Present plans provide for the erection of lamps on Blake and Willow Streets.

**READING, MASS.**—Local extensions are contemplated to the municipal electric-light plant, to cost about \$5,000.

**SHIRLEY, MASS.**—The Shirley El. Co. has been granted pole locations on Shaker Road, where this company proposes to erect a high-tension transmission line from the Wilds Road to a point near the Samson Cordage Works, for the purpose of supplying electricity to operate the cordage works, and to the amount of 300-hp. transformer station. It is reported, will be erected in the mill yard.

**TAUNTON, MASS.**—The committee on public works and franchises has recommended additional street lamps for General Sherman Street and thoroughfares.

**MANCHESTER, CONN.**—The new lighting system was put in operation on Sept. 9. The improvement in street lighting was initiated by the Manchester Business Men's Association, whose members have pledged themselves to pay one-half of the cost for five years, the city to pay the other half. The establishment of the new system was made the occasion of a celebration.

**UNIONVILLE, CONN.**—The County Commissioners have granted the Union El. L. & Pwr. Co. of Unionville permission to erect a 22,000-volt transmission line in Farmington, from Knott's Corners to Avon. The proposed line is to extend from Unionville through Hartford to Wethersfield, and will transmit energy generated at the plant of the Hartford El. L. Co. in Hartford.

### Middle Atlantic

**DUNKIRK, N. Y.**—The Board of Water Commissioners is considering the question of extending the municipal electric transmission lines to the village of Dunkirk, Heater Co. and entering into a contract with the company to furnish electricity to operate the plant.

**MEXICO, N. Y.**—The Public Service Commission has granted Mexico El. Co. permission to issue \$41,000 in capital stock the proceeds to be used for extensions and improvements to its plant and transmission line. The company proposes to extend its line from Mexico to the village of Vermilion, Clifford, Palermo and Arthur.

**NEW BERLIN, N. Y.**—The New Berlin L. & Power Co. has just completed a new concrete boiler house and has installed a 15-hp. boiler and a 100-hp. Harrisburg Ideal engine.

**NEWBURGH, N. Y.**—The Public Service Commission has granted the Central Hudson Gas & El. Co., of Newburgh, permission to make two extensions to its system and for the erection of two new franchises, one in the town of Wappinger, Dutchess County, and the other in Hamptonburg, Orange County.

**SENECA FALLS, N. Y.**—It is reported that ground has been broken for the Tracey Development Co. plant which is to generate electricity for Waterloo, Seneca Falls, Auburn, Geneva and several towns in Cayuga County. The contract for excavations and erecting the power house was let to Grant, Smith & Co., Chicago, now in charge of the large canal work from this place to Seneca Falls, and involves an expenditure of \$100,000. The building will be

provided with the latest type machinery and will be thoroughly up to date.

**SODUS, N. Y.**—On Sept. 9 the Wayne Pwr. Co. of Sodus started its service to Naples, connection being made with the 11,000-volt transmission line from Atlanta. The company is now serving Naples, Atlanta, North Okeston, Covington, Wallace and Avoca. G. R. Mills is president.

**BOYERTOWN, PA.**—The Boyertown El. Co. is installing a 300-kw, 60-cycle, 2300-volt General Electric generator and a three-panel switchboard. A. E. Groff is superintendent.

**CUNEMAUGH, PA.**—Several new boilers are being installed in the municipal lighting plant.

**DUBOIS, PA.**—The Dubois El. & Trac. Co. is contemplating extensions to its electric-lighting system and street-railway system. The company recently installed a 300-kw generator and switchboard. An electric railway, it is reported, will be built from Falls Creek to Coal Glen by the Jefferson Coal Co., which will connect with the system of the Dubois L. & Trac. Co.

**EMAUS, PA.**—Bids will be received by the school board of the borough of Emaus until Sept. 22 for the construction of a new Public School building on North Street, between Fifth and Sixth Streets. Separate bids will be received at the same time and place for complete heating and ventilating system, plumbing system and complete installation of electrical work, in accordance with plans and specifications prepared by E. M. Pickin, Hunsicker Building, Allentown. E. C. F. Wagner is secretary of school board.

**FRANKFORD, PA.**—Plans have been adopted by the Frankford Board of Trade for an ornamental street-lighting system in the city of the city.

**HIGH SPIRE, PA.**—The Borough Council is considering the question of lighting the streets of the borough by electricity.

**JOHNSTOWN, PA.**—An effort is being made by the business men on Main Street, between Franklin and Clinton Streets, to secure the installation of ornamental street lighting in their section of the city.

**LANCASTER, PA.**—The ordinance requiring electric wires to be placed underground within a year has been passed by the City Council.

**NEW CASTLE, PA.**—Plans are under way for the erection of a curb lighting system along Washington Street from County Line Street to Greenwood Avenue. The contract will be awarded within the next few weeks.

**TITUSVILLE, PA.**—The municipal electric-light plant has recently been completely overhauled. Fred C. Johnson is electrician and Herbert A. Holstein is city manager.

**WILLIAMSBURG, PA.**—The new power plant of the Penn Central L. & Pwr. Co. will be formally opened next week. The plant is said to have cost \$1,000,000.

**LEBANON, N. J.**—The installation of an electric-lighting system in Lebanon is under consideration. It is proposed to secure the service from the Hunterdon El. & Pwr. Co., of High Bridge.

**BALTIMORE, MD.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Oct. 6 for miscellaneous repairs to mechanical equipment and construction changes at the United States appraisers' stores, Baltimore, Md. For details see proposal columns.

**TOWSON, MD.**—The contract for the installation of mechanical equipment, including heating, lighting and ventilation, for the Maryland State Normal School, near Towson, has been awarded to Riggs, Discher & Stringer, engineers and contractors, 25 Light Street, Baltimore. The contract amount is approximately \$75,000 and includes the installation of 600-hp water-tube boilers, ice machines, pumps, automatic stokers, vacuum heating system, etc.

**LOGAN, W. VA.**—The Logan County L. & Pwr. Co. is reported to have a new power house (concrete, brick and steel building, 100 ft. by 84 ft., 55 ft. high), with brick chimney and coal-handling apparatus. New equipment, including 600-hp water-tube boilers, two 2500-kw turbines, pumps, condensers, etc., will be installed. Hids, it is understood, have been received for construction of power house. Proposals for mechanical equipment will be asked for later. The company also proposes to erect about 75 miles of 44,000-volt transmission lines and will furnish electricity to coal mines in the Logan and Boone counties. R. W. Francis, Hunsicker Building, Washington, D. C., is engineer.

**PARKERSBURG, W. VA.**—W. L. Waters, of Pittsburgh, has made an inspection of the Little Kanawha River, and it is said that he has proposed to the United States government to improve the stream with

docks and dams to Burnsville for the concession of the water-power rights. Burnsville is situated on the waterway connecting the regions of the State. Mr. Waters is said to represent Eastern capital. It is estimated that \$12,000,000 would be required for the improvements contemplated.

**RICHMOND, VA.**—The Department of Street Cleaning would like to receive information pertaining to the latest improved motor street-sweeping machinery, both large and small, American and foreign makes. This information is to be delivered to the office of the superintendent of the Department of Street Cleaning as soon as possible. Henry J. Cohn is superintendent.

**WASHINGTON, D. C.**—Proposals for wire cable, manila tapes and rule and packing will be received at the office of the general purchasing officer, the Panama Canal, Washington, D. C., until 10.30 a.m. Sept. 30. Blanks and general information relating to Circular 388 may be obtained from that office or the office of the assistant purchasing agents, 24 State Street, New York City. Major F. C. Hogg, chief of engineers, U. S. A., is general purchasing officer.

**WASHINGTON, D. C.**—Sealed proposals will be received at the office of the supervising architect, Washington, D. C., until 3 p.m. Sept. 23 for furnishing and installing new ornamental street-lighting fixtures in the United States Court House and Post Office Building, New York, N. Y., in accordance with the specifications and drawings, copies of which may be had at the office of the supervising architect, O. Wenderoth, Washington, D. C., or at the office of the supervising chief engineer, New York, N. Y. See advertisement in proposal columns.

**WASHINGTON BARRACKS, D. C.**—Bids will be received at the Engineer Depot, United States Army, Washington Barracks, D. C., until Sept. 23 for furnishing and installing motor-driven ventilating fan coupled to and driven by a 110-volt, three-phase, 60-cycle squirrel-cage induction motor. For further information address Lt.-Col. Joseph E. Kuhn.

### North Central

**ANN ARBOR, MICH.**—The Eastern Michigan Edison Co. has been awarded a five years' contract for furnishing energy to the boulevard lighting system which has recently been installed by the merchants of the city.

**BATTLE CREEK, MICH.**—The contract for construction of an electric railway to connect Coldwater and Battle Creek (25 miles long) has been awarded to J. T. Adams, contractor, of Columbus, Ohio.

**BLISSFIELD, MICH.**—Fifty-three taxpayers have petitioned the City Council for day service from the municipal electric-lighting plant.

**FENTON, MICH.**—Plans are being considered for the installation of an ornamental lighting system in Fenton.

**GRAND RAPIDS, MICH.**—The State Railroad Commission has granted the Citizens Tel. Co. of Grand Rapids, permission to issue \$100,000 in bonds, the proceeds to be used for improvements to its plant and equipment.

**MARQUETTE, MICH.**—The new Jones furnace plant to be equipped with an electric power plant. Four motors aggregating 50 hp will furnish the required energy. J. T. Jones is manager.

**MEMONIE, MICH.**—The Memonine & Marinette El. Trac. Co. is now making a fireproof repair shop and paint shop with 2300 ft. of floor space. Edward Daniell is general manager.

**MILFORD, MICH.**—Within the next two months the Milford El. Co. is to erect a new transmission line using 16,000 ft. No. 0 bare copper wire, cross-arms, etc. Among contemplated purchases are one 150-kva direct-connected vertical wheel-type generator, three-phase, 60-cycle, 2300-volt, 164-r.p.m., and exciter, one 200-hp waterwheel for 16-ft. head, 164 r.p.m., 40 in., and one governor for above turbine, with 100-hp waterwheel switchboard equipment; also two 25-kw transformers. C. C. Sherk is superintendent.

**MIO, MICH.**—The Au Sable Power Co. has commenced the construction of its fourth dam on the Au Sable River. The new dam will be of similar construction to the others now in operation. The station will be equipped with generators having a total capacity of 10,000 kw.

**SAGINAW, MICH.**—It is reported that a petition has been presented to the City Council asking that the proposal to issue bonds be submitted to the people for the erection of electric-light plant.

**LANCASTER, OHIO.**—Preparations are being made by the Board of Public



Offers to change the municipal electric-light system from single phase, 135-volt, 110-volt, alternating current, to three-phase, 60 cycle, 110 volt, as soon as possible. Bonds to the amount of \$5,000, if understood, have been issued for the work. H. E. Katzenmeyer is clerk of board.

**CLEVELAND, OHIO.**—Bids will be received at the office of the commissioner of purchases and supplies, City Hall, Cleveland, Ohio, until Sept. 23 for furnishing lighting fixtures for the new city hospital group. Specifications may be obtained at the office of the city architect, 420 City Hall, Cleveland.

**CLEVELAND, OHIO.**—Bids will be received at the office of the commissioner of purchases and supplies, 513 City Hall, Cleveland, until Sept. 23 for three low-voltage steam-turbine induction-motor-driven municipal pumps for division pumping station for the Department of Public Utilities, division of water, 413 Superior Avenue.

**CLEVELAND, OHIO.**—Bids will be received at the office of the clerk of the Board of Education, East Sixth Street, Cleveland, Ohio, until Sept. 21 for furnishing material and work necessary to complete the remodeling of electric wiring at the East High School, at East Eighth-second Street, corner of Decker Avenue N. E., in accordance with plans and specifications on file in the office of the architect of said board. S. G. Hogan is director of schools.

**COLUMBUS, OHIO.**—Bids will be received by Samuel A. Kinnel, at noon of Oct. 12 for furnishing and erecting motor-driven centrifugal pumping machinery for the main sewage pumping station. Specifications are on file in his office. Bids will be received for pumps of capacities of 15,000,000 gal., 10,000,000 gal. and 5,000,000 gal. per hour. Prices for labor and material must be stated separately as well as in lump sums.

**MANSFIELD, OHIO.**—Bids will be received by C. H. Hughes, director of public safety, until Sept. 23 for furnishing and installing a police signal system.

**MARBLEHEAD, OHIO.**—The Marblehead Pwr. Co. will probably purchase within the next six months the equipment for a six-mile, 2200-volt, single-phase transmission line. G. W. Lapp is electrical engineer.

**MIDDLETOWN, OHIO.**—Permission has been granted to the Colin-Gardner Paper Co., it is reported, to erect a new rotary house. The company also is planning to erect a new power house, which will be equipped with automatic stokers.

**NORWALK, OHIO.**—The Cleveland, Southwestern & Columbus Ry. Co., which furnishes electrical service in Norwalk, has submitted a proposal to the City Council offering to furnish energy to operate the proposed municipal electric-light plant for a period of five years, or longer if desired. The company also offers to sell the city a portion of its distributing lines, equipment, transformers, meters, etc., as the city may wish at a price to be mutually agreed upon, and if an agreement cannot be arrived at the price shall be determined by arbitration. The company agrees to discontinue its present contract (which does not expire for another year) as soon as the city equips its own distributing lines, provided that it is given the contract to furnish electricity at the same. Bonds to the amount of \$120,000 have been authorized for the installation of a municipal plant.

**NORWOOD, OHIO.**—The Board of Control has awarded the Harrisburg Pwr. & Machine Wks., of Harrisburg, Pa., the contract for two Corliss engines (460 hp each) at \$10,049. The Allis-Chalmers Co., of Milwaukee, was awarded the contract for two 355-kw generators at \$8,700, for the municipal electric-light plant.

**PIQUA, OHIO.**—The Miami Lt. Ht. & Pwr. Co. is preparing to erect single-line standards on the principal streets of Piqua.

**PLAIN CITY, OHIO.**—At a special session of the City Council it was voted to issue bonds for \$6,500 to repair the light and water plant. Bonds of \$500 each are to be issued, running for a period of three years, with interest at 5½ per cent, payable semi-annually.

**SANDUSKY, OHIO.**—The City Council has decided to submit to the voters of this city the question of a \$200,000 bond issue for municipal electric lighting plant. This action is said to be a result of the controversy with the city officials on the lighting rates for the city. H. Whitford Jones, of Cleve-

land, it is reported, will be retained to prepare plans if the bond issue is carried.

**URBANA, OHIO.**—The Urbana Lt. Co. is contemplating extending its service to Woodstock. The company is now operating a transmission line to North Lewisburg and may extend the line to Woodstock.

**URBANA, OHIO.**—The Board of Control has selected the five-lamp cluster system for lighting the business section of the city. The plans provide for 24 standard lamps which will replace the lamps now in use. The lamps will be installed by the Urbana Lt. Co.

**YOUNGSTOWN, OHIO.**—Improvements will be made at the Lowellville power house of the Mahoning & Steubenville Ry. & Lt. Co. and considerable equipment added to take the place of that recently destroyed by fire. Instead of rebuilding the separate substations, the company will install a new permanent substation at Lowellville to increase the rating of the plant. A large amount of heavy machinery has already been delivered to the company.

**YOUNGSTOWN, IND.**—Hearings continue to be held on the bids for the new municipal lighting plant. The street-lighting situation and the desirability of changing from the old arc lamps to the incandescent type have been thoroughly discussed. After further consideration a decision will be made.

**PORTLAND, IND.**—Bids will be received at the office of the supervising architect, Engineering Department, Washington, D. C., until Oct. 1 for construction complete, including mechanical equipment, lighting fixtures and approaches, of the United States post office at Portland. Drawings and specifications may be obtained at the office or from the custodian of site at Portland. O. Wenderoth is supervising architect.

**BLOOMINGTON, ILL.**—The Bloomington & Normal Ry. & Lt. Co. is rebuilding its engine and will erect a transmission line from Chenoa to Lexington, material for which has been purchased. M. G. Linn is superintendent.

**FAIRFIELD, ILL.**—The City Council of Fairfield plans the installation of an additional generator in the municipal electric-light plant for taking care of the day load.

**GALVA, ILL.**—The new plant of the Galva Electric Lt. Co. is now completed. The building is of brick, 96 ft. by 56 ft. The installation consists of three large boilers of 204 hp and a heavy-type Corliss engine which operates a 250-kw generator. Plans are under way to install a second unit similar to the first. In addition to supplying energy to Galva, the following cities will be served: Oneida, Altona, Lafayette, Cambridge and Bishop Hill. E. O. Hargrove is president, and H. C. Politz is secretary and treasurer.

**SPRINGFIELD, ILL.**—An ordinance providing for 30 arc lamps to be erected in the outlying districts has been submitted to the City Council.

**SPRINGFIELD, ILL.**—The Springfield Gas & El. Co. has erected a transmission line to the Tuxhorn Mine to furnish energy there. The equipment consists of one 100-kw motor generator set and three 30-kw, 6600/440-volt transformers. The present electricity will be used to operate the underground haulage apparatus and mining machines; electricity will be used later for the Tuxhorn mine. Roscoe Woltz is commercial power engineer.

**STERLING, ILL.**—It is reported that the city has entered into a five-year contract with the Illinois Northern Utilities Corp. to light its streets. The new schedule calls for \$150 per year, plus an annuum as compared with \$16.50 on the old contract. The number of lamps has also been increased from 250 to 270.

**WATERLOO, WIS.**—The city of Barron is making additions to its distributing system and changes in arc-lamp street-lighting system, material for which has been purchased. M. H. McKee is city clerk.

**HARTFORD, WIS.**—Improvements have been made to the municipal electric-light plant consisting of 30 incandescent, a 450-hp cross-compound Allis-Chalmers engine, a 375-kva generator and a Western Electric switchboard. H. Parfrey is superintendent.

**MONDOVI, WIS.**—Within the next two months the Mondovi El. Lt. & Pwr. Co. expects to erect 20,000 ft. of new line, and to purchase alternators, switchboards, oil engine, generator, switchboard and a water-wheel governor. A. D. Alt is secretary and treasurer.

**NEW RICHMOND, WIS.**—It is understood that the Wells El. Const. Co. will erect an electric-light plant here. A. S. Wells is manager.

**OAKFIELD, WIS.**—Within the next year the Oakfield Lt. & Pwr. Co. expects to pur-

chase some transformers, lightning arresters and meters. W. E. Bristol is secretary.

**SHARON, WIS.**—The United Ht., Lt. & Pwr. Co. expects to purchase within the next three months one 60-kva or 70-kva generator, 2300 volts, three-phase, 60-cycle, directly connected to a 13-in. by 12-in. side-crank engine; a 6-kw regulator for series lighting; switchboards, instruments, etc. The company is negotiating over the pole line of the United Ht., Lt. & Pwr. Co., of Delavan. Leon C. Le Baron is superintendent of the water and light department of Sharon.

**SHAWNEE, WIS.**—The municipal electric-light and water plant expects within the next year to erect a water-power plant that will develop 400 hp or install an engine of about 800 hp. Paul A. Caprano is superintendent and chief engineer.

**CEYLON, MINN.**—Bids for the labor and material required in the construction of an electric-light system here will be received until 8 p.m. Sept. 14. Plans and specifications are on file in the office of F. C. Necke, village recorder, and also in the office of Earle D. Jackson, consulting engineer, St. Paul, Minn.

**FRANKLIN, MINN.**—The Whorland El. Lt. Co. has reported to have been granted a franchise to furnish electricity for lamps and motors in Franklin.

**HIBBING, MINN.**—The installation of a municipal electric-light plant in Hibbing is reported to be under consideration.

**PIPESTONE, MINN.**—If plans of the Pipestone El. Lt. Co. mature, energy will be transmitted by this company to Trosky, Edgerton and Jasper.

**SOUTH STILLWATER, MINN.**—The Consumers Power Co., of St. Paul, Minn., is planning to extend its lines to this place.

**WACONIA, MINN.**—Plans are being considered, it is reported, for the installation of an electric-lighting system in Waconia.

**HARRIS, IA.**—Bids will be received until 8 p.m. Sept. 23 for the construction of a substantial overhead transmission system and for furnishing meters, transformers and lamps. L. J. Hagerty, town clerk.

**PATON, IA.**—Bids will be received by the town of Paton until Sept. 22 for construction of proposed transmission line and distribution system, in accordance with plans and specifications on file in the office of the city clerk at Paton and at the office of W. H. Grover, of Ames, engineer. Separate bids are to be submitted for the substitution to be erected in Paton.

**BUTLER, MO.**—Extensions and improvements will be made to the municipal electric-light plant next year, including the installation of three-phase 60-cycle, alternating-current generators, switchboard and instruments. Extensions will be made to the distribution system, for which copper wire, poles, insulators, etc., will be required. Improvements also will be made in the water-works system, equipping the same with electrically operated machinery. H. M. Cannon is manager.

**CORDER, MO.**—It is probable that the proposed electric-lighting plant at Higninsville to serve Corder with energy will be accepted.

**KIRKWOOD, MO.**—The Board of Aldermen has authorized improvements to the municipal electric-light plant, involving an expenditure of \$17,000. The Board of Public Improvements will have charge of the work.

**PALMYRA, MO.**—It is reported that the Arrow Engineering Co., St. Louis, Mo., has been awarded the \$25,000 contract for the equipment and rebuilding of the electric-light plant and water-works. The generators, switchboard and motors will be of General Electric design. The cost for a sum of \$26,000 for the new work were taken by the Continental Trust Co., of Chicago.

**CONDE, N. D.**—The people of Conde are agitating the question of an electric-light plant.

**DAVIS, S. D.**—A franchise, it is reported, has been awarded to a Milwaukee company to install and operate an electric-light plant in Davis.

**FLANDREAU, S. D.**—The Flandreau Lt. & Pwr. Co. expects to purchase within the next eight months one 50-hp producer-gas engine and one 100-kva, 2300-volt engine-type alternating-current generator.

**ALLIANCE, NEB.**—Plans are under way for the erection of an electric-light plant at this place. A. C. Arends is interested.

**WYMORE, NEB.**—The new electric-light plant will soon be in operation. The equipment is said to have cost \$15,000.

**KANSAS CITY, KAN.**—The commissioners are offering \$202,500 in bonds for improvements to the municipal electric-light plant.

**PAWNEE ROCK, KAN.**—The electric light plant has been temporarily closed pending the completion of a purchase which will combine the lighting of the town with the manufacture of ice.

## Southern States

**HENDERSONVILLE, N. C.**—The Hendersonville L. & Pwr. Co. has just completed the development of its No. 2 water-power, which will soon be placed in operation. R. M. Oates is president.

**SNOW HILL, N. C.**—The Town Board has purchased equipment for an electric light plant, which will be installed at once. The proposed plant will cost about \$4,000 and will be driven by a 35-hp oil engine.

**WASHINGTON, N. C.**—Contracts have recently been awarded for improvement to the water, light and sewerage system. The equipment will include two 500-kw Curtis turbines, two 250-hp Babcock & Wilcox boilers, two 750-gal. compound fire pumps; also the construction of a 500,000-gal. reservoir. H. B. Charles is superintendent.

**MICANOPY, FLA.**—The new electric-lighting plant has recently begun operation. This plant was constructed by the J. B. McCrary Company, Atlanta, Ga.

**OCALA, FLA.**—The proposal to issue \$75,000 in bonds for extensions to the municipal electric-light system and for construction of ice plant will be submitted to the voters on Oct. 27.

**TAMPA, FLA.**—City Engineer Ed. Fitzgerald has recommended the installation of a central fire-alarm and police signal system.

**JELICO, TENN.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Oct. 14 for construction complete, including mechanical equipment, lighting fixtures and approaches, of the United States post office at Jelico, Tenn. Drawings and specifications may be obtained from the above office or from the custodian of site at Jelico. O. Wenderoth is supervising architect.

**SHELBYVILLE, TENN.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Oct. 13 for construction complete, including mechanical equipment, interior lighting fixtures and approaches, of the United States post office at Shelbyville, Tenn. Drawings and specifications may be obtained at the above office or from the custodian of site at Shelbyville. O. Wenderoth is supervising architect.

**ARKWATER, ARK.**—At an election held Aug. 25 the proposal to grant a franchise to C. H. Evans and others to install an electric-light plant was defeated.

**CORNING, ARK.**—Preparations are being made to rebuild the local electric-light plant, which was recently destroyed by fire. Plans for the equipment are not yet completed, but will probably include one 300-kw to 350-kw and one 150-kw, two-phase, 60-cycle, 2300-volt, vertical-shaft engine, motor, transformer, etc. H. B. Hays is engineer in charge of the work. George A. Booser is interested in the company.

**LITTLE ROCK, ARK.**—The Arkansas L. & Pwr. Co. has recently incorporated with a capital stock of \$50,000, will have its main office in Little Rock, but will operate in the cities of Arkadelphia, Camden, Malvern, Magnolia and other places. The company is a successor of the Arkansas Pwr. Co., which is building a power plant at Malvern. H. C. Couch is president, and J. L. Longino is secretary, both of Little Rock.

**MELVILLE, LA.**—Plans and specifications have been prepared by W. L. Thompson, consulting engineer, of Boyce, for the installation of a municipal electric-light plant in Melville.

**NEW ORLEANS, LA.**—Steps have been taken by the merchants of Camp Street for the installation of ornamental lamps on Camp Street from Canal Street to Howard Avenue. The Electrical Supply Co. is interested in the project.

**PLATTENVILLE, LA.**—Furnishing electricity for lamps and motors on the bayou between Donaldson and Lockport, La., a distance of about 55 miles, in connection with a proposed electric interurban railway, is under consideration by W. Water Olmeyer, of Plattenville. Dr. H. S. Smith, Albert Boudreaux and Alfred Picot, of Thibodaux, La. It is proposed to organize a company to be known as the Louisiana Ry. L. & Pwr. Co.

**CUSHING, OKLA.**—Within the next three months the Cushing El. L. & Pwr. Co. expects to purchase a 300-kw turbine set with jet condenser, and a return-tubular boiler 36 in. by 72 in. H. Askin is vice-president.

**BEAUMONT, TEX.**—The Beaumont El. L. & Pwr. Co. is making extensive improvements in its plant, approximating \$100,000.

**SMITHVILLE, TEX.**—The Smithville El. L. & Pwr. Co. has recently purchased two 150-hp Ames high-pressure boilers and one 18-in. by 36-in. Hamilton Corliss engine, all of which will be erected at once. The company expects to purchase a new switchboard within the next three months. Emil Buescher is proprietor.

## Pacific States

**MONTESANO, WASH.**—It is reported that the North-west El. & Wtr. Wks. is making plans to improve the service during the coming year so that it will be adequate to meet the demands of the city.

**SPOKANE, WASH.**—It is reported that the Pacific Tel. & Tel. Co. will expend \$20,000 in extensions and improvements to its system in the various sections surrounding Spokane. Work has already commenced.

**WILBUR, WASH.**—The Washington Pwr. L. & Pwr. Co. of Spokane, has been awarded a contract by the City Council for furnishing electric service to this city. It is understood that some extensions and improvements will be made.

**ASTORIA, ORE.**—It is reported that the Marconi Wireless Tel. Co. will immediately erect a large wireless station here. Four steel towers will be erected on a concrete foundation. The station will be a 25-kw plant and will probably cost \$80,000.

**DRAIN, ORE.**—The city of Drain is installing an electric distribution system. The equipment will consist of one General Electric switchboard (three phases, 60 cycles), with ammeter and circuit switch; three ammeters, one voltmeter, two autoline switches, transformers, 100 40-ft. poles and 20 miles of wire, and 48 80-watt incandescent street lamps. The work is being done by the city. Electricity for operating the system will be furnished by the Douglas County L. & Wtr. Co., of Roseburg. John H. Sutherland, is engineer in charge of the work.

**LINDSAY, CAL.**—The installation of an ornamental street-lighting system in Lindsay is under consideration. The Mount Whitney Pwr. & El. Co. is reported to have offered to donate the electroliers.

**LOS ANGELES, CAL.**—Specifications have been submitted by the city electrician to the Board of Public Works for the proposed ornamental lighting system for Mariposa Avenue between Romaine Street and Melrose Avenue.

**SAN FRANCISCO, CAL.**—The San Francisco Hotel Association has petitioned the supervisors' lighting committee to order the installation of sixty electroliers on Third Street, from Market to King Street, which were purchased by subscription.

**SAN FRANCISCO, CAL.**—Sealed proposals will be received at the office of the City Engineer, San Francisco, Cal., until 2 p.m. Sept. 29 for furnishing duplicate internal-combustion engines with directly connected air compressors, about 30 hp each. Blank proposals and particulars may be obtained by addressing the light-house inspector, San Francisco, Cal.

**SAN JOSE, CAL.**—The Inyo-Cerro Gordo Mining & Pwr. Co., of San José, recently incorporated, has applied to the State Engineer for a commission for work rights on Lone Pine Creek. The company contemplates a 1500-hp development. Energy generated at the plant will be used to operate the machinery in the mines and tramways. H. E. Healy is president.

**TULARE, CAL.**—Plans are being prepared for the construction of a new substitution for the Mount Whitney Pwr. Co., just east of Tulare.

**BOISE, IDAHO.**—The city of Boise has cancelled the contract which has been held with the Idaho-Oregon Light & Pwr. Co. for installing lamps and furnishing energy for lighting the streets of South Boise. It is said that the city has decided to install its own system.

**PLUMMER, IDAHO.**—Dunkit Brothers, of this city, were recently granted a certificate of public convenience and necessity by the Public Service Commission at Boise for the installation of an electric plant. It is understood that work on the project will begin within 60 days.

**WHITEFISH, MONT.**—The city clerk will shortly receive bids for installing an electric-light plant here.

**WATLUX, MONT.**—Henry Zophi, of this city, has applied for a franchise to install an electric light and heating plant. Mr.

Zophi and others associated with him will invest about \$20,000 in the work. It is reported. It is proposed to furnish 21-hour service.

**UTAH VALLEY, UTAH.**—Steps have been taken by the Central Pueblo Improvement Association for the installation of an ornamental street-lighting system on Union Avenue.

**LAS CRUCES, N. M.**—The Las Cruces El. L. & Ice Co. expects to purchase with the next four months (provided it is possible to make the necessary financial arrangements) a 250-hp Diesel-turbine oil engine for belt connection with a 150-kva alternator at 600 r.p.m. D. W. Morgan is manager.

**PORTALES, N. M.**—Within the next 12 months the managers of the municipal electric-light plant expect to purchase poles, transformers, meters and various electrical appliances, including heating and cooking apparatus, vacuum cleaners, washing machines, etc. W. H. Bralley is town clerk.

## Miscellaneous

**JUNEAU, ALASKA.**—The Peel River Pwr. Co., which recently obtained a government grant for the construction of a hydroelectric chemical and power plant on the Peel River, 35 miles south of here, will begin work within the next few months, according to H. B. Kenyon, the partner, who said to be promoting the project.

**PANAMA.**—Bids will be received at the office of the general purchasing officer of the Panama Canal, Washington, D. C., until Sept. 30, for furnishing steel wire cable, files, drill sleeves, etc. Blank and general information relating to this circular (No. 865) may be obtained from the above office or the offices of the assistant purchasing agents, 24 State Street, New York, N. Y.; 514 Whitehead Center Building, New Orleans, La., and 1086 North Point Street, San Francisco, Cal.

## New Incorporations

**PLEASANTON, KAN.**—The Pleasanton Electric L. & Pwr. Co. has been incorporated with a capital stock of \$10,000.

**BEATTYVILLE, KY.**—The Beattyville Utilities Co. has been incorporated with a capital stock of \$10,000 by T. B. Bkaley, of Beattyville; H. S. Van Zant, of Frankfort, and E. Pearce Bullock, Jr., of Louisville.

**LOUISVILLE, KY.**—The United States Utilities Co. has been chartered with a capital stock of \$60,000 by J. M. Bradley, B. F. Wortham and W. T. Gossett.

**ST. LOUIS, MO.**—The Davis Creek Coal Co. has been incorporated with a capital stock of \$75,000 by J. J. Wells; J. L. Rowland, of Novinger, Mo.; L. L. Brande, of Chicago, Ill.; Edward H. Conrades and R. E. Romauer. The company proposes to operate coal mines and also to generate and distribute electricity for lamps and motors.

**FAIRVIEW, MONT.**—The Jennison L. & Pwr. Co. has been incorporated with a capital stock of \$100,000 for the building an electric light and power plant near here. The incorporators are Charles W. Jennison, of Williston; Herman W. O. Frank and William Miller, of Minneapolis, Minn., and Warren Jennison, of Fairview.

**HELLEFONTE, PA.**—The Slab Cabin El. Co. has been granted a charter with a capital stock of \$5,000 to operate in Ferguson Township. The office of the company is Hellefonte. A. W. Lee is one of the incorporators.

**CLEARFIELD, PA.**—The Rossiter El. Co. has been chartered with a capital stock of \$5,000 to operate in Cance Township. The office of the company will be in Clearfield. A. J. Muser is among the incorporators.

**EASTON, PA.**—The Butler-Edward Co. has been chartered with a capital stock of \$5,000.

**CLINTON, TENN.**—The Cumberland Pwr. & Ice Co. has been incorporated with a capital stock of \$25,000 by J. P. Stanton, Samuel Watts, E. M. Beasley and others.

**BECKLEY, W. VA.**—The Beckley Utilities Co. has been incorporated by G. C. Hedrick, E. L. Ellison and W. W. Wilkes, of Beckley; Theodore Swann and J. E. Brown, of Charleston; and J. P. Stanton. The company is capitalized at \$100,000 and purposes to supply water and power.



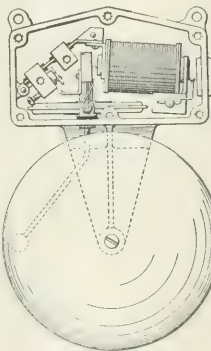
# Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED  
SEPT. 8, 1914.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York, N. Y.]

- 1,109,667. **SIGNALING-CONTROLLING SYSTEM:** C. E. Beach and H. W. Doughty, Birmingham, N. Y. App. filed Oct. 31, 1910. Automatic fire-alarm signal.
- 1,109,678. **ELECTROMAGNETIC DEVICE:** E. M. Jones, Atlanta, Ga. App. filed Nov. 7, 1907. Railroad track signal.
- 1,109,686. **TELEPHONE EXCHANGE SYSTEM:** F. R. McBerry, New Rochelle, N. Y. App. filed Nov. 10, 1910. Mechanical trunk-line switching.
- 1,109,689. **ELECTRIC-CIRCUIT CLOSER AND BREAKER:** T. H. McQuown, Cambridge, Mass. App. filed Nov. 24, 1906. For automatic recorders, ignition devices, etc.
- 1,109,703. **TELEPHONE-EXCHANGE SYSTEM:** F. N. Reeves, New York, N. Y. App. filed March 20, 1912. Automatic selector control.
- 1,109,707. **SYSTEM OF ELEVATOR CONTROL:** J. C. Smith, Louisville, Ky. App. filed July 5, 1911. Acceleration and safety devices.
- 1,109,726. **POT-HEAD:** P. F. Williams, Chicago, Ill. App. filed Jan. 26, 1911. End-piece connection.
- 1,109,733. **FUSE HOLDER:** H. W. Young, Chicago, Ill. App. filed April 28, 1913. Refillable-cartridge safety fuse.
- 1,109,735. **ELECTRIC ATTACHMENT FOR CARBURETORS:** A. S. Bignell, Bergerville, Quebec, Canada. App. filed Aug. 23, 1913. Heats for starting.
- 1,109,737. **COUPLING:** J. W. Coffman, Springfield, Ill. App. filed March 24, 1912. Railroad cable and pipe connections.
- 1,109,764. **ELECTRODE FOR VAPOR-ELECTRIC APPARATUS:** C. A. Kraus, Newton Highlands, and R. D. Mailey, Lynn, Mass. App. filed June 30, 1910. Anode temperature control.
- 1,109,770. **ELECTRIC SWITCH:** A. B. Lee, Oakland, Cal. App. filed May 11, 1912. Gas-engine ignition.
- 1,109,778. **RELAY CONTACT DEVICE:** G. C. Murphy, Louisville, Ky. App. filed Jan. 14, 1912. Solenoid type for railroad signal.
- 1,109,818. **TELEGRAPH KEY:** R. L. Boulter, Los Angeles, Cal. App. filed March 29, 1912. Vibrating transmitter.
- 1,109,830. **QUADRUPEX TELEGRAPH SYSTEM:** J. Gott, Hove, Brighton, Eng. App. filed May 9, 1912. Double differentially wound polarized relay.
- 1,109,850. **ELECTRIC SLOW-DOWN DEVICE:** D. L. Lindquist, Yonkers, N. Y. App. filed Feb. 17, 1910. Reversible motor for elevators.
- 1,109,859. **FIRE ALARM:** M. Moloney, Christchurch, New Zealand. App. filed Feb. 14, 1912. Thermostat switch.
- 1,109,878. **ALARM CABLE:** J. Sulzbacher, New York, N. Y. App. filed Dec. 30, 1911. Signal and thermostatic.
- 1,109,879. **RAILWAY SIGNALING SYSTEM:** L. H. Thullen, Edgewood Park, Pa. App. filed Feb. 5, 1904. Track, block, power and signal system.
- 1,109,880. **SIGNALING SYSTEM FOR RAILWAYS:** L. H. Thullen, Edgewood Park, Pa. App. filed Aug. 22, 1904. Return circuit by track rails; alternating current.
- 1,109,881. **SIGNALING SYSTEM FOR RAILWAYS:** L. H. Thullen, Edgewood Park, Pa. App. filed Aug. 22, 1904. Direct current or alternating-current, power and relay signal.
- 1,109,886. **MANUFACTURE OF ELECTRIC FILAMENTS:** C. A. von Welsbach, Vienna, Austria-Hungary. App. filed Aug. 9, 1898. Platinum core volatilized from an osmium coating.
- 1,109,887. **MANUFACTURE OF ELECTRIC FILAMENTS:** C. A. von Welsbach, Vienna, Austria-Hungary. App. filed Aug. 24, 1899. Osmium and partly reduced oxide of thorium.

- 1,109,888. **MANUFACTURE OF ELECTRIC FILAMENTS:** C. A. von Welsbach, Vienna, Austria-Hungary. App. filed Aug. 24, 1899. Osmium and zirconium alloy.
- 1,109,899. **BRUSH FOR ELECTRIC CONTACTS:** J. E. Coles and E. L. M. Ragonot, Paris, France. App. filed Nov. 1, 1913. Made of wire filaments.
- 1,109,901. **REVERSIBLE BRUSH HOLDER FOR DYNAMOS:** J. L. Creveling, New York, N. Y. App. filed Aug. 29, 1911. Constant polarity.
- 1,109,909. **WIRELESS OSCILLATOR:** H. P. Dwyer, San Francisco, Cal. App. filed Aug. 5, 1912. For generating long continuous waves.
- 1,109,919. **SWITCH KEY:** A. F. F. Gilson, Closter, N. J. App. filed Feb. 10, 1914. Prevents rebound of listening and ringing key.
- 1,109,940. **ELECTRICAL APPARATUS:** H. E. Reeve, New York, N. Y. App. filed Feb. 17, 1911. Flexible diaphragm joint.
- 1,109,947. **SWITCH KEY:** G. P. Tromp, New York, N. Y. App. filed Feb. 10, 1914. Spring brake to prevent rebound.
- 1,109,950. **SIGNALING APPARATUS:** A. Andren, Brooklyn, N. Y. App. filed Jan. 25, 1909. Elevator flash signal.



1,109,940—Electrical Apparatus

- 1,109,960. **AUTOMATIC TELEPHONE-TESTING SYSTEM:** W. L. Campbell, Chicago, Ill. App. filed April 1, 1907. Manual test of "busy" or "idle".
- 1,109,968. **TOY CONSTRUCTION:** J. L. Cowen, New York, N. Y. App. filed April 22, 1912. Railroad-track conductor and guide.
- 1,109,969. **ELECTRIC BELL:** W. J. Cook and M. M. Breuer, Denver, Col. App. filed May 24, 1912. Alternating-current or direct-current vibrator.
- 1,109,996. **THERMOSTAT:** F. J. P. Kuhlmann, San Francisco, Cal. App. filed Oct. 14, 1912. For operating switches, valves, etc.
- 1,110,012. **TIMBRE CONTROLLER FOR ELECTRICAL MUSICAL INSTRUMENTS:** M. L. Severy, Arlington Heights, and G. B. Sinclair, Winthrop, Mass. App. filed Aug. 7, 1905. Magnetic string vibration.
- 1,110,021. **ELECTRICALLY CONTROLLED SWITCH:** H. E. White, Glen Ridge, N. J. App. filed July 15, 1912. Motor-starting series relay.
- 1,110,027. **TELEPHONE SWITCHING SYSTEM:** W. Aitken, Liverpool, Eng. App. filed Oct. 24, 1910. Automatic disconnecting branch exchange.
- 1,110,028. **HIGH-FREQUENCY ALTERNATOR:** E. F. W. Alexanderson, Schenectady, N. Y. App. filed Oct. 19, 1911. Inductor design.

- 1,110,029. **HIGH-FREQUENCY ALTERNATOR:** E. F. W. Alexanderson, Schenectady, N. Y. App. filed Oct. 19, 1911. Improvement on inductor (patent No. 1,008,577).
- 1,110,039. **SERIES-PARALLEL CONTROL SYSTEM:** E. R. Carichoff, Schenectady, N. Y. App. filed April 15, 1913. Operating windings in the motor circuit.
- 1,110,071. **AUTOMATIC TRUNKING SYSTEM:** E. A. Mellinger, Chicago, Ill. App. filed June 10, 1909. Grouping control.
- 1,110,078. **INCANDESCENT ELECTRIC LAMP:** D. J. O'Brien, San Francisco, Cal. App. filed June 14, 1905. Parallel straight filaments.
- 1,110,094. **SYSTEM OF CONTROL FOR ELECTRIC MOTORS:** E. S. Zuck, Cleveland, Ohio. App. filed Jan. 3, 1911. Combined auxiliary and main circuits.
- 1,110,099. **LAMP SOCKET:** V. G. Apple, Dayton, Ohio. App. filed April 8, 1914. For automobiles, etc.
- 1,110,110. **FLASHLIGHT:** W. E. Compo, Toledo, Ohio. App. filed Feb. 19, 1914. Dry-cell attachment.
- 1,110,151. **PROTECTIVE DEVICE:** H. A. Steen, Milwaukee, Wis. App. filed July 22, 1911. Alternating-current time relay.
- 1,110,152. **ELECTROMAGNETICALLY OPERATED THERMOSTAT:** H. A. Steen, Milwaukee, Wis. App. filed July 22, 1911. Alternating-current field.
- 1,110,153. **THERMOSTAT:** H. A. Steen, Milwaukee, Wis. App. filed July 22, 1911. Movable heating coil.
- 1,110,163. **ELECTRIC-LAMP RECEPTACLE FOR SIGNS:** G. B. Thomas, Bridgeport, Conn. App. filed Nov. 25, 1910. Inserted from the rear.
- 1,110,166. **MACHINE FOR PRODUCING ELECTRICAL COILS:** C. R. Underhill and D. J. Kelsey, New Haven, Conn. App. filed Sept. 30, 1912. Wire and tape winding.
- 1,110,179. **LIGHTNING ARRESTER:** E. Bennett, Olmstead, Utah. App. filed Aug. 26, 1908. Spark-gap with movable arc.
- 1,110,184. **WIRELESS COOK-STOVE OR COOKER:** E. L. Brown and M. Murphy, Janesville, Wis. App. filed July 26, 1913. Automatic cut-off.
- 1,110,193. **ATTACHMENT PLUG:** E. E. Dougherty, San Bernardino, Cal. App. filed Feb. 14, 1914. Segmental screw-thread.
- 1,110,208. **PROCESS OF ELECTRICALLY TREATING MELTING AND REFINING METALS:** C. G. Keller, Paris, France. App. filed Aug. 12, 1902. Casting ladle is taken to the electrodes.
- 1,110,228. **TELEPHONE RECEIVER:** A. Plecher, Las Animas, Col. App. filed Feb. 3, 1911. Annular magnet.
- 1,110,253. **MEANS FOR PRODUCING OSCILLATING CURRENTS OF HIGH FREQUENCY:** A. H. Cohen, San Francisco, Cal. App. filed Feb. 3, 1913. Parts exposed for inspection.
- 1,110,254. **MAXIMUM-DEMAND ELECTRIC METER:** L. H. Conklin, East Orange, N. J. App. filed Nov. 16, 1910. For three-phase system.
- 1,110,259. **ELECTRIC-LINE-APPARATUS PROTECTOR:** P. K. Higgins, Los Angeles, Cal. App. filed Oct. 22, 1903. Fusible core and carbon envelope.
- 1,110,261. **APPARATUS FOR PERFORATING RECORD CARDS:** H. Hollerith, Washington, D. C. App. filed Feb. 4, 1913. Improvement on patent No. 682,197.
- 1,110,271. **SWIVEL ATTACHMENT PLUG:** C. D. Platt, Bridgeport, Conn. App. filed Feb. 26, 1914. Contact and latch construction.
- 1,110,285. **ELECTRICALLY OPERATED HAMMER:** F. E. Brixius, Manitowish, Wis. App. filed April 19, 1913. Solenoid-operated riveter.
- 13,798 (reissue). **MEANS FOR RECEIVING INTELLIGENCE COMMUNICATED BY ELECTRIC WAVES:** G. W. Pickard, Amesbury, Mass. App. filed March 9, 1912. (Original patent No. 877,451, dated Jan. 21, 1908; division of original patent No. 836,531, dated Nov. 20, 1906.) Rectifier and detector.

# Electrical World

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No. 13

## War News by Radio

It is through a curious chain of circumstances that public attention has recently been brought to the reliability

of transatlantic wireless telegraphy. Following the interruption of direct communication by cable between the United States and Germany, and as a consequence of severe censorship by the allied powers through whose telegraphic systems messages from Germany were forced to pass in attempting to reach America, no information of unquestioned German origin could be had except via the radio stations at Sayville, L. I., and Tuckerton, N. J. Through a complication in the matter of federal license the Tuckerton plant was closed temporarily at first, and it is now disabled, leaving Sayville as the only station by way of which reports from Berlin are received. The conflicts in statement between dispatches coming from London and Paris through the usual channels and those said to be "wireless" from Germany soon caused doubt as to the accuracy, and even the possibility, of radio transmission direct from Nauen to the United States. In an article on page 615 of this issue Mr. John L. Hogan, Jr., describes the Sayville plant and discusses its capabilities as they pertain to transatlantic wireless telegraphy. The implication that receipt of Berlin's messages is impossible, which is heard frequently in the cries of "faked news," would seem to have no foundation in so far as the engineering progress of radiotelegraphy is concerned. Although continuous twenty-four-hour commercial service has never been established between Europe and the United States, it has repeatedly been shown that messages might be transmitted over the great distance with moderate ease whenever daylight absorption and static interference were small. As Mr. Hogan points out, although there is no information available to prove or disprove the veracity of the press messages supposed to have been forwarded through Sayville, the technical condition of radio transmission is such that Nauen might easily send to Sayville for several hours each night.

## Hasten the Railroad Case

The Interstate Commerce Commission will give the railroads a chance to prove that war conditions make an advance in rates now imperative. Painfully solicitous for shippers who might want to testify, the commission has put off the commencement of hearings for a month. This is precious time lost. It is unfortunate that the commission could not have seen its duty clear to act immediately. In the original case the proceedings and subsequent consideration of testimony dragged on for weary months until the patience and hope of the car-

riers were tired to exhaustion. If the commission will leave out useless formalities, if it will "cut the red tape" which is the notorious accompaniment of government procedure, it can give relief when relief will do most good. At the risk of being regarded as unthinking and uninformed we are so heedless as to believe that no re-hearing is necessary in a case that is as plain as day, but that heretical criticism fails to take into account the apparent idea of the commission that the form is almost as important as the substance. The hearing process, long and debilitating as it may prove to be, is not a necessary preliminary to railroad relief, yet valuable time is to be spent on it. There can be no assurance at this early day as to the length of time that will be required for presentation of new testimony to convince the commission that railroad conditions have undergone revolutionary change; but by every moment that it is shortened credit will be strengthened and resources conserved. The material interests of the country are so deeply concerned in the question of railroad prosperity that it behooves the commission to expedite action. Public utilities are concerned because their welfare is bound up with general industrial welfare and because a recognition of the harmful influences in the railroad situation will lead inevitably to a recognition of the effect of the same influences on all utilities. Prompt relief for railroads is one of the desirable early steps to repair the disaster done to business here by the awful European war.

## Dividends in Scrip

The declaration of a dividend in scrip announced by one of the public utility holding companies calls attention to a method of financing that may appear to be desirable for other properties. The Philadelphia Company will pay its current dividend on the common stock in scrip redeemable on or before May 1, 1916, and bearing 7 per cent interest. The effect of this, of course, is that the company borrows the amount of the dividend from shareholders at 7 per cent for eighteen months with the privilege of prepayment. It is easier for the company to borrow from shareholders than through banks or bond dealers; it is likewise cheaper. Under present conditions banks are not encouraging new loans, and for companies that are short of cash the alternatives are presented of payment in scrip or of the passing or reduction of the dividend. To the present time most of the companies that have found it prudent or necessary to conserve cash resources have done so by either passing or reducing the dividend, but with the gradual improvement of the banking situation which is likely to come about, the other alternative of payment in



scrip should be adopted by more of such companies whose earnings still remain good. With every day that goes by the end of the financial distress and commercial stagnation in Europe is nearer, and, however desirable it may appear to be now to hold cash in hand, sooner or later new financing will have to be done. When securities are to be sold it will help the public utility companies to get satisfactory prices if they can point to an uninterrupted dividend record. Payment in scrip is a smaller adverse credit factor than the complete omission of a dividend. In the many properties of financial integrity whose revenues are substantially unaffected by the results of war there are certainly sound reasons why the credit position should be kept strong so as to protect the cost of future financing.

### The Color of Illuminants

Any color is capable of being expressed in terms of red, green and blue components, as was explained by Maxwell, Helmholtz and other physicists. This is sometimes called the trichromatic analysis of color. There is, however, another method, which determines the dominant hue and the amount of white which must be associated therewith in order to make a match. This is sometimes called the monochromatic analysis. The use of the monochromatic analysis and a particular form of monochromatic analyses are described in a paper by Mr. L. A. Jones, read at the Cleveland convention of the Illuminating Engineering Society. The instrument is very interesting, but is somewhat complex optically, containing, as it does, three pairs of Nicol's prisms, two pairs of collimating lenses, a Lummer-Brodhun cube, a constant-deviation prism and several transparent reflectors. However, the results obtained in its measurements of the colors of test lamps appear to be definite and direct. As a source of white light, the noonday sun is used. It will be interesting to have a series of comparison color measurements made with this and with a trichromatic analyzer.

### The Supreme Court a National Bulwark

In this age of extremists and radical reformers the recent Phi Beta Kappa address at Harvard University of former President Taft upon the functions of the United States Supreme Court should strike a responsive chord in the breast of every lover of constitutional liberty. Certainly the opinions of the former President upon the nation's chief tribunal are those of a duly qualified expert, and the speaker's thesis that the court constitutes a national bulwark against ill-considered popular whims may well be emphasized for the sake of innumerable public utility officers and security holders who may at times be disquieted about the waves of radicalism which sweep here and there throughout the country. In a masterly review of the work of the court in relation to matters in which there seemed to be a conflict between its decisions and the contemporaneous view of the people, Mr. Taft demonstrated that the will

of the people has never been defeated by the court, but its acts have been generally acquiesced in by the people and its decisions vindicated by subsequent events. Here is a tribunal unique in the history of government, with greater power, much of it necessarily political in the broad sense, than any other court that ever sat. Its standing before the world shows how patriotically and ably, and with what wise moderation, it has exercised its tremendous power to help the people in their task of self-government. "It lives to-day," said Mr. Taft "strong, virile, courageous, able, willing to recognize progress, to treat the constitution in the way it has always treated it, elastic enough to permit a construction which will conform to the growth and necessities of the country, and yet determined to enforce the principles of individual right and the essential limitations upon the branches of the government which are provided for in our fundamental law." In a time when the suddenness of progressive measures seems more important than their wisdom, the country needs the conservative hand of the court, not to prevent reform by the exercise of the popular will but to prevent change by popular whim. The history of the court in previous political crises and its quiet but effective strength to outlive attacks should engender courage, and whenever every other branch of government fails in sane, sound action the Supreme Court can be relied on as a bulwark to save the country from the injurious effects of hasty action on the part of a majority of the electorate.

### A Peculiarity of Gas-Filled Lamps

A note in the Digest this week gives some definite information about a peculiarity of gas-filled metallic-filament lamps which is especially striking. Since all such lamps have a positive temperature coefficient, the initial rush of current is much larger than the current of steady flow. The present investigation takes up the matter from an exact quantitative standpoint, and the information disclosed is of a most interesting character. The theoretical initial current is, of course, determined by the impedance of the lamp. Ohmic resistance cold would indicate that the possible current in the gas-filled lamp is about twelve times the steady current, which, of course, is relatively reduced as compared with the vacuum lamp on account of the higher temperature at which the filament is worked. An examination with the oscillograph showed about 70 per cent of this ratio, and for the 500-watt and 1500-watt sizes there was a period of about one-third of a second before steady flow was finally established. The current approximates twice its steady value in about one-twentieth of a second. The possible current taken by gas-filled lamps is, therefore, so great as to need consideration in the setting of circuit-breakers and in the instantaneous effects on the voltage. In fact, the gas-filled lamp takes relatively a considerably greater starting current than the alternating-current motors, which usually have enjoyed a bad reputation in this respect. Fortunately, the high current in the case of the lamps is very brief, so brief as hardly to cause more than a momentary drop in the

voltage, but in setting circuit-breakers it is found necessary to adjust them for about six times the steady load current for a momentary maximum, which indicates the need of interposing a slight time-lag in order to insure safety. It is not improbable that this peculiarity of the gas-filled lamps may actually be turned to advantage in some problems of regulation, since the filament acts like a wide-open valve automatically closing to a definite point in a small fraction of a second.

### Some Idiosyncrasies of Rainfall

A recent hydraulic study by a Norwegian engineer in which the flow of a utilized stream was thoroughly investigated with reference to its bearing upon hydro-electric energy supply incidentally brings to the front some curious facts. A thorough study of the Norwegian rainfall based on observations taken at about 500 stations and covering a period from 1875 to 1909 was recently made by Professor Mohn. As in the case of some earlier investigators, he discovered a very remarkable correspondence between rainfall and the sun-spot period of about eleven years. The large minima of the rainfall graph corresponded with great precision with the sun-spot minima, and the maxima also on the whole corresponded remarkably well. Some relation between terrestrial meteorology and solar meteorology, so to speak, may fairly enough be considered reasonable, and the agreement between the data in this Norwegian case is surprisingly complete upon the face of the returns.

In the hydraulic study which serves as a text of these remarks it is a striking fact that the very worst deficit of flow occurred at a sun-spot maximum. The preceding sun-spot minimum was a year of at least average flow, while the succeeding minimum was low, yet better by at least 10 per cent than the flow of the maximum sun-spot year, which was the lowest for the thirty-five years of observation. It is painfully evident from this, as from many other similar data, that theories apparently well confirmed by the average of many observations are yet very unsatisfactory as a practical guide. Man has as yet discovered no reliable clew to long-distance rainfall predictions. There may exist a long cycle of weather, as various meteorologists have supposed, but the cycle is certainly of a very loose and general character, significant only with respect to large averages over very great regions and altogether masked by local conditions of an apparently fortuitous character. It would be of great service to the resources of the country if the government departments could begin a more thorough study of rainfall and run-off than they have yet been able to make. Persistent gaggings in many localities coupled with a study of the geological formations and local topography may give within a not unreasonably long term of years sufficient data as to flow to save many an unwise expenditure and to point out in advance many difficulties. The governmental work already done is excellent in quality but deficient in quantity.

### Efficient Prime Movers

Several articles in our foreign contemporaries have raised again the question of the relative economy of gas and steam engines. The subject itself is much worn, but something of interest is lent to its present consideration by bringing to the front the matter of valuable by-products partly offsetting the cost of energy. Without doubt the gas engine under favorable circumstances is a reasonably cheap source of energy, particularly in the smaller units. In these, however, the matter of by-products cannot seriously enter, since only in working on a large scale are by-products a practicable source of revenue, and the success of the by-product profit depends on the price which can be obtained, which in turn hinges on the supply. The large internal-combustion engine has made an excellent record where blast-furnace gases are available. With natural gas or producer gas it does well in units of large size, but with gas of illuminating quality the economic outlook is not good, except in very small sizes. Producer systems of considerable size have been used abroad with fair success, and a number are giving good results in this country, without, however, having obtained a sufficient reputation largely to increase their use. At present they seem to be of special rather than general applicability, but in some localities and with good care have shown excellent economy.

In the report of the National Electric Light Association committee on prime movers, upon which we recently made comment, it was made quite clear that in very large units the steam turbine can outrun even producer-gas-engine equipments in thermal efficiency, particularly at loads somewhat below the normal. In fact, at full load a 20,000-kw turbine can operate at a thermal efficiency of 24 per cent in the turbo-generator itself, and with boilers as efficient as the large units tested in Detroit a year or two ago the efficiency will come very close indeed to 20 per cent from the coal to the electrical energy. Only the oil engine seems able to improve on this efficiency to any material extent, and the oil engine is limited to rather moderate sizes so far as the present outlook goes. In smaller units, say of 1000 kw or 2000 kw, the tables are turned, and it is in such cases that the internal-combustion engines can more than hold their own.

It must not be forgotten, however, that the large steam turbine is not without a rival in steam efficiency. Unless we are very much deceived in the figures which have been repeatedly published, the efficiency of a first-class high-efficiency reciprocating-engine equipment of the locomobile type is equal to that of the large steam turbine. The locomobile is certainly capable of producing a brake-hp-hour with 10 lb. of steam, which means less than 14 lb. per kw-hr., a figure not easily reached in turbines of any moderate size up to the present time. While, therefore, the internal-combustion engines in units of moderate size cannot be left out of account in central-station economics, it is a question where they will stand when the smaller steam units establish the efficiency that is within their reach.



# The News of the Week

## Activities and Events in the Electrical Field— Reports of Meetings—Commission Findings, Etc.

### Prospects for Adamson Bill Lessened

Although administration leaders in Congress have not dropped the Adamson water-power bill, the European war has lessened the enthusiasm which attended the introduction, report and passage of the bill in the House. Congress now believes that there is no reason for the quick passage of the water bill, "because there is no money to be invested in dams," to use the words of a member of the interstate and foreign commerce committee of the House. However, if the Senate will report and pass a bill omitting the conservation ideas which are so repugnant to Representative Adamson, it is probable that a conference between the Senate and House will weld a measure which will be far removed from the House bill as it passed that body. Representative Adamson's one ambition respecting the bill is to rid it of all of what he terms "Pinchot foolishness." He has frequently expressed the opinion that "he would like to see a bill passed that would result in capital being invested in a few dams—not a bill passed to obstruct the building of useful dams."

### Economics of the Half-Watt Lamp

In a paper on "New Developments in Incandescent Lamps," read at the recent convention of the Vermont Electrical Association at Brattleboro, Mr. C. W. Betcher, Harrison, N. J., pointed out that the gas-filled lamp now has 55 per cent of daylight color in its luminous flux, compared with 40 per cent in the case of the 1-watt-per-cp tungsten lamp and 22 per cent in the 3.1-watts-per-cp carbon-filament incandescent. Lamps of this type now range from 200 watts to 1000 watts in rating at pressure ranges of from 105 volts to 125 volts. The 1000-watt lamp, burning only three or four hours a night, yields a revenue of \$100 a year at 10 cents per kw-hr. and is specially adapted to the lighting of store and theater fronts, yards, etc. All these units are valuable in competing with gas arcs. The cost of connecting a 1000-watt unit to central-station circuits should not exceed from \$1 to \$2, so that the sales expense runs much lower than with many other classes of load. American manufacturers have now standardized the length of gas-filled lamps from the cap of the base to the center of the light source, which greatly facilitates the design and application of suitable reflectors.

### House Passes Patent Office Bill

The House of Representatives on Sept. 21 passed the committee bill to reorganize the Patent Office, increasing the number of examiners in chief from three to five and the number of law examiners from two to five, at an expense of something like \$60,000 a year.

During the debate Mr. Oldfield, in explanation of the bill, said, in part: "The inventors of the country are not getting thorough searches. The business of the Patent Office has grown so rapidly in the last ten years that they are not getting proper searches because the force is not sufficient. The Patent Office will have a

surplus this year of more than \$200,000. It has a surplus now, since the office was established, of \$7,000,000."

The bill went to the committee on patents from the Commissioner of Patents, and Commissioner Ewing said in regard to it:

"I cannot too strongly urge the need of this reorganization and increase of the force. The business of the office to-day is larger than it has ever been. The number of applications filed and the labor of examining each application increase steadily with the growth of the literature of the various arts, so that the office force is less adequate to do the work which it has to do than it was ten years ago.

"It is the function of the office to prevent the granting of patents which should not be granted, and the insufficiency of provision for its work results inevitably in improperly granting patents, with consequent burden upon the public."

### Recent Activities of the Society for Electrical Development, Inc.

The September report to members of the Society for Electrical Development, Inc., shows the progress made by the various sections during the past month. In both St. Louis and Duluth a committee was formed to co-operate with the municipal authorities in framing the city ordinances. Investigations have been made in large cities of the Central States on the uses of electricity in various directions, and manufacturers have been visited with a view to securing closer co-operation on their part with the engineering department. A list of all the manufacturer members' catalogs has been completed, and the society is now collecting city ordinances relating to electric wiring, signs, etc. The pamphlet devoted to electrical devices for home comforts will be ready in the course of this month for distribution by members to prospective customers. It is proposed to send a window transfer embodying the membership emblem of the society in gold and colors and mounted on celluloid for framing to each member.

The first design for a series of six picture stamps has been approved and is now in the hands of the lithographer. No decision has yet been reached in the prize-story competition, and since everything bearing a postmark not later than Sept. 1 is eligible some little time will elapse before the result can be announced. A series of six designs has been adopted for street-car advertisements. The window-display department, in conjunction with the news and editorial departments, is planning a campaign to secure the various mercantile trade papers as members of the society. The section has also completed plans for an ornamental street-lighting campaign. The play entitled "This Is the Life," in two reels, is now being shown in forty-five different cities. Other films of a similar character will be released this month and next. The society is also compiling a list of motion-picture films owned by its members, with a view to having them for use at entertainments or lectures, this having proved a popular method of promoting the use of electricity.

### Annual Meeting of Roentgen Ray Society

The fifteenth annual meeting of the American Roentgen Ray Society was held in Cleveland, Ohio, Sept. 9-12. The program, which extended over four full days, contained a large number of papers of extreme interest. It was arranged in the form of symposiums treating of the use of Roentgen rays in examinations of the head and chest, intestinal diagnosis, gastric and duodenal diagnosis and Roentgen dermatitis.

A meeting of special electrical interest was the symposium on hard rays. Messrs. J. S. Shearer, W. D. Coolidge, W. Duane, H. Clyde Snook and H. W. Van Allen participated. The relation between penetrating quality and voltage or current was discussed at considerable length, and the opinion was prevalent that X-ray tubes should be standardized by a special laboratory before placing them upon the market.

The inefficiency of the production of Roentgen rays was brought out by Dr. Coolidge, who stated that the losses are negligible in transformation of the energy into cathode rays, but only a small fraction of 1 per cent of the cathode-ray energy was converted into X-rays. As a matter of fact, about 99.8 per cent of the cathode-ray energy was lost in heat. A further loss is represented in the inefficiency of utilization of the X-rays produced.

The meetings were well attended, there being an average assemblage of about 200.

A large exhibit of Roentgen ray photographs, many of which were double radiograms for stereoscopic viewing, was made. The exhibit of new X-ray apparatus and supplies was also quite elaborate. The new X-ray tube developed by Dr. Coolidge was a source of much interest and favorable comment.

Roentgenology has become an extensive applied science and stands as a great monument to the discoverer of X-rays and to science in general.

### Convention of Massachusetts Electrical Contractors

A large and enthusiastic convention of the Electrical Contractors' Association of Massachusetts was held at the Hotel Bancroft, Worcester, on Sept. 23 and 24, among those in attendance being President John R. Galoway of the National Electrical Contractors' Association, Washington, D. C.; Past-president Marshall L. Barnes, Troy, N. Y.; National Director George E. Shepherd, Wilkes-Barre, Pa., and Secretary Arthur R. Jones of the Electrical Contractors' Association, Cleveland, Ohio.

The program included the following papers and addresses: "The Contractor's Troubles and the Remedy," by Mr. W. K. Tuohey, Springfield, Mass.; "The Electrical Contractor and Lighting Service," by Mr. M. D. Cooper, National Electric Lamp Works, Cleveland, Ohio; "Leadership," by Mr. George E. Shepherd; "The Society for Electrical Development," by Mr. George B. Muldaur, New York; "Policing in Organization," by Mr. A. R. Jones; "Relation of Electrical Code to Contractor," by Mr. Ralph Sweetland, Boston, Mass.; "Central Station and Contractor," by Mr. H. D. Leonard, Worcester; "Auditing and Accounting," by Mr. A. R. Jones, and "Legislation as It Affects the Contractor," by Mr. A. J. Hixon, Boston, Mass. Abstracts of these papers will be printed in a later issue. The program also included a sight-seeing trip to the insulating department of the American Steel & Wire Company at Quinsigamond, and a banquet at the hotel on Thursday night. A vigorous rejuvenation of the Jovian Order took place on Wednesday evening with a good attendance.

### Trust Legislation Reported to Senate

Senator Culberson, chairman of the conference committee of the House and Senate on the Clayton anti-trust bill, reported that measure to the Senate, in the form of the conference agreement, late on the afternoon of Sept. 23. He gave notice that he would call up the report at the earliest possible moment.

The measure as agreed to, and as it will go to the President for signature, contains the clause prohibiting price discriminations which was placed in the bill by the House and later stricken out by the Senate. The prohibition strikes at discriminations, direct or indirect, which substantially lessen competition or tend to create monopoly.

The measure also retains the prohibition against tying contracts or exclusive contracts in articles, whether patented or unpatented, although the penalty provision attached to this clause in the Senate has been stricken out and the prohibition applies only in cases where competition is substantially lessened or monopoly created.

The Senate language has been retained in clauses which would exempt labor unions and farmers' organizations from the operation of the anti-trust laws.

### Indianapolis Street-Lighting Contract

In the report of the directors of the American Public Utilities Company interesting reference is made to the street-lighting contract obtained by the Merchants' Heat & Light Company, of Indianapolis, one of the subsidiaries of the American Public Utilities Company. It is said that the contract calls for the installation of more than 2500 arc lamps, a considerable amount of ornamental street lighting and approximately 1000 incandescent lamps for alleys. The gross revenue from this source will amount to about \$125,000 a year. The construction of the lines necessary to carry out the contract is now in progress. Under the terms of the contract a saving to the city of approximately \$75,000 a year will be effected, and the company is enabled to extend its service at small cost.

### Important Patents on Mercury-Vapor Apparatus

The Patent Office issued last week to the Cooper Hewitt Electric Company sixty-two patents relating to systems of lighting and of rectification by means of vapor-electric apparatus. Among the individual inventors, all of whom have assigned their inventions to the Cooper Hewitt Electric Company, are Dr. Peter Cooper Hewitt and Messrs. Percy H. Thomas, Max von Recklinghausen, Frederick H. von Keller, Charles Orme Bastian, Joseph C. Pole and Stanwood E. Flitner. Some of the patents, owing to complicated interference proceedings, have been pending in the United States Patent Office for ten years or more, one of them (Hewitt's patent No. 1,110,562) going back to an original application filed April 11, 1898. This patent of Dr. Hewitt is particularly broad in scope since it covers necessary methods of operating vapor lamps throughout the region commonly considered characteristic of quartz mercury-vapor lamps.

Other patents of importance relating to the quartz-lamp art are those issued to Charles Orme Bastian and bearing the numbers 1,110,607, 1,110,608, 1,110,609 and 1,110,985. These Bastian patents appear to supplement his former patent No. 1,079,926, as a sort of rounding up of the Bastian system of vapor apparatus.

Patents issued to Thomas relate to a variety of de-



vices important in the development of the Cooper Hewitt vapor-rectifier arts wherein the Cooper Hewitt apparatus is adapted for use in arc-lighting systems; in railway work; in the charging of storage batteries, and systems wherein the lamp itself is operated in series and in parallel. The patents to Von Recklinghausen relate to improvements in Dr. Hewitt's rectifier utilizing a container of metal.

The patents to Von Keller relate to starting apparatus for vapor lamps and to a high-tension vapor converter.

Flitner's patent relates to tilting supports used in starting vapor devices.

Altogether, the patents are of wide scope and importance in the arts of vapor utilization for lighting or rectification purposes.

## CONVENTION OF EDISON ASSOCIATION

### Generating and Distribution Problems Discussed—Latest Developments in the Mercury Turbine, in Fuel Economy and in the Elimination of Smoke

An account of the first two days' session of the convention of the Association of Edison Illuminating Companies, held at White Sulphur Springs, W. Va., Sept. 14 to 17, was given in these columns last week. Three sessions were held on the last day of the meeting, the third being a banquet at which the following officers were elected for the year:

President, Mr. Walter F. Wells, Brooklyn, N. Y.; vice-president, Mr. Peter Junkersfeld, Chicago, Ill.; treasurer, Mr. Louis A. Ferguson, Chicago, Ill.; secretary, Mr. George C. Holberton, San Francisco, Cal.; executive committee, Mr. Charles L. Edgar, Boston, Mass.; Mr. W. W. Freeman, Cincinnati, Ohio; Mr. Samuel Insull, Chicago, Ill.; Mr. John W. Lieb, Jr., New York, and Mr. Joseph B. McCall, Philadelphia, Pa.

Handsome engrossed testimonials of regard were also presented by the association to Mr. C. A. Coffin, retiring president, and to Mr. E. W. Rice, Jr., the new president of the General Electric Company.

### Features of Technical Program

Mr. W. L. R. Emmett opened Thursday morning's technical program with an address on "Mercury Turbine Developments and Possibilities," in which he discussed the proposal to increase greatly the thermal range and efficiency of present steam plants by first using the heat of the boilers to operate turbines running on mercury vapor at pressure near atmospheric, the exhaust from these turbines being then employed to generate steam in condenser boilers, this steam to operate steam turbines as usual.

The report of the committee on steam operation, Mr. J. D. Andrews chairman, was chiefly given over to statements by the manufacturers of power equipment. Suggestions were also offered, however, for the determination of the ash-fusing point in the purchase of coal on a heat-unit basis, since the commercial value of a coal depends upon the tendency of its ash to clinker. Figures given for the operating economy of the 25,000-kw and 20,000-kw turbine units of the Commonwealth Edison Company showed an average water rate of 12.13 lb. per kw-hr. and a coal consumption of 1.92 lb. coal per kw-hr.

### Generating and Distribution Problems

In his paper on "Single-phase Loads from Polyphase Systems," Mr. B. G. Lamme described the transformation of single-phase loads into polyphase loads by means of polyphase motor-generator sets and by means of

polyphase rotary converters. Regulation is accomplished by double-field boosters, induction regulators, etc.

Mr. Paul M. Lincoln discussed "Protection Against Effects of Grounds and Short-Circuits," and recommended the position grounding of neutrals, using resistance leads to prevent a single other ground from causing a short-circuit. The ground-lead resistance should be of such value as to limit the current flow at normal voltage to about twice that necessary to operate the heaviest circuit-breaker on the system.

Much of the report of the committee on high potentials was given over to the subject of insulators, and the superiority of high-frequency tests was emphasized. A compact oscillatory testing set was described. This set is designed to be moved along the line, the insulators being tested in place, thus increasing the reliability of the line. Disconnect switches in the grounding wires of transformer cases were recommended for the safety of the lineman. The protection of high-voltage generator coils from corona by the use of metallic binding tape was declared to have been successful.

### Generating Plant Topics

The committee on load-factor, Mr. J. W. Lieb, Jr., chairman, recommended adoption by the association of the A. I. E. E. definition of load-factor, the year being taken as the period unless otherwise specified. Maximum load or demand was defined as the highest half-hour average load or demand except where otherwise specified.

In their paper entitled "Accounting for the Variation in the Coal Economy of a Large Central Station," Messrs. C. H. Parker and R. E. Dillon discussed the effects on operating results of the factors of back pressure, loading, steam pressure, superheat, boiler-feed temperature, fuel, value of coal, load-factor, etc., and presented curves by which the coal economy of a station may be corrected for variations of these variables. Results with a fair-sized steam plant were given for comparison.

"The Central Station in Its Relation to the Problem of City Dust" was treated by Messrs. R. B. Bolton, C. B. Grady and Dr. J. A. Deghuet, and the cinder catchers installed at the New York Edison Company's Waterside stations were described in detail. Comparative tests have shown that whereas an unequipped stack discharged cinders amounting to from 1 to 2 per cent of the weight of coal fired, in the case of another similar stack equipped with a cinder catcher about 95 per cent of the cinders and ash was removed. Air-cleaning and cooling apparatus for treating the air used to ventilate generators and transformers was also described. Aside from other advantages the cooling of the ventilating air results in valuable increased station capacity, it was pointed out.

### Electric Vehicles and Battery Service

Much information on the use of electric vehicles in Germany was contributed by Mr. E. W. Lloyd to the report of the committee on electric vehicles, Mr. George H. Jones chairman. The 600 electric taxicabs of Berlin, the imperial parcel-post delivery wagons, city street-sprinkling carts, etc., therein mentioned, were described in an interview with Mr. Lloyd published in the *Electrical World* of Aug. 15. Battery-operated railroad cars representing an investment of \$3,000,000 are now used on 4000 miles of German railroads. As one solution of the garaging problem, the committee outlined a plan by which vehicles would be sold without batteries, battery service being furnished by a maintenance company at a fixed price per month (depending upon the size of the vehicle) plus a mileage charge.

## CONVENTION OF MUNICIPAL ELECTRICIANS

### Discussion on Police and Fire Alarm Signal Systems and Grounding of Signal Boxes—Association Adopts Rules on Overhead Line Construction

The nineteenth annual convention of the International Association of Municipal Electricians began at the Hotel Islesworth, Atlantic City, N. J., on Sept. 15 with President J. W. Kelley, of Camden, N. J., presiding and 150 members and guests in attendance. The membership of the organization comprises representatives from the municipal electrical departments of American cities with a total population of more than 40,000,000. Mayor William Riddle of Atlantic City welcomed the delegates, and Treasurer C. E. Diehl of the association responded. Dr. C. P. Steinmetz, vice-president of the association, was also called upon, and he summarized the purposes and activities of the association members, noting their administration of fire-alarm systems to minimize fire waste, of police-alarm systems to promote public safety, and of electrical inspection to prevent increasing public hazards from the utilization and distribution of electrical energy.

#### Insulation Tests

A paper on "Insulation Tests," presented by Mr. P. I. Patton, mentioned frequent injuries due to receiver cords, which in practice are far too ineffectively insulated. A series of tests on different types of cords now in service was detailed, all of these cords failing to maintain satisfactory insulation upon short exposure to moisture. The Philadelphia plan of covering cords with high-grade 1/16-in. wall-rubber tubing was recommended as a means for avoiding danger to the user.

#### Illumination

Mr. C. S. Redding, in a paper on "Measurement of Illumination," briefly reviewed the progress of illumination methods up to the present day and gave in detail the considerations involved in selecting the lamps and amount of illumination necessary for public lighting requirements. The "illuminometer" developed by the Macbeth company was also described at some length.

Following the presentation of the paper, Dr. C. P. Steinmetz gave a summary of the work of the joint investigation made in New York City streets on the safest and most attractive types of lamps and intensities of illumination.

Mr. Yeakel, of Baltimore, suggested the need of more accurate standards and disinterested advice in protecting the public's interest when adopting municipal lighting plans and signing contracts, and after some further discussion a standing committee on illumination was appointed to assist members in such cases.

### Maintenance of Police and Fire Alarm Telegraph Systems

The paper of Mr. R. J. Gaskill, superintendent of fire alarm, Fort Wayne, Ind., on "Education of the Public in Using the Fire-Alarm System," discussed the frequent delay or omission in sending fire alarms caused by the public's lack of knowledge of the location of alarm signal boxes, or even of the method of operating them. The effectiveness of conspicuous colors for the box and supporting pole, the use of distinctive illumination at boxes during darkness, the demonstration of box operation at the frequent public gatherings and the use of public press notices were recommended.

"Safe Grounding for Fire and Police Signal Boxes" was discussed by Mr. A. C. Farrand, city electrician of Ventnor City, N. J., who made some suggestions for the disposition also of insulating material. It was stated that any person touching the usual fire alarm or signal box with ungrounded metal case may be subjected to

shock. Mr. Farrand suggested the use of insulating material for both inner and outer shells of these boxes and the grounding only of the movable operating parts.

#### Grounding Signal Boxes

The report of the committee on grounding was presented by Mr. T. O'Hearn, city electrician of Cambridge, Mass. The association a year ago went on record as indorsing the grounding of all exposed metal parts of alarm and signal boxes in cities, and this committee was directed to investigate methods of grounding with the co-operation of the National Bureau of Standards.

Partly as a result of these tests, and upon other advice obtainable, the committee presented its conclusions and recommendations as follows:

(1) That ground connection be made to metal water mains where these exist, and that ground wires be run not less than 500 ft., if necessary to secure such a connection.

(2) That ground connections, if necessarily made to artificial grounds, be interconnected so that not less than four such separate grounds are employed for one or several alarm boxes. That any such ground as driven pipes or other buried ground be below permanent moisture level, or at least 10 ft. deep, and in places where added moisture results from the nature of the location, such as lawns, hollows, etc.

(3) That grounding be done to any metal part of box or to parts within box which can be touched without opening inner case.

(4) That, to permit of such effective grounding without prejudice to the alarm service of the system, all alarm and signal boxes be initially tested at the factory with break-down voltage between current-carrying and accessible metal parts of 10,000 volts (analogous to A. I. E. E. requirements for distributing transformers).

In the discussion Dr. Steinmetz indorsed the recommendations in general and particularly noted the break-down test as a relative and moderate initial precaution to delay break-down until protective arresters may if possible relieve the strain. Others brought out the fact that lightning has frequently destroyed ungrounded boxes, the lack of ground proving not to offer the previously presumed protection. The fact that a wood pole or post is, when wet, a ground of high resistance, sufficient to bring strain on box insulation and insufficient to protect human beings, was also emphasized.

#### Work of Fire Underwriters

The session concluded with a short address by Mr. C. H. Lum, assistant general manager of the National Board of Fire Underwriters, on "The Work of the National Board of Fire Underwriters."

Mr. J. E. Latta, as representative of the National Fire Protection Association, emphasized the non-commercial character of that association and urged that from the nature of their relations to their municipalities the members of the International Association of Municipal Electricians should be especially interested in fire protection.

#### Electrolysis

The report of the committee on electrolysis, presented by Mr. Arbuckle, of Bayonne, N. J., gave a short summary of the present status of various methods proposed for abating damage from earth current.

A paper by Mr. J. M. Perkins, arriving at much the same conclusions and referring frequently to the results and studies of the National Bureau of Standards, was also read before the subject came up for general discussion.

In a paper on "Cost of Street Lighting," by Mr. Harry Holtz, of Philadelphia, the increased cost per lamp with



underground systems was noted, and the cost variation with power source in steam plant, water plant or water plant with steam reserve was discussed at some length.

#### Overhead-Line Construction

One of the subjects of wide interest to the convention was the character of overhead construction. After the reading of a paper on "Standard Construction for Fire Alarms and Police Circuits," by Mr. C. S. Downs, of Altoona, Pa., the report of the committee on high-voltage overhead construction was presented by Mr. A. L. Pierce, Wallingford, Conn. As representing the first concerted action which has been taken by municipal representatives looking toward the adoption of a standard which shall adequately protect the public and promote progress in the industry, this report has aroused considerable attention.

Following the report, Dr. Steinmetz in discussing the recommended rules suggested careful consideration by a standing committee of all future additions to the rules, so that mistakes could be avoided and each step be a forward one. He spoke further of the great possibility and opportunity for municipal electricians, since their police power makes possible the rejection or acceptance of any specification offered by utility companies or engineers and the city representative alone represents the whole public in his community. In conclusion, Dr. Steinmetz suggested that the design fell naturally to the operator, and that performance and results were the objects to be sought in a standard for construction developed by the city's representatives or submitted for their approval. Considerable further favorable discussion of the proposed recommendations was participated in by Messrs. J. B. Yeakle, Baltimore; J. W. Kelley, Camden; C. W. Pike, Philadelphia; A. L. Pierce, Wallingford; W. J. Canada, Washington, and others. Mr. W. T. Oviatt, chairman of the National Electric Light Association overhead-line committee, who was present, was also invited by President Kelley to make some remarks. Mr. Oviatt stated that the suggested rules appeared satisfactory and believed that within a year his committee would develop rules for separation, strength of construction and other factors of overhead construction which could not fail to meet the approval of the municipal electricians. He commended also the spirit of co-operation and the lack of haste shown by the committee in reaching its conclusions.

Upon motion of Dr. Steinmetz, a vote of thanks was given to the National Bureau of Standards and to Mr. W. J. Canada, its electrical engineer, who drew up a material part of the committee recommendations as adopted. Future co-operation of the National Bureau of Standards was also requested.

The concluding paper, "Temperature Coefficiency in Cable Testing," was presented by Mr. Leo Firman, of Philadelphia. Some results of tests conducted by Mr. Firman for the Philadelphia Electrical Bureau were given, from which a serious inadequacy of coefficients for insulation given in existing tables would seem to be shown. A new coefficient is being used by the Philadelphia Bureau, and the advantage of thorough investigation of the subject by the Bureau of Standards was suggested by Mr. Firman, so that all municipalities may have reliable data available for use in purchasing cables.

Officers for the ensuing year were elected as follows: President, Mr. W. H. Flandreau, city electrician, Mount Vernon, N. Y.; first vice-president, Dr. C. P. Steinmetz, consulting engineer, Schenectady, N. Y.; second vice-president, Mr. R. J. Gaskill, city electrician, Fort Wayne, Ind.; third vice-president, Mr. C. E. Convers, San Antonio, Tex.; secretary, Mr. C. L. George, Houston, Tex., and treasurer, Mr. C. E. Diehl, Harrisburg, Pa.

## CONVENTION OF ILLUMINATING ENGINEERS

### Approved Solutions of Lighting Problems Suggested—Developments in the Science of Illumination and in the Lighting Industry Discussed

More than 200 persons, including a number of ladies, registered at the eighth annual convention of the Illuminating Engineering Society held at the Hollenden Hotel, Cleveland, Ohio, Sept. 21 to 25. Mayor Newton D. Baker, the Cleveland chief executive whose "three-cent electricity" propaganda has attracted wide interest, delivered the address of welcome. Without entering upon local controversial topics, Mayor Baker commented broadly on the moral lessons of the European conflict and pointed out that materialistic progress cannot be substantial without the spiritual advance of civilization. He urged every man to prosecute diligently, his own special work or duty, but not to be unmindful of the larger affairs of government with which every good citizen should keep in touch. Prof. G. A. Hoadley, Swarthmore, Pa., responded on behalf of the society.

#### President Bond's Address

President C. O. Bond in his address took up first the internal work of the society, discussing the success of the plan of holding chairmen of committees responsible to the general council but allowing each chairman to name his own committee. Passing to the future activities of the organization, President Bond pointed out that the Illuminating Engineering Society has not yet supplied criteria for standards of good illumination, as, for example, approved solutions of the problems of lighting typical dwellings or offices. On such an approved solution the whole society could unite. A step in this direction, however, is the new illumination designed for the council room of the society at New York, which it is planned shall represent the very best practice in the artificial lighting of an office. But without the acceptance of some approved standard by illuminating engineers themselves, said President Bond, doubt on the part of the general public with regard to illumination affairs is only to be expected. That after eight years of activity the I. E. S. has neglected to take any steps toward adopting standards of illuminating practice has been due, said Mr. Bond, not so much to lack of information available as to lack of courage.

The society, he went on, should also seek wider and more diffused publicity concerning its work, aims and purposes. Many of its papers are of such general interest that if condensed and popularized they would prove widely acceptable for publication in the general magazines and in the popular press. An attractive children's primer covering the points of elementary lighting hygiene might also well be prepared and a copy hung in every schoolroom. There are some 18,000,000 school children and 600,000 teachers in this country, and through them a large part of the general public could be reached and educated in matters of proper lighting. More sustaining memberships should also be obtained from municipalities, educational institutions, endowments, etc., said the president. Already the I. E. S. is taking a practical part in contributing to the protection of the health of the public in the investigation of matters having to do with eye strain and the conservation of vision. In closing, President Bond announced the formation of an illuminating engineering society in Japan, and deplored the effect of the war in Europe on the activities of the sister organizations of the I. E. S. in England, Germany and France.

Messrs. C. H. Sharp, New York; J. R. Cravath, Chicago, and G. S. Barrows, Philadelphia, were named as the committee on the president's address, and Messrs.

M. G. Lloyd, Chicago; L. B. Marks, New York, and L. B. Eichengreen, Philadelphia, were appointed to act as the committee on resolutions.

#### Work of the Research Committee

Prior to the reading of the report of the committee on progress by Mr. F. E. Cady, Cleveland, Ohio, a brief résumé of the work of the research committee was presented by Dr. H. E. Ives, Philadelphia. The fourteen members of the 1914 committee were chosen from one community (Philadelphia), but they represent many diversified branches of lighting science, there being also included among the number four ophthalmologists, one physiologist and two psychologists. Informal laboratory meetings have been held on Saturday afternoons following luncheons, and at the close of the discussions reports of the proceedings are prepared by the chairman and submitted to the members for criticism. After revision these reports are presented to the society for publication in its transactions. Dr. Ives recommended that a similar plan be adopted next year, the members of the research committee to be chosen from some other one city or vicinity, so that the members might meet frequently for discussion.

#### Progress in Lighting

The committee on progress, of which Mr. F. F. Cady was chairman, submitted a report relating to the development in the science of illumination and in the lighting industry. The subjects dealt with were gas lamps and appurtenances, electric incandescent lamps, arc lamps, vapor and vacuum-tube lamps, lamps for projection purposes, street lighting, exterior illumination, interior illumination, photometry, illuminating engineering societies, the International Illumination Commission, reflection, physiology, legislation and literature. The report consisted of well-edited abstracts of articles which appeared during the past year in journals devoted to illumination, the material being arranged in logical order to show the relation of each development to the others and the general trend of progress.

#### The Color of Illumination

In a paper by Mr. L. A. Jones much information was given concerning the quality of the light emitted by various lamps compared with sunlight as the standard

COLOR AND WAVE LENGTH OF DOMINANT HUE

Source	Per Cent White	Hue
Sunlight	100	.....
Average clear sky	60	472.0
Standard candle	13	593.0
Hefner lamp	14	593.0
Pentame lamp	15	592.0
Tungsten glow lamp at 1.25 w.p.c.	35	588.0
Carbon glow lamp at 3.8 w.p.c.	25	591.5
Nernst glower at 1.50 w.p.c.	31	586.7
Nitrogen-filled tungsten at 1.00 w.p.c.	34	586.0
Nitrogen-filled tungsten at 0.50 w.p.c.	45	584.5
Nitrogen-filled tungsten at 0.35 w.p.c.	53	584.0
Mercury-vapor arc	70	490.0
Helium tube	32	598.0
Neon tube	6	605.0
Crater of carbon arc at 1.8 amp.	59	584.6
Crater of carbon arc at 3.2 amp.	62	584.6
Crater of carbon arc at 5.0 amp.	67	583.4
Acetylene flame (flat)	36	585.5

for color. The standard was taken as direct sunlight reflected from a non-selective surface, magnesium carbonate. A summary of the results is given in the accompanying table.

In determining the relative color values use was made of a colorimeter of the Nutting monochromatic type. The principle involved in the monochromatic method is that any color can be matched by the mixture, in proper proportions, of white light with monochromatic light of the required wave-length. The wave-length of the monochromatic light that is necessary to make the color match is known as the wave-length of the dominant hue and is expressed herein as  $\mu\mu$ . The intensity of the white light expressed as a percentage of the sum of the intensities of the pure hue and white mixed together to match the color being analyzed is known as the "per cent white." The author stated that the precision obtainable in a single reading is of the order of  $\pm 3$  per cent in the per-cent-white reading and  $\pm 0.5 \mu\mu$  in the wave-length of dominant hue. By taking a number of observations any probable error can be greatly reduced.

#### Discussion

Mr. W. R. Mott, Cleveland, Ohio, opened the discussion of Mr. Jones' paper with a mention of the Bloch standard used in Germany. He declared that sunlight must become a secondary standard when skylight is employed as the reference. He also discussed the possibilities of the flame arc as a standard source of color. Dr. H. E. Ives, Philadelphia, Pa., pointed out the difficulty of comparing white with pure spectrum colors, and declared that the method proposed substitutes a comparison which is indefinite for one which, though arbitrary, is nevertheless fixed and definable. Mr. M. Luckiesh, Cleveland, Ohio, commented that the Jones method seemed to him philosophically superior, but he called attention to discrepancies in the results obtained by various observers. Mr. J. B. Taylor, New York, also questioned whether two observers could duplicate results closely. Dr. C. H. Sharp, New York, objected strongly to the expression "watts per candle" used by the author in designating efficiency.

#### Other Activities of the Week

The other papers read and discussed at the session last Monday afternoon were "Artificial Daylight—Its Production and Use," by Messrs. M. Luckiesh and F. E. Cady, of the National Lamp Works of Cleveland, and "Development of Daylight Glass," by Mr. E. J. Brady, of the United Gas Improvement Company of Philadelphia. Abstracts of these papers, as well as of the other papers presented at the technical, commercial and laboratory sessions, together with the gist of the discussions to which they gave rise, will be published later in these columns. Almost every phase of artificial and natural illumination was provided for on the program, and the intricate problems incident to accurate photometric work were taken up by a number of authors in the laboratory sessions.

#### Entertainment Features

The entertainment program and general convention arrangements of the I. E. S. meeting at Cleveland were unusually complete. A handsome souvenir program contained abstracts of the various papers and also scheduled the technical sessions and numerous entertainment features. On Monday evening there was a reception and ball at the hotel. On Tuesday afternoon inspection parties were piloted to various Cleveland industries, and in the evening there were popular lectures on photo-sculpture and color photography. On Wednesday night the annual banquet was held, and on Thursday the convention delegates were entertained at Nela Park, dinner being served at Camp Nela. During the sessions a number of pleasing automobile rides, teas and card parties were arranged for the entertainment of the visiting ladies.



## PACIFIC COAST MEETING OF A. I. E. E.

Subjects of Special Interest to Western Public Service Corporations and Engineers Discussed at Spokane, Wash.

—Inductive Interference Order of California Commission Criticised

The Pacific Coast meeting of the American Institute of Electrical Engineers and the annual convention of the Northwest Electric Light and Power Association were held in the Hotel Davenport, Spokane, Wash., Sept. 9, 10 and 11, with joint and parallel sessions.

Entertainment was provided throughout the convention period, beginning with an informal reception at the Hotel Davenport on Sept. 9, with automobile trips to nearby resorts and the Country Club and theater parties. On the evening of Sept. 9 a Dutch lunch was held jointly by the two associations, for the principal purpose of permitting the delegates to become acquainted, and on the following evening Mr. A. H. Halloran, of the *Journal of Electricity, Power and Gas*, gave an illustrated lecture on the electrical features of the Panama-Pacific Exposition. On the evening of Sept. 11 a joint banquet was given to the delegates, Mr. O. B. Coldwell, of Portland, Ore., being toastmaster. President P. M. Lincoln of the Institute, Mr. R. Pope, Mr. A. H. Halloran and Mr. N. Brockett spoke in a happy vein. On Sept. 12 and 13 large numbers of the delegates visited the Long Lake power station under construction by the Washington Water Power Company and took an inspection trip over the single-phase railroad of the Inland Empire Railroad Company, finishing the entertainment features with a dinner at Hayden Lake, Idaho.

The joint convention was called to order Sept. 9 by Mr. H. L. Blecker, Mayor Hindley of Spokane then welcoming the delegates to the city, after which Mr. Norman Brockett replied to Mr. Hindley on behalf of the joint convention.

The two bodies reconvened separately after the joint session. The report of the A. I. E. E. meeting follows. The deliberations of the Northwest Electric Light and Power Association will be published in a subsequent issue.

Immediately after the joint opening exercises, the sixth Pacific Coast meeting of the A. I. E. E. was called to order by Mr. J. B. Fiske, who dwelt on the past work of President P. M. Lincoln in regard to the sections, thereby enabling a Pacific Coast meeting to be held, notwithstanding the great distances between sections.

### Transformer Wave-Forms

In a paper entitled "The Effect of Delta and Star Connections Upon Transformer Wave-Forms" Mr. L. F. Curtis described tests made with the oscillograph to show the no-load exciting current and voltage waves of three single-phase, 10-kw, 1100/110-volt, sixty-cycle step-up transformers, when the windings of the generator and both sides of the transformers were connected in all possible symmetrical delta and star relations. A 7.5-kw generator was used. The tests were divided into four groups, according to the connections of the generator, and in all cases normal low-tension line voltage was maintained. The author pointed out that the best voltage forms will, in general, be obtained with a star-connected generator and delta-star or star-delta connected transformers.

### Discussion

This paper was discussed by President Lincoln, Mr. Corbett, Mr. Miller, Mr. Robinson, Mr. Geary, Mr. Merwin, Mr. Ferris and Professor Carpenter.

President Lincoln, in opening the discussion, brought out the conception of the floating neutral rotating around the true neutral of a three-phase transformer, at a

velocity of three times the fundamental wave, when considering problems of third harmonic waves. The general discussion had a decided trend to the measurement of wave-forms, and Mr. Ferris described the method devised by the California joint committee on inductive interference to exaggerate the wave-form where higher harmonics, beyond the ordinary range of the oscillograph, were to be studied. This was accomplished by leading the current to be measured through a suitable air-core inductance and resistance, with a shunt of a condenser in series with the vibrating strip. The discussion also touched upon the practical experiences with delta-connected and star-connected high-tension transformers on transmission systems.

### Hydroelectric Development at Big Creek

Mr. Edward Woodbury read a very interesting paper on some operating conditions of the 150,000-volt transmission system of the Big Creek development of the Pacific Light & Power Corporation, of Los Angeles, an abstract of which paper will be published in a later issue. Interest in this development, which stands in the forefront of high-tension transmission work, is keen, and the contribution made by Mr. Woodbury dealing with operating features was listened to with great interest.

### Discussion

Mr. Woodbury read part of his paper, abstracting the appendices, bringing out a number of interesting sidelights on the operating experience on this notable installation. The paper was quite extensively discussed by President Lincoln, Mr. Harrisberger, Mr. Fiske, Mr. Fraser, Mr. Miller, Mr. Geary, Mr. P. N. Nunn and Mr. Trenner, Mr. Woodbury closing with answers to the numerous questions brought out by previous speakers. Mr. P. N. Nunn gave an interesting comparison of the early developments of transmission systems with the progress of this art at this date, as shown by Mr. Woodbury's paper. He described the work begun in 1890 of transmitting at 3000 volts, then the highest operating voltage, and carried the story of development up to the present-day high-tension systems. He touched on a number of very interesting details in connection with the changes that were made in construction and operation, and his remarks were received with special attention at this meeting. The operation of this system was discussed to some extent, and the successful regulation of the long high-voltage lines by means of 15,000-kva rotary condensers received consideration.

### Transmission and Distribution Construction

Some of the details of transmission and distribution construction employed by the Western Canada Power Company, Ltd., Vancouver, B. C., were described in Mr. F. D. Nims' paper on "A Distribution System for Power Purposes." Steel-core aluminum cables and hemp-center stranded-copper conductors are employed on this company's 60,000-volt circuits. On wooden-pole lines saddle-type pins are used so that the cross-arms do not have to be weakened by boring holes to accommodate the ordinary type of pin. On one of the steel-tower double-circuit lines where the conductors are arranged in two vertical planes the middle cross-arms were extended to prevent the conductors coming in contact when loaded with sleet and snow.

All of this company's 12,000-volt circuits are supported on wooden poles. When two or more circuits have to be run between the same points each one is supported on its individual pole line, the several circuits being carried over different routes to avoid service interruption. No substations are maintained for distributing purposes along the line. Where energy is required

along the route outdoor-type transformers and oil-break switches (or pole-type or combination fuse and disconnecting switches) are mounted on poles. In some cases indoor-type water-cooled transformer installations are employed, which are protected by galvanized-iron sheeting.

Distribution in Vancouver and New Westminster is effected by means of steel-taped lead-armored cables laid directly in the ground without protection except under railway tracks or busy streets where wood ducts are used. Transformers for city distribution are either installed in vaults or on poles. In the latter case the high-tension cables extend to the top of the pole, where they terminate in outdoor-type potheads. The cables are protected up to 10 ft. above ground by an inclosing pipe. Underground installations of this character cost about \$6,483.84 per mile of cable, not including overhead or engineering expenses.

#### Discussion

The discussion was opened by Mr. Fiske, who questioned the installation of this system in other than residential districts. President Lincoln brought out the matter of locating faults in steel-armored cable as described in this paper, and made some observations regarding the heating of large cables in heavy duct lines of ordinary construction, and the relief from this to be expected from steel-armored cables laid separately in the earth. Mr. Rohrbach discussed the question of costs at some length, by comparing the costs given in Mr. Nims' paper with those available on ordinary tile and fiber duct construction. Mr. MacCalla recited some experiences in Sydney, Australia, some years ago, where electrolysis had practically destroyed the armored cable before service was actually begun. Mr. Carpenter discussed further the location of faults in steel-armored cable by ordinary methods. Mr. Woodbury, Mr. Rosenblatt, Mr. Harrisberger and Mr. Corbett discussed the features of transformers and 60,000-volt lines which had been included in the general description of this system. Mr. Lebenbaum discussed the merits of the three-conductor sector-type cable in this type of underground system. Mr. Nims, in closing the discussion, emphasized the point that for conditions under which this system was installed (Vancouver, B. C.) up to four cables the steel-armored cable was cheaper than the duct system.

#### Electricity in the Lumber Industry

Mr. E. F. Whitney's paper entitled "Electricity in the Lumber Industry" contained a description of applications of electrical equipment to logging and milling operations. In spite of the large amounts of refuse available for fuel, several sawmill companies in the Northwest are using central-station energy exclusively. The author pointed out that the largest field for electrical apparatus in the lumber industry is in logging, which includes felling, gathering and loading of trees. Portable equipment used for this purpose by the Potlatch Lumber Company was described. Data were also given showing the costs of logging to be \$10.83, \$16.54, \$17.13 and \$20.93 per day when handling 76,200 ft. (board measure) of lumber per day, using electricity, oil, coal and wood respectively. An analysis of log-hauling operations showed that electricity could be used to advantage. Maintenance and operating expenses for electric and steam-hauling equipment under typical conditions bear the ratio of three to four approximately. Where hand stacking is employed two men can rarely handle more than 10,000 ft. of lumber, but with a simple electrically operated stacker driven by a 12-hp motor the same number of men can handle 50,000 ft. per day. An unstacker operated by a 5-hp motor will take care of 60,000 ft. per day. It was

pointed out that squirrel-cage induction motors are employed to drive mill machinery where possible, semi-group drive being employed almost entirely. The equipment has to be designed generally for the maximum output as the load fluctuates considerably. The duty of log carriages is severe, as the retardation at the end of travel and the acceleration of return must be exceedingly high to prevent loss of productive time.

#### Discussion

Mr. Whitney's paper was discussed at great length by Messrs. Scott, Miller, Weber, Fiske, Merwin, Cheek, Norman, Fraser and Harrisberger, covering numerous phases and details of this application of electric power. Mr. Whitney closed the discussion, covering at length various points brought up. This paper will be of undoubted value to the lumbering industry, as well as to the engineer, in showing what has been accomplished.

#### Electric Versus Steam Locomotive Operation

In a paper on the "Electric Operation of the Butte, Anaconda & Pacific Railway," Mr. J. B. Cox compared the operation of steam and electric locomotives. Considerable valuable data were included, showing the decrease in overtime work, the increased tonnage per train, the fewer number of trips required, the increased running speed, and the relative maintenance and operating expenses. Comparing operations in June, 1913, and June, 1914, there were 25 per cent fewer trains required and 35 per cent more tonnage hauled per train with electric locomotives than with steam. The saving from partial electrification was more than \$150,727 a year for energy alone. The total saving in electrification was about \$237,581 a year, while the traffic has been increased about 9 per cent over what it was with steam operation. A saving in trainmen's wages of \$31,146 a year has been effected. Other expenses have also been reduced as follows: Repairs, 26 per cent, and engine-house expenses, 38 per cent. The total cost of electrification was in round figures \$1,201,000, making the total net savings about 20 per cent of the investment.

#### Discussion

Mr. Cox's paper had not been received in time to be printed for this convention, and therefore, while the reading of it invoked considerable discussion, the discussion was not so general as would naturally be expected on this subject. Mr. Lebenbaum opened the discussion, referring particularly to experience with various types of pantograph trolleys and the final adoption of the roller type of bearings. Mr. Kohler raised the question of reliability of six months' service costs upon which to base conclusions, because of having smaller maintenance charges when equipment is new, making reference to steam-locomotive experience in regard to this feature. Messrs. Miller, Ralston and Stacy also discussed the subject, and Mr. Cox in closing added materially to the information given in his paper on constructional features and actual operating experience.

#### Motors for Dredges

In his paper entitled "Application of Electric Motors to Gold Dredges" Mr. G. B. Rosenblatt declared that electric energy has been applied quite universally of late to the driving of gold dredges. Of the \$88,400,000 worth of gold produced last year in the United States, nearly a fifth came from gold dredges. The elevator dredge is the most commonly used for gold mining. Energy is required at the digging and primarily for driving the bucket chain, although some energy is also needed for lifting and lowering the ladder and for operating the devices that pull or hold the dredge up



against the bank so that the buckets will bite into their work. The duty of the motors is similar to that for ordinary hoisting service. Alternating-current motors are generally used. For small motors the drum-type controller is employed, and for the larger machines the liquid rheostat provides the best control.

#### Discussion

Mr. Rosenblatt read his paper with frequent observations on the subject matter, dwelling particularly on the difficult motor application known as "stocker motor." A written discussion by Mr. F. W. Harris, Los Angeles, was read, which discussed Mr. Rosenblatt's paper very fully, more particularly, however, with reference to California conditions. Messrs. Ross and Armstrong discussed the general subject from the mining engineers' viewpoint. Mr. Pope covered his recollections of early days in the gold fields on the Fraser River, British Columbia. A written discussion by Mr. W. M. Shepard, of San Francisco, was read, which made special reference to the question of a squirrel-cage versus a wound-rotor induction motor for driving the stocker. The problem of motor application to this work was extensively discussed.

#### Operating Characteristics of Insulators on 55,000-Volt Lines

In a paper entitled "Economy in the Operation of 55,000-Volt Insulators" Mr. M. T. Crawford gave a brief outline of operating experiences on three 55,000-volt lines, two of which have been in service ten years and one five years. The insulators originally installed on Line A were among the first of their kind and voltage to be made. The manufacture of high-voltage ware was not well understood at that time, and electrical failures began to occur soon after installation. It has been necessary gradually to replace these insulators. On Line B insulators of a better grade were used, although they cannot compare with the ware turned out by manufacturers nowadays. Until recently these insulators held up quite well. On Line C the best type of insulators were used and each unit was thoroughly tested. Up to now there have been only three failures. The author described a device by means of which defective insulators can be readily detected in the early stages of deterioration; by periodic use of this device and replacement of insulators failures in service have been practically eliminated.

#### Discussion

Mr. Harrisberger made a few remarks concerning the causes which lead up to the features of testing insulators described in Mr. Crawford's paper. He also made special reference to the danger of cementing iron pins onto the high-tension insulators, and covered the practical conditions of training linemen to test insulators in the manner described in the paper. Messrs. Geary, Miller, Noack, McCormick and Merwin discussed the troubles with insulators, Mr. Noack covering more especially what is generally called "aging of insulation." He questioned any molecular change in porcelain, but instead described the effects of external forces, such as expansion and contraction due to changes in temperature, when the porcelain is used in conjunction with cement, iron, steel and other materials. Mr. Pope brought out the question of use of glass for high-tension insulators and referred to information on this subject previously given in the *Proceedings* of December, 1912. Mr. Geary and Mr. Ross also touched on the subject of using glass for high-voltage insulators.

Mr. Fraser and Mr. Woodbury spoke concerning the insulator tests, and Mr. Harrisberger closed the discussion, replying to some of the questions asked by others who had taken part in it.

#### Inductive Interference

The Friday afternoon session was devoted to the report by the joint committee on inductive interference to the State of California, which was presented by Mr. L. P. Ferris. (For order of commission see *Electrical World*, Sept. 5.)

The reading and discussion occupied the whole afternoon session and was listened to with undivided attention by a large audience.

The president called upon Mr. P. N. Nunn to open the discussion, and Mr. Nunn reviewed the report very fully, bringing out that, notwithstanding the fact that the scientific investigation deserves attention, there is still another aspect to this matter. The report comes also "as the announcement of a matter of public policy, an arbitrarily enacted law adopted by a commission of one of the largest states, presumably having in mind a somewhat similar action upon the part of other states; therefore this, as an enactment by the Railroad Commission of California, stands before us as a probable restrictive piece of legislation upon those developments which are involved in this investigation. Read casually, it is a surprise to find the extent to which the traditions and practices of power companies are discussed, modified and overruled; read more carefully, there appears a broad-minded equity running through it, a co-operation between the different interests involved; read still further, one finds evidences of a far more serious nature, a matter of hardship. The rules laid down are not superficial; on the contrary, they are subtle. The effect of the various provisions presented is not apparent upon casual reading, but it will bear thinking out."

Mr. Nunn went on further to point out that the right to waive substantially all the rules laid down was given to the communication companies. He also complained that "at crossings and other unavoidable cases of close proximity the power line shall be kept above the communication line and constructed in conformity to the National Electric Light Association's specifications." Regarding transpositions, he brought out that the communicating companies were sole judges of the number, type and locations. The requirements for oil switches were also discussed, as well as the prohibition of air switches. Mr. Nunn, in closing his extended and caustic review of this report, said: "Throughout it is eminently reasonable and mild in its wording, but from first to last it, of course, seeks to establish and fix the responsibility. It is an enunciation of principle—principle which it does not find the way to carry out, which it is unable to define, which it is not for a moment in a position to step forward and urge to be carried out in definite terms; but it fixes the principle that these things ought to be done if they can be done. If that were established here before a technical society or before the N. E. L. A., it would be interpreted in a different manner. At all events, in the light of what I know of this subject, it is my personal opinion that as a legal document this is very skilful, very, very far-reaching, of importance which entirely overshadows its immediate technical value to us."

Mr. Halloran read a written discussion by Mr. A. J. Bowie, Jr., showing that under certain conditions switching lines with air switches produced less disturbances than when oil switches were used.

Messrs. Fiske, Humphry, Martin, Corbett, Kahler and Merwin discussed individual sections of the report, and also brought out the menace to the power interests caused by any commission adopting such report in the present light of knowledge of the subject. Mr. Ferris closed the discussion by answering a number of the questions raised, whereupon President Lincoln declared the convention closed *sine die*.

# Trade Conditions and Opportunities

Different Points of View on the Great Questions and Commercial Possibilities Opened by the European War

## WASHINGTON ON EXPORTS AND IMPORTS

Authorities of Department of Commerce and Pan-American Union Caution Manufacturers

The Department of Commerce has finished compiling the totals of exports and imports of the United States for August and is now at work classifying the details. The general figures of exports for the month show a falling off of \$77,572,475. The total August exports amounted to \$110,337,545, compared with \$187,909,020 in August, 1913. For the eight months of the year ended with August the exports were \$1,311,319,707, against \$1,515,182,157 for the same period last year.

August imports, which include much of the raw material used by exporters of manufactured goods and products, totaled \$129,399,496, compared with August, 1913, figures of \$137,651,553. In the eight months ended with August this year imports were valued at \$1,269,992,869, against \$1,156,300,228 in 1913. There is therefore also a falling off in imports for August, including raw material from which products are manufactured for export, of \$8,252,057.

It should be borne in mind that some of the import figures are affected by the tariffs and not by the war. Of the August imports, 61.8 per cent entered free of duty, compared with 50.9 per cent in August, 1913.

Because of the wide interest among American exporters in the possibilities of South American trade, the Pan-American Union made public in Washington on Sept. 22 a statement cautioning manufacturers against the belief that there is a great market for the actual sale of products of the United States in Latin America at this time. Cable inquiries were sent by the Pan-American Union to thirty-four of the capitals and commercial centers of South and Central America.

"The responses," the Pan-American Union states, "show that it is important both to these countries and to the United States to sound this note of caution."

"What the business interests there now need is not so much manufactured products or additional ships as active financial help in the form of necessary money advances, reasonable credits and an actual market for their raw products, which usually go to Europe. The real Latin-American opportunity is more one for co-operation, investigation and preparation."

In these views the Department of Commerce, through Secretary Redfield, coincides.

Mr. Redfield announces that the department "will shortly place in Rio de Janeiro, Buenos Aires, Santiago and Lima commercial attachés, speaking the language of the country to which they are sent, and who will be instructed to make continued studies of the markets for the benefit of American industries."

Mr. Redfield sums up conditions in Latin America as follows:

"Credit is shaken or has for the time passed away. The course of exchange has been broken with no new one yet to replace it. The result is that while the ultimate purchasing power of South America has not been impaired, her present buying power and her resources of current credit are seriously and adversely affected. Her first and foremost need, therefore, without which she cannot buy largely, is to have re-established her basis for credit. Without this credit merchants and manufacturers in this country cannot afford to sell; without it Latin America cannot buy."

## SOUTH AMERICAN TRADE OPPORTUNITIES

Conditions to Be Kept Clearly in Mind if Export Business Is to Be Secured

BY DAVID KINLEY\*

In our efforts to secure the South American trade opened to us by the war in Europe we must keep clearly in mind certain conditions of success. We must be able to offer goods similar in kind and amount to those whose supply is cut off; we must be ready to take in exchange the products of our South American neighbors, and we must be able to finance the projects of the countries we wish to enter, if we would make our entry into this trade permanent.

In 1912 the United Kingdom, Germany and France together exported to the ten South American republics an aggregate of \$435,000,000, distributed as follows: United Kingdom, \$244,972,000; Germany, \$136,060,000; France, \$53,853,000; total, \$434,885,000. In addition a considerable amount was taken from Belgium and Austria.

Of this trade, that from Germany, Belgium and Austria-Hungary is wholly cut off, while that from France and Great Britain will undoubtedly be considerably reduced. The figures serve, however, to show in a rough way the extent of the market opportunity.

But we cannot judge how much of this market we can capture without considering the nature of the articles traded in. Taking the markets of Argentina as an example, we find that in 1913 she imported \$34,000,000 of food products and \$89,000,000 of textiles and textile manufactures, of which \$41,000,000 were cotton, \$16,000,000 wool, and the rest other textiles. In addition, she took from other countries \$23,000,000 worth of oils, grease, etc., \$14,000,000 of it being in kerosene, naphtha and similar products. In iron and steel and the manufactures of the same the aggregate imports were \$50,000,000; of railway cars, autos and railway carriages, \$37,000,000; of building materials, \$35,000,000; of earths, stones, glass, coal, etc., \$36,000,000, and of electrical apparatus, \$10,000,000. These are the largest items, and most of them will appear as the largest items in the imports of the other South American countries. Evidently they are things which we can supply if we can increase our production sufficiently. Our present cotton crop is proving a source of financial embarrassment, yet if our mills were able to take it up and manufacture it into cloth we should be able to fill the South American gap in a very large measure. The fact that it is not being bought by our mills illustrates one of the limitations under which we work. That is, that to supply so large a market a tremendous increase of our industrial capital is necessary, and this cannot be suddenly made.

Now to build up a trade we must not only be able to supply our South American neighbors with the things we manufacture, but we must be ready to take in exchange the things which they are accustomed to sell to Europe. We must be ready to take coffee from Brazil, Costa Rica and elsewhere, and cocoa from Ecuador. Bolivia is looking for another new market for her tin, of which 40,000 tons are said to be waiting for ship-

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ment now. Chile offers us minerals of various kinds, Peru has a variety of articles, but the most important of her present exports is nitrates. A good many of the exported articles are raw materials and food which we produce ourselves in sufficient quantity for our own consumption. We cannot step in and replace the demand of Germany, England and France for Argentine corn, wheat and meat. Hence it is clear that our new trade will be limited as much by the extent to which we are ready to buy their goods as by the extent to which we are able to supply our own.

We must remember, too, that a considerable portion of the goods exported from South America to Europe is to pay interest on European investments in that country and is not in exchange for current products. In so far as this is true we cannot trade in those goods. To be sure, we have lost some of our market in Europe, and what would normally go there may be diverted to South America in addition to new extra products that we can rapidly turn out. Nevertheless, when all limitations are allowed for, the market open to us in South America on account of the war is a tremendous one and very much larger than we shall be able to supply.

#### Some Conditions of Success

As just remarked, a considerable proportion of South American exports represents interest on indebtedness. In other words, England, France and Germany have built up their great South American trade largely by financing South American enterprises. If we are to replace any or all of these countries in the future, we must furnish capital. This is particularly true in the west-coast countries, whose mineral resources are awaiting a larger development than they have yet had. If we can loan South American enterprises sufficient capital, we shall get the trade which these enterprises develop. For example, if a group of American financiers should advance \$50,000,000 for railroad or mining enterprises on the west coast, they would not send gold to these countries. They would give the proper parties credit for the amount, and these parties would then purchase in this country the materials and other supplies necessary for the enterprise. They would pay for these by drafts on the credits which had been advanced to them. In due time, after their enterprises were under way and successful, they would pay the interest and the capital on their loan from the proceeds of their exports to this and other countries. It is obvious, then, that the financing of enterprises down there leads to an increase of exports from the country which does the financing. It is true that we can build up our trade to a considerable degree without financing enterprises, but we can never hope to get the large bulk of the business. For to trade with the people of an undeveloped country without financing them means simply to sell our products for theirs. But they have few products to sell unless they can get capital to make them. The more capital they can get the more they have to sell, and the more, therefore, they are able to buy. This process accounts for the great hold of the English and Germans in Argentina and Chile. There is a considerable field still open in these countries. But we should have an easier time in Peru, Ecuador, and possibly in Brazil.

There is too much talk of government initiative in this matter. We cannot build up trade by writing about it or talking about it, or by determining that "this country" must do business with some other country. Countries do not trade. Business firms and individuals trade. If, therefore, any manufacturer or group of manufacturers is in earnest about developing trade with South America, he must proceed on his own initiative. He should send sensible, responsible agents

at once to report upon the conditions under which business can be done. He should find the usual terms of credit, for the conditions and methods of doing business, particularly in granting credit, are not the same in all these countries in all lines of business. These agents should report exactly what articles the people have been accustomed to buy and what they want in style, quantity, colors, prices and other details. The manufacturer should then endeavor to meet the wishes of his prospective customers in all respects. All this implies what a recent manufacturer has called a "network of intelligent agencies."

Moreover, it will be necessary to make reasonable conditions about payment. Consequently we must have better banking connections than we have ever had with South America. We must have banking agencies that will make it possible to establish credits in New York and Chicago to be drawn against by exporters and importers. These banking agencies can also be utilized for financing development. But they must be made to serve the people there and not be treated as simply an extension for our own profit by exploiting our customers. They must do banking business in South American ways and according to South American conditions.

#### Shipping

A good deal has been said about the need of shipping facilities. A careful study of the situation will show, I believe, that direct shipping connections have been lacking because we have not had the trade rather than because of the lack of vessels. In the past a considerable proportion of the vessel space from New York to Buenos Aires, for example, is said to have returned in ballast. There is less need for anxiety on the score of shipping than some people seem to think. Nevertheless, we should make an immediate and determined effort to get lines of ships within American control. We and the South Americans need our own lines of steamers to do our business, if for no other reason than to avoid preferential treatment of European exporters by European shipping.

### MANUFACTURERS' EXPORT DISCUSSION

#### Business Men and Representatives of Department of Commerce on South American Trade

The American Manufacturers' Export Association held a lunch at the Whitehall Club, New York, on Sept. 18 to discuss foreign trade conditions. Mr. Charles E. Jennings, the president, presided.

The first speaker was Mr. H. N. Douthitt, special agent of the Department of Commerce, who is to go soon to South America to investigate the trade possibilities for American manufacturers of electrical machinery and other kinds of machinery.

Mr. Charles M. Muchnic, third vice-president American Locomotive Company, spoke of erroneous ideas in regard to South American trade possibilities. He said that in view of the deplorable financial conditions in South America the opportunities open to American manufacturers at this time are to lay foundations for future returns.

Mr. William A. Graham Clarke, commercial agent in charge of the Bureau of Foreign Commerce in New Orleans, discussed the serious conditions arising from the lack of mills here to make cotton goods.

Prof. Guy Edward Snider, of the College of the City of New York, who has just returned from South America, spoke of the acute financial situation there.

Mr. J. J. Teal, of the Lehigh Valley Railroad, told of the plan of that company to send a special train from New York to Buffalo to advertise export trade.

## AS MANUFACTURERS VIEW THE OUTLOOK

### Business Prospects Give Grounds for Expectation of Reasonable Confidence in Industry

In accordance with the request of the *Electrical World*, manufacturers have expressed views on the business outlook as follows:

#### Electric-Stove Business Flourishing

Mr. George A. Hughes, president of the Hughes Electric Heating Company, of Chicago, when questioned on Sept. 9 by a representative of the *Electrical World* on the business outlook, said that both the volume of business and the collections of his company are in a very satisfactory condition. To Aug. 1 business this year was 100 per cent ahead of last year. However, August did not show the same rate of increase, although still described as good. Mr. Hughes thinks that when the warring nations of Europe begin to call for the foodstuffs of the United States general business will improve. In the meantime business concerns should go ahead in a sensible, conservative way, and both business houses and individuals should be impressed with the fact that the hoarding of money is bad. The company has done a large export business in electric stoves and ranges, which have gone to nearly all parts of the world. The war has seriously affected this business, as shipments have been held up on account of the enormous freight charges demanded owing to the risks of war. As soon as the foreign-exchange situation is clarified Mr. Hughes looks for a resumption of export business with neutral countries. While Germany has had the bulk of the South American electrical trade, Mr. Hughes believes that there is a great opportunity for American manufacturers to supply the smaller socket devices. Owing to the rates for electrical energy usually charged in South America, the situation is not so favorable in relation to the export of machinery and consuming devices, which make a heavier demand for energy. Mr. Hughes concluded: "We are going right ahead. Our business has been really surprisingly good considering the situation abroad and at home, and we believe that the end of the year will show that we have done a greater volume of business in 1914 than in 1913. You may put us down as feeling sanguine so far as our individual activities are concerned. We have been buying some of our materials in Europe heretofore, but have made arrangements to supply our needs in the United States."

#### Signs Point to Constructive Effects

Mr. J. G. Splane, vice-president Detroit Insulated Wire Company, Detroit, Mich.: "At present it is impossible to forecast what effect the European war will have on United States export trade, although all signs point to the constructive side. Up to the present we have been running full time, and the volume of orders coming in is very encouraging for the future. We have been depending upon European countries for some of our raw materials, but fortunately have a stock on hand. It appears to me, however, that substitutes can be found if necessity arises."

#### Numerous Inquiries from Other Countries

Mr. Thomas Duncan, Duncan Electric Manufacturing Company, Lafayette, Ind.: "Replying to your recent communication asking our opinion as to whether or not the present European war will tend to increase the electrical business of the United States, we unhesitatingly state that such a condition already exists. We have in the past two weeks had numerous inquiries for our meters and transformers from several firms in Great Britain, as well as from nearly every country in South America, which conclusively shows that the busi-

ness is, by force of circumstances, coming to the United States. As to our being dependent upon European countries for raw materials, we are pleased to report that our needs in this respect have already been met and are now being taken care of here at home."

#### Business About Normal

Mr. B. H. Howell, president Hemming Manufacturing Company, Garfield, N. J.: "This business is only indirectly affected by export conditions, as owing to the special nature of our work we supply material only to American manufacturers. We have found our business remains about normal. We are able to obtain all of our raw materials in this country."

## FACTS ABOUT EXPORT CONDITIONS

### Suggestions and Data Relating to Opportunities in Foreign Fields for American Manufacturers

Dr. Albert A. Snowden, foreign trade commissioner of the National Association of Manufacturers, points out opportunities for increased sale of American goods in Australia and New Zealand.

Minister of Foreign Affairs Sazonoff of Russia declares that Russian markets will be open to England and America and that experts should be sent now to study them.

New York bankers are considering efforts to provide for exchange with South America in dollars and cents instead of through London in pounds and shillings.

Two representatives of the American Express Company and the New York Central Lines will go to South America on Oct. 1 to investigate business opportunities.

The First National Bank of Boston, after a canvass, reports in its "New England Letter" increasing optimism by representative New England industries.

The National Foreign Trade Council will hold a convention in Washington during January, 1915.

To promote foreign trade the Bureau of Foreign and Domestic Commerce has opened branch offices in Boston, Mass., and Seattle, Wash.

The Lehigh Valley Railroad sent a South American trade special train from New York to Buffalo this week. The train left New York on Sept. 21. Stops were made at Easton, South Bethlehem, Allentown, Wilkes-Barre, Hazleton, Sayre, Ithaca, Auburn, Geneva, Rochester and Buffalo. At all of these cities meetings were scheduled, at which export possibilities were discussed. The speakers on the train were Messrs. Charles M. Pepper, formerly with the Department of Commerce; Edward Albes, representative of Director General Barrett of the Pan-American Union, and W. S. Kies, in charge of the South American branches of the National City Bank of New York.

## REPRESENTATION IN SOUTH AMERICA

### Society for Electrical Development Ready to Make Plans for Trip

The Society for Electrical Development, Inc., announces that if a group of its members want to send a special representative to South America to develop trade opportunities it has a competent, experienced electrical engineer for whose services arrangements may be made through the society. This representative, having lived for thirty years in South America, speaking Spanish and Portuguese and having a wide acquaintance, could take charge of the interests of non-competing electrical manufacturers.



## PUBLIC SERVICE COMMISSION NEWS

## Illinois Commission

The Illinois Public Utilities Commission has granted the request of the Central Illinois Public Service Company, of Mattoon, for permission to change electric-lighting rates in Carthage. It was found that the proposed rates were based upon the tables approved by the commission.

## Ohio Commission

In filing its inventory and appraisal, as required by the commission, the Chardon Telephone Company, of Chardon, made the request that the rate for service be made sufficiently large to provide a reasonable amount annually for operation, a certain definite and determined amount for replacement fund annually, and a sum that will cover dividends on the common stock at the rate of 6 per cent, based upon the reproduction cost. The present value of the property is given as \$32,746.86, while the reproduction value is placed at \$55,529.31.

The application of the Bucyrus Light & Power Company for a rehearing of its case has been denied by the commission. In all probability it will be taken to the Supreme Court.

## New York Commissions

On account of the illness of Mr. Daniel V. Murphy, special counsel for the Second District commission in the New York Telephone Company rate case, the date for beginning presentation of testimony by the company has been postponed from Sept. 22 to Sept. 30 in New York City.

The Second District commission has decided that telephone companies cannot be compelled to furnish service to patrons who use telephone equipment other than that supplied by the company. The decision in this case arises from the complaint of the State Agricultural and Industrial School at Industry, N. Y. This complaint asked that the New York Telephone Company be compelled to furnish connections with the private switchboard erected and maintained within the institution. Commissioner Frank Irvine holds that the public necessity represented by efficient telephone service takes precedence over the private convenience even of a public institution which might demand the service asked in the complaint.

## Pennsylvania Commission

The Pennsylvania Public Service Commission has rendered a decision in the case of Mr. James Thompson and M. A. Hanna & Company against the Erie County Electric Company, holding that a company may classify its customers without regard to costs or methods of production. The complainants charged that the rates they were asked to pay for electrical energy were greater than those made against other persons and corporations for similar service. The commission said: "It has long been recognized in the manufacture of electricity that irregularity in the demands of a customer results in the least desirable class of business, owing to the necessity for making provision for furnishing sufficient service at the time of greatest requirements for the same, and then having a greater or less portion of the power-station equipment idle at other times, when the customer has no need of the full amount that provision has been made for. Another difficult service to maintain is where the requirements are subject to sudden and recurring wide fluctuations. In such cases unusual precautions and provisions are required at the generating station, to prevent the variable demands of one customer, unless served from an individual generator, affecting adversely the regularity of the voltage and energy furnished to all the other customers."

## Current News Notes

**ELECTRIC CROSSING GATES AT VANCOUVER.**—Several electrically operated crossing gates are being installed by the Canadian Pacific Railroad to protect traffic across its tracks along the water front at Vancouver, B. C. They are of the portcullis type and will be raised and lowered by pressing a push-button controlling the master operating switch.

\* \* \*

**A ONE-TO-FIVE CUSTOMER-POPULATION RATIO AT DALLAS, TEX.**—With a population of 110,000 served by its lines, the Dallas (Tex.) Electric Light & Power Company has 20,000 customers connected, representing one user of electric service for every five and one-half inhabitants, or, taking the usual basis of the directory makers, which assumes five persons for each family, almost every household in Dallas is a user of central-station service.

\* \* \*

**DEMAND FOR ELECTRIC TRUCKS IN ENGLAND AS RESULT OF WAR.**—Because of the fact that gasoline trucks are useful for service in the European war zone, and since nearly all such trucks in England have been requisitioned by the government, electric vehicles are now in many cases being substituted. It is reported that the available stock kept on hand by the various dealers in London has been entirely bought up. Recently American manufacturers inaugurated a campaign to sell electric automobiles in England, and present conditions seem exceedingly favorable to the success of their efforts.

\* \* \*

## SOCIETY MEETINGS

**REJUVENATION AT DAYTON.**—The Dayton branch of the Jovian Order held a highly successful rejuvenation on Tuesday evening, Sept. 15, initiating a class of thirteen candidates. One hundred members and guests were present, and Statesman T. F. Kelly presided. The initiatory work was handled by the following team: Jupiter, Mr. T. F. Kelly; Pluto, Mr. A. Gibbons; Vulcan, Mr. H. F. Wollaston; Neptune, Mr. S. Perry; Mars, Mr. K. Nocka; Mercury, Mr. C. A. Kuebler; Apollo, Mr. C. F. McClure; Arvenium, Mr. G. B. Sarye; Hercules, Mr. F. S. Breidenbach; Chief Imp, Mr. O. B. Remelin; Imps, Messrs. James Atwood, R. R. Pleasant, and H. Long. The initiates included Messrs. G. R. Hughes, T. L. Farnham, O. Kressler, E. C. Wells, J. J. Munsell, R. W. Martin, R. D. Gillespie, N. Emmons, I. G. Kumlér, E. P. Tappehorn, T. J. Parent, W. A. Keyes and George Grove.

\* \* \*

**ACTIVITIES OF INVENTORS' LEAGUE.**—Upon a special invitation of the New York Telephone Company given to the members of the Inventors' League of the United States, the latter, after a short business meeting held on Sept. 14, visited the telephone exchange in West Seventeenth Street, New York, where the interesting features of this exchange were fully explained. The members of the league have also been invited by the New York Edison Company to visit and inspect one of its power stations on Monday evening, Oct. 5. Prior to that visit a meeting of the league will be called at the league's rooms in Scheffel Hall, 194 Third Avenue, New York, at 7:30 p. m. An invitation to attend this meeting is extended to inventors in general. The league will have two booths at the International Exposition of Inventions, to be held at the Grand Central Palace, New York, from Dec. 12 to 19, where medals and diplomas of the American Institute will be awarded.

## Central Station in Office-Building Basement

Auxiliary generating and steam-heating plant of the  
Northwestern Electric Company in Portland, Ore.,  
connected with hydroelectric plant on White Salmon River

THE Northwestern Electric Company brings electricity into Portland, Ore., from its hydroelectric plant on the White Salmon River in Washington, described in the *Electrical World* Aug. 9, 1913. Transmission is at 66,000 volts over a cedar-pole line of standard construction. The only point of special interest in the transmission line is the crossing at the Columbia River. This consists, in fact, of two separate crossings, one having two supporting towers 125 ft. high and two strain towers 40 ft. high, the other having three supporting towers 150 ft. high and two strain towers 40 ft. high. The towers are arranged for six transmission wires and one ground wire. The transmission wires are of  $\frac{3}{4}$ -in. crucible-steel cable, carried on grooved wheels on the supporting towers and held by three sets of strain insulators at the strain towers.

The transmission line is carried well into the city to a main step-down and distributing station on the east bank of the Willamette River. This station is a concrete, fireproof structure, with remote-control solenoid-operated switches, following general standard design. The potential is transformed to 11,000 volts for distribution to distant points, and across the river by submarine cables to the West Side. A portion of the energy is also again reduced in pressure to 2400 volts for

local distribution within reach of the main station.

After crossing the river to the West Side of the city the circuits lead to a combined steam-heating and generating, step-down alternating-current distributing and direct-current generating and distributing plant in the basement of the Pittock Block, which stands in the heart of Portland's business district. This plant, one of the largest of its kind in the West, is installed entirely below the street surface, in the basement of a large office building. It contains 3000 normal hp in Stirling boilers, capable of being overloaded 100 per cent and using oil fuel; two 3500-kw Curtis steam turbines, two 1500-kw motor-generator sets, with provision for two more; two balancer sets; two exciter units, one steam-driven and one electrically driven, and the necessary transformers, switchboards and other apparatus.

### Elimination of Vibration and Noise

In the design of the station particular attention had to be given to vibration, noise and heat, in order to avoid annoyance to the tenants of the building. Forced ventilation was, of course, necessary.

To eliminate any possible vibration, the moving machinery was placed on extra-heavy concrete founda-

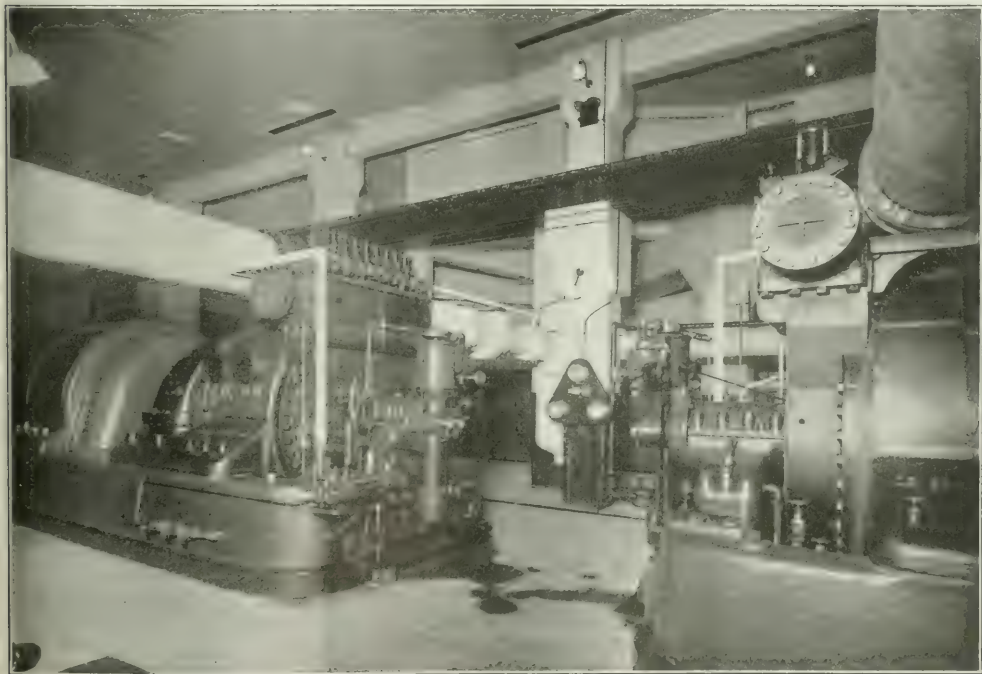


FIG. 1—GENERATOR ROOM OF NORTHWESTERN ELECTRIC COMPANY IN PITTOCK BLOCK, PORTLAND, ORE.



tions, separated from the building foundations by an 18-in. space, which space was filled with sharp crushed rock. This space was narrowed to 3 in. at the floor line and covered with an iron floor plate. Special care was also taken in the balancing of the machines, and the axis of rotation of the large turbines was placed at right angles to that of the exciter turbine and motor-generator sets, so that any vibrations would be broken up and not amplified in any way.

Noise was eliminated in every way possible. The synchronous motors driving the direct-current generators are entirely inclosed, air for cooling them being supplied by small motor-driven fans which receive their supply of air from a shaft to the roof, and the heated air

Under normal conditions of operating, electricity is supplied from the hydroelectric plant, with the steam turbines either floating on the line or generating at point which will just supply the needed steam to the heating mains. Tirrill regulators are used at the main power plant, on the turbine generators and the synchronous motors, resulting in practically perfect voltage regulation. If the circuits from the hydroelectric plant fail, the steam plant picks up the load without interruption.

Electricity is distributed from the Pittock station to the entire underground district at 120/240 volts direct current, and at 2400 volts and 11,000 volts alternating current for the overhead district. The steam-heating

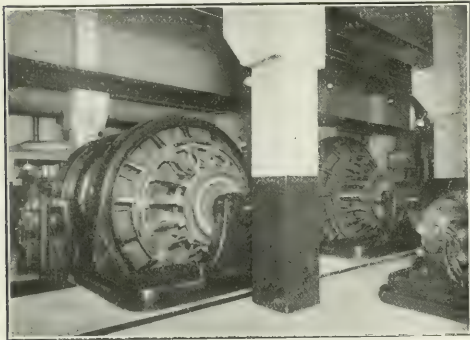


FIG. 2—MOTOR-GENERATOR SETS IN PITTOCK BLOCK



FIG. 4—BUS STRUCTURE IN PITTOCK BLOCK

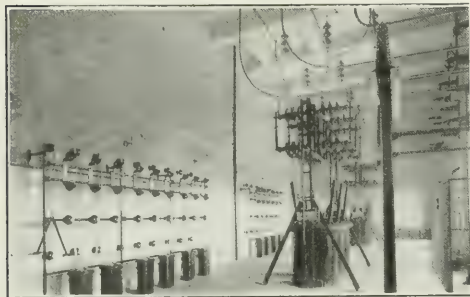


FIG. 3—INTERIOR OF ALBINA SUBSTATION



FIG. 5—CIRCUITS ENTERING ALBINA SUBSTATION

is discharged through ducts under the floor leading to a main discharge shaft surrounding the smokestack. The steam turbines draw their own air from a separate shaft and discharge it into the main discharge shaft. A triple ceiling prevents any remaining noise from reaching the floor above.

Heat and ventilation are cared for jointly. A large airshaft from the roof supplies air to two large steam-driven fans, which force the air through a passage over, and the entire width of, the ceiling, discharging it through openings properly placed and proportioned for supplying proper ventilation. The same shaft supplies air for the boilers. The arrangement prevents any heat from the plant passing through the ceiling to the rooms above.

After several months of operation the plant has proved entirely satisfactory, some slight changes in the ventilating openings being all that have been found necessary. The steam turbines are operated non-condensing, the exhaust steam going to the steam-heating mains at about 6 lb. pressure.

distribution is at low pressure. The system was installed by the American District Heating Company. Mr. B. C. Condit is chief engineer of the company under whose supervision the installation has been made.

### Mineral Reserves and Their Relation to Industrial Independence

Mr. George Otis Smith, director of the United States Geological Survey, has prepared a paper on "Our Mineral Reserves." The paper has been published in pamphlet form. The sub-title of the paper, "How to Make America Industrially Independent," indicates the purpose of the discussion. Mr. Smith is convinced that now is America's opportunity to make its mineral industry even more dominant as a factor in the world commerce, and his paper was prepared as an answer to inquiries received by the Geological Survey, and also to stimulate other requests for co-operation in this important work.

## Transatlantic Radio Station at Sayville, N. Y.

**Equipment of Long Island station through which German war news is received—Possibility of direct wireless communication between Germany and the United States. By John L. Hogan, Jr.**

THE Sayville radiotelegraph station, on the south shore of Long Island about 60 miles from New York, has been the center of much interest and discussion in the past few weeks, since after the cutting of the German cable at a point near the Azores nearly all European war news from Germany has been received at this wireless plant. The American public has been treated to allegations of "fake" transmission and counter claims as to the genuineness of the dispatches furnished for publication, and the daily press has become involved in a quite heated argument as to the possibility of Sayville's receiving direct from Germany. It is therefore worth while to consider the technical side of the matter and to examine the installation in question.

About two years ago the Atlantic Communication Company finished erection of the Sayville plant, and it was announced at that time that direct transatlantic telegraph service with Nauen, near Berlin, would ultimately be furnished through this station. The aerial system, and in fact the entire equipment,<sup>1</sup> is on so large a scale as to indicate that this was the purpose. The antenna consists of a twelve-wire umbrella radiating some 400 ft. from the top of a 500-ft. triangular-section guyed steel tower and having its wires tied at their outer ends by 800-ft. guys to a ring of short poles. The tower itself is in two sections, the lower of which rests upon an insulated ball-and-socket joint at the base and carries at its top (about 360 ft. from ground) another universal joint which supports the upper section. Thus the tower depends entirely upon its twelve guys and has only vertical rigidity. The guy wires are arranged in four groups of three each, fastened to the tower at four heights and in pairs to anchorages set in two concentric circles about the tower. The antenna is insulated from the tower, and the guys and tie wires are sectionalized by special glass and porcelain strain insulators.

No direct earth connection is used in transmission, but instead there is utilized a "capacity ground" or electrical counterpoise, which consists of an elaborate system of radial wires extending under and beyond the umbrella aerial and strung on insulators over lines of 15-ft. poles.

The station was originally fitted with two complete transmitters, one of 50-kw and the other of about 8-kw primary alternating-current power. It is stated that a third transmitter, of still smaller power, has since been installed for short-distance working with ships. Energy at 440 volts, sixty cycles, three-phase, is brought to the station from public service lines and operates a General Electric motor-generator for charging a 600-amp-hr., 220-volt storage battery. This accumulator furnishes energy for operating the entire radio plant.

The sending sets are of the high-spark-frequency, quenching-gap type and are much alike except as to size. In the high-power transmitter the 220-volt direct current operates a 75-hp motor directly connected to a 60-kva, 500-cycle, 600-volt, single-phase

alternator. Power from this machine passes through control switches and the signaling relay to the power transformer, which has a secondary voltage of 60,000. This high pressure is used to charge the oscillation circuit condenser, which consists of five groups of tinfoil and glass Leyden jars in series-parallel and has a total capacity of 0.044 microfarad. The condensers discharge across a bank of eight quenching-gap units, in which from forty to fifty short, highly cooled parallel plate gaps are placed in series, and through the primary of the oscillation transformer. Conductively coupled to this coil is the aerial-to-ground circuit, in which high-frequency current of about 120 amp is set up. The antenna resistance is given as something under 3 ohms at 3000 m wave-length, so that the antenna power is about 35 kw and the over-all efficiency from the power transformer primary about 75 per cent to 80 per cent.

The entire transmitter is designed for remote control, and the labor of operating is divided between the telegrapher, in his soundproof operating and receiving room, and a supervising engineer, who remains in the control room separated from the sending apparatus by only a glass partition. The operator telegraphs either by hand key or punched-tape apparatus through a series of three relays, the last of which breaks the main primary current of the power transformer and has forced air cooling in order to handle some 150 amp to 200 amp. A motor-driven antenna switch, which shifts the aerial from sending to receiving connections and protects the operator by opening the relay circuit when in receiving position, is also controlled from the operating room, by means of a foot switch. The adjustments of transformer voltage, generator speed, spark tone, oscillation circuit coupling, etc., are maintained by the operating engineer in the control room, where are installed the necessary meters, signal lamps, switches and rheostats. There is also provided a tone indicator, in the form of a small vacuum tube inductively affected by the sending current and rotated by a motor. Observation of the flashes of this tube gives the operating engineer direct information as to the regularity and purity of the high-pitched musical spark which it is his duty to maintain.

With this high-power transmitter a number of distance tests to ships and other powerful land stations have been made. Press messages sent out nightly have been received under best conditions by ships in the English Channel and at Gibraltar over distances approximating 3200 miles. Transmission to the German plant at Nauen has been accomplished both by day and by night, it is stated; but the fact that commercial telegraph service has not been opened to the public bears out the opinion that daylight working between these stations cannot be relied upon in times of heavy "static" disturbance. These atmospheric interferences have been the bane of all long-distance radiotelegraphing, and it is not surprising that the 50-kw plant at Sayville cannot be depended upon for reliable communication with Nauen, some 3700 miles or more away.

But receiving from Germany is quite a different matter. The Nauen station has its aerial wire system sup-

<sup>1</sup>Described by Messrs. F. von der Wouda and A. E. Seeling in a paper before the Institute of Radio Engineers, 1913.



ported by a guyed tower similar to that at Sayville but nearly 1000 ft. in height, and the sending equipment there is stated to include both high-frequency spark and radio-frequency (continuous-wave) generators, each capable of supplying 100 kw of oscillation power to the antenna. Basing the conclusion upon the performance of comparable equipments over like distances, it would appear that even though Sayville were fitted only with the usual receiving apparatus comprising sensitive rectifying detectors and closely adjustable tuning apparatus, good signals would be heard from the Nauen spark transmitter at night whenever atmospheric disturbances were no more than moderate. There would, therefore, seem no reason to believe that the Nauen-Sayville transmission is impossible upon technical



RADIOTELEGRAPHIC STATION AT SAYVILLE, L. I.

grounds, and it is indeed probable that for at least three or four hours each night fairly good transmission is had.

The statements that no press dispatches are transmitted from Nauen, and that consequently none are received at Sayville, are said to be based upon the fact that certain stations along the eastern coast of the United States, which are normally able to receive from the powerful Nauen spark transmitter, have been unable to intercept any such messages. Ergo, it is said, Sayville has been unable to receive any messages of the kind. Accepting the statement as made, there would appear no disproof of the transmissions alleged, for at least two reasons.

The first of these two possible explanations is the almost obvious one that by the use of special gas amplifiers for building up currents in the telephone circuits Sayville might receive from Nauen during almost

static-free night periods, when the transmitter there is operated on powers so small as to give unreadable signals at any of the United States stations which are quoted as having been on the watch to intercept such communication. These telephone relays are used exclusively by the Telefunken companies and appear to surpass in delicacy the similar devices generally available in this country. The second reason is that transmission may have been upon sustained waves, which are not audible to receivers equipped with the usual apparatus. By the use of oscillating vacuum tubes operating upon the heterodyne principle, and so producing "beat" signals which may be further amplified by the relays mentioned, it would be possible for Sayville to interpret signals utterly too feeble to affect the tikker receivers which are commonly relied upon for translation of messages carried by continuous waves.

The writer holds no brief for the validity of the dispatches published in the daily press of the country as originating at Nauen and received by Sayville. The propensities of space writers to exaggerate, especially upon such topics as the European conflict, are too widely appreciated to permit justification of any such position. There is, however, great interest shown by engineers in general as to the possibility of direct radio transmission from Germany to the United States, and it is the purpose of this brief discussion to point out that such communication is easily possible under favorable conditions, such as occur almost nightly, in the present state of radio technology. To refute entirely the claims that the questioned messages were actually transmitted and received it will be necessary to demonstrate that the Nauen station has been observed far more closely than would appear from any statements made public to date.

### Combined Electric and Hydraulic Drive for Air Compressor

A 300-hp air compressor recently installed on one of the properties of the Snowstorm Mining Company in the Cœur d'Alene district of Idaho is connected by rope drive to a twin-runner waterwheel unit and to a 250-hp induction motor. The shafts of these two driving units are coupled together so that the units may be used independently or in parallel. Energy for the motor is obtained from a commercial plant.

A 46-in. rope sheave is mounted on the motor shaft and is connected to a 14-ft. sheave on the compressor. The waterwheel equipment consists of two runners. One runner is approximately 44 in. in diameter and is capable of developing 325 hp when running at a speed of 347 r.p.m. This speed is the same as the full-load speed of the motor. The other wheel is approximately 72 in. in diameter and develops 250 hp at 212 r.p.m. Both waterwheels are keyed on the same shaft, which is extended and coupled to the motor shaft, carrying the driving sheave. Both wheels are never operated at the same time. The water supply to the idle wheel being cut off, it rotates on the shaft without performing useful work except to provide additional flywheel effect for the installation.

In case the compressor is operating at full load and sufficient water is available, the 44-in. runner alone is operated; if, however, the water supply is not great enough, energy is taken from the commercial plant's circuit to drive the motor and thus assist the waterwheel. At certain times, when the output of the compressor is low, the 72-in. runner is used.

The hydraulic apparatus for this installation was designed and constructed in the San Francisco works of the Pelton Water Wheel Company.

## High - Voltage Outdoor Switching Stations

Use of the horn-gap air-break switch as exemplified on the transmission system of the Mahoning & Shenango Railway & Light Company of Youngstown, Ohio. By W. H. Acker and C. A. Harrington

**I**N the natural growth and extension of a high-tension transmission system need for sectionalizing equipment on the main arteries to facilitate the segregation and cutting out of portions of the lines which may develop trouble is soon manifest. The construction of tap-off or branch lines from the main cir-

gap air-break switch has come into prominent use for outdoor switching and sectionalizing of high-tension transmission lines, being utilized under just such conditions as are outlined above.

On the transmission system of the Mahoning & Shenango Railway & Light Company, Youngstown, Ohio, there are eighteen such outdoor air-break switching stations and a total of thirty-two three-pole single-throw and one three-pole double-throw horn-gap air-break switches.

Fig. 1 is a "one-line" diagram of this transmission system showing the locations of the outdoor air-break and indoor oil switches. Under normal operating conditions the generating stations at Youngstown, Lowellville and Ellwood City operate in parallel through the transmission system, the main portion of which is a double circuit. Automatic oil circuit-breakers are provided on all high-tension feeders leaving the various generating stations, and all synchronizing of stations into the system is done across these oil circuit-breakers. All outdoor switching is taken care of with the horn-gap air-break switches.

The air-break switching stations consist of a suitable timber framing, on which the switches are mounted, and an operating platform from 10 ft. to 12 ft. below the switch framing, from which the switches are oper-

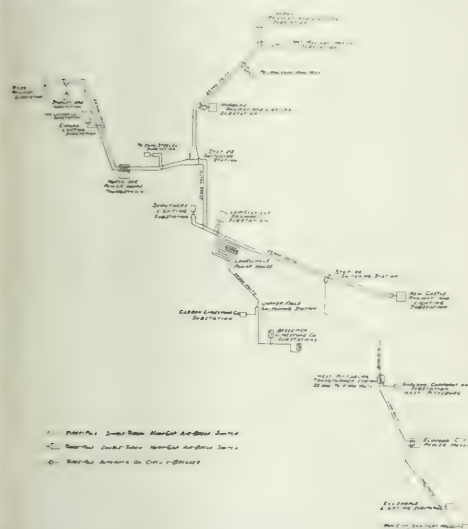


FIG. 1—HIGH-VOLTAGE TRANSMISSION SYSTEM OF MAHONING & SHENANGO RAILWAY & LIGHT COMPANY

culits further increases the necessity for suitable disconnecting arrangements, such circuits being of relatively minor importance as compared with the main lines. The connections entering substations either tapping off the main transmission circuits or served from these tap-off or branch lines must in many cases be provided with outdoor disconnecting and switching or selector equipment in order that the substation may be disconnected and isolated from the system in case of serious trouble or fire in the latter, and that the service connections through the substation may be readily transferred by means of outdoor selector switches from one high-voltage circuit to another, where double-circuit transmission is used, without the service being interrupted.

It is always, of course, extremely desirable, and in many cases absolutely necessary, that the outdoor disconnecting, switching and selector arrangements be dependable, simple and inexpensive. In many cases they are infrequently used, but when needed must be operated quickly and positively, while at the same time the connected load which may receive energy through the switch is very small and the revenue derived therefrom would not warrant an expensive arrangement.

It is only within the last few years that the horn-

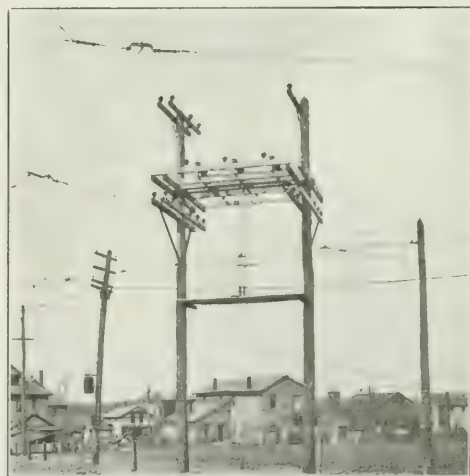


FIG. 2—INSTALLATION TO CONNECT SUBSTATION TO EITHER OF TWO TRANSMISSION LINES

ated. In most cases the switching station is supported from ordinary wooden poles. The arrangement of the switches, wiring and operating handles varies considerably and depends entirely upon the operating conditions, all switching stations being duplicates where the same conditions have to be cared for. All handles for operating the air-break switches are of wood, the



grounded galvanized-iron-pipe operating mechanisms previously used having been replaced in order to eliminate the grounding of the metallic frame of the switch. In some cases the wooden operating handles are so arranged that they interlock the two air switches on the platform in such a manner that both switches cannot

to take care of disconnecting, sectionalizing and selector switching problems.

Fig. 2 shows a switching tower on which two switches are mounted. The double-circuit transmission lines come onto the tower just below the framing on which the switches are mounted and the single circuit into the substation leaves the tower on top. The galvanized-iron operating rods have since been changed to wood. The handles operating these switches are not interlocked and the station attendant may parallel the transmission circuits upon receipt of the necessary orders. In case of interruption of energy supply the switch which is closed may be opened and the other switch may be closed and the service resumed without waiting for orders.

The switching tower shown in Fig. 3 was built to take care of the same conditions as that in Fig. 2, with the exception that it was necessary to bring the two high-voltage transmission circuits in on the top and run the single circuit into the substation from below



FIG. 3—TURNOVER SWITCH ARRANGEMENT FOR SUBSTATION

be in the closed position at the same time, making it impossible for the two transmission circuits to be paralleled at stations thus equipped. At other switching stations where it may be desirable to parallel the two high-voltage circuits while transferring the load from



FIG. 4—HORN-GAP SWITCHES CONTROLLING ENTRANCE OF HIGH-VOLTAGE LINE TO FACTORY BUILDING

one circuit to the other the interlocking of the operating handles has been omitted.

The accompanying halftones of several different switching towers designed to meet various and very different operating conditions show how readily the horn-gap air-break switch can be adapted and arranged

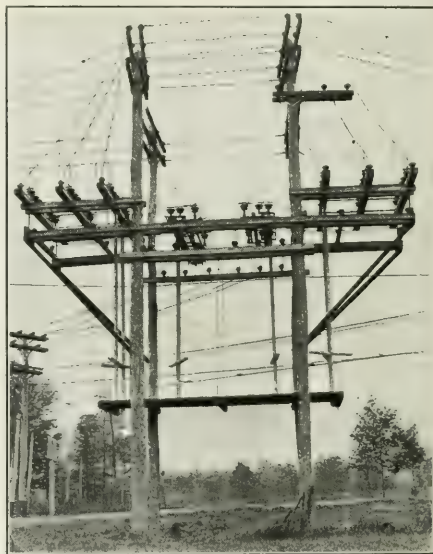


FIG. 5—INSTALLATION OF SIX HORN-GAP SWITCHES AT JUNCTION OF SIX TRANSMISSION LINES

the framing for the switches. A large number of the switching towers are duplicates of Fig. 3.

The switching station shown in Fig. 4 is mounted on top of a steel-frame factory building, the substation apparatus being installed below on the gallery floors. Two three-pole single-throw air-break switches are mounted on the wooden framing on top. The two transmission circuits come onto the structure below the switches and on the outside. The single circuit from the switches to the roof bushings leaves the structure below the switches and is mounted between the two transmission circuits. The wooden operating rods for the switches are interlocked by the horizontal operating handles.

The view shown in Fig. 5 is of a sectionalizing switching tower at the junction of six three-phase transmission circuits. Use is made of six three-pole single-throw air-break switches so arranged that any circuit leaving the tower may be cut out independently of the other circuits. No arrangement for paralleling the circuits is provided, the duplicate transmission lines being independently sectionalized on opposite ends of the tower.

# Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods and Current Practice Among Successful Utilities

## The Users of Electricity in Buffalo

A table which classifies about 10,000 of the residence consumers of electricity in Buffalo, N. Y., according to their monthly bills has been used by the Buffalo General Electric Company in newspaper advertisements such as that reproduced to show the public that electricity is an

### WHAT IT HAS COST 10,000 CITIZENS OF BUFFALO TO USE ELECTRICITY IN THEIR HOMES!

#### A TABLE THAT TELLS A TALE

Number of Bills	MARCH	APRIL	MAY	JUNE	JULY
UNDER \$1.00	1,845	2,043	3,062	3,022	3,328
\$1.00 EVEN	1,156	1,272	1,579	1,920	2,111
1.01 to \$1.49	2,954	2,999	2,727	2,717	2,472
1.50 to 1.99	1,532	1,526	1,295	1,379	1,004
2.00 to 2.49	794	798	640	565	424
2.50 to 2.99	583	578	432	398	216
3.00 to 3.99	387	363	295	238	167
4.00 to 4.99	168	142	106	106	64
5.00 & OVER	285	235	228	164	104
	9,706	9,976	10,414	10,469	10,140

THE ABOVE DATA WAS COMPILED FROM OUR RECORDS AND WE BELIEVE IT SHOWS CONCLUSIVELY THAT THE USE OF ELECTRICITY IS AN ECONOMIC NECESSITY.

If your house is wired, let us install Electric Service; if it is not, call for a proposition from an electrical contractor. You will be surprised to learn how reasonably and easily it can be done.

**BUFFALO GENERAL ELECTRIC COMPANY**  
ELECTRIC BUILDING WASHINGTON AND GENESEE STREETS

## ADVERTISEMENT OF BUFFALO CENTRAL STATION

economic necessity. In addition to giving an idea of the cost of electric service, this advertisement advises persons whose houses are unwired to find out how reasonably their homes can be equipped for electric service.

From March 1 to the beginning of August the number of bills for \$1.49 or less increased from 61 per cent to 82 per cent of the total. During the same period the number of bills for \$1 or less increased from 31 per cent to 58 per cent of the total, while those between \$1 and \$1.50 decreased from 30 per cent to 24 per cent.

## A New Electric Commercial-Vehicle Garage in Chicago

Electric automobile garages intended for the care of pleasure or passenger vehicles are not uncommon, but the number of garages intended for electric commercial vehicles and used for general public service rather than for the needs of private owners is very small. In Chicago a new garage has been established to serve commercial vehicles exclusively, and some features of this equipment are illustrated herewith. One complaint of the smaller users of electric wagons and trucks has been that there were few public garages where their vehicles were welcome; therefore any increase in the number of commercial-vehicle garages will be welcomed by all interested in the electric-vehicle industry.

The new establishment bears the name "Electric Service Garage" and occupies a building formerly housing the Scully Steel & Iron Company. It is situated near the corner of Halsted and Fulton Streets in the center of a district where the amount of trucking done is large. The building is illustrated in Fig. 1. The new garage is intended exclusively for electric trucks and has room for the accommodation of a large number of vehicles. It is supplied directly with direct current of a suitable voltage by the Commonwealth Edison Company, so that converting apparatus is unnecessary.

### Up-to-Date Machine Shop

Operated in connection with the garage is a machine shop equipped with modern tools and intended to provide means for making any kind of repairs to electric trucks. Fig. 4 shows the repair shop. At present this machine shop is used for general outside repair work, but as the truck industry develops it is expected that the shop will be kept busy on truck repairs exclusively. It is intended that this garage and the allied repair shop shall stand in the same relation to electric wagon traffic as a railway roundhouse and repair shop does to railway traffic. Heretofore electric-vehicle garages have been used principally for charging and washing pleasure



FIG. 1—THE "ELECTRIC SERVICE GARAGE," CHICAGO



vehicles, the facilities for making repairs being comparatively limited. The service obtained from these garages meets the requirements of the owners of pleasure vehicles, but commercial vehicles call for garage service of a different kind. Electric delivery wagons and trucks cannot be operated satisfactorily

the truck and in such a position that they can be inspected readily.

A feature of this new electric-service garage that deserves special notice is the arrangement for keeping battery-charging records. A record sheet (supplied by the Commonwealth Edison Company for the sake of en-



FIG. 1—1-TON TRUCK

where there are no facilities for making repairs quickly. In the new Chicago garage broken parts can be replaced on short notice by means of the 3.5-ton overhead traveling crane shown in Fig. 3. The body of the largest truck can be lifted from its chassis and replaced with very little trouble.

The wiring and construction work of this garage was all done by the men in the machine shop, who also did the work for the rather elaborate switchboard shown in Fig. 6. At the present time this board is equipped with only six charging outlets, but more charging apparatus is being installed. The charging outlets have a rating of 80 amp each and are arranged in pairs so that there are two outlets in each outlet box, as shown in Fig. 5. By means of a double-pole knife switch each pair of outlets can be operated in parallel to give "boosting" charges of 160 amp when necessary. The energy in each

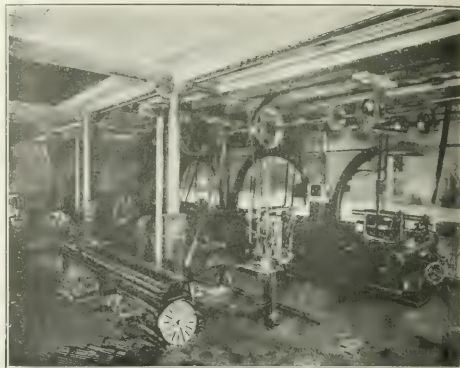


FIG. 4—REPAIR SHOP

couraging the keeping of such records) is fastened by means of thumb tacks to a thin board that slides like a drawer into a suitable cabinet. This cabinet is shown at the left in Fig. 6. A card and slide are provided for each car. When the charging of a vehicle is begun the slide is removed from the cabinet and is usually left on



FIG. 5—80-AMP CHARGING OUTLETS AND PARALLELING SWITCHES



FIG. 3—3.5-TON ELECTRIC OVERHEAD TRAVELING CRANE

charging outlet passes through a kilowatt-hour meter, and all electricity is sold on a meter basis at the rate of 5 cents per kw-hr. The 1-ton electric wagon used in repair work and shown in Fig. 2 was built in the garage shop. It is of the "motor-in-the-wheel" type, the batteries being placed at the sides of the body of

the seat of the car until all the data relating to the charge have been entered on it, when it is put back into the cabinet. This cabinet system, first used, it is believed, by the Rochester Railway & Light Company, is a convenient and satisfactory method of keeping charging records.

Application has been made for the official garage sign

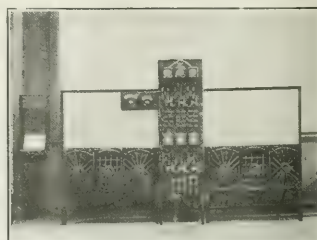


FIG. 6—SWITCHBOARD, SHOWING RECORD CABINET ON LEFT

of the Electric Vehicle Association of America. Mr. R. Macrae, electric-vehicle expert of the Commonwealth Edison Company, was consulted in relation to the designing of this interesting garage, the equipment and operating methods of which bear testimony to the growing appreciation of electric automobiles.

## Rates for Street Lighting and for Cooking

In a paper read before the New England Section of the National Electric Light Association on the economics of street lighting and electric cooking rates, Mr. R. S. Hale, of the Edison Electric Illuminating Company of Boston, emphasized the distinction between comparing total income with total expenses and comparing income from one kind of service with income from another kind. Street-lighting prices have been pretty well settled in New England upon a price-per-lamp basis. Suggestions that the price ought to be per mile of street or per square yard of street illuminated are almost always made by engineers or professors who are comparing, or who expect to compare, several kinds of lamps or systems. There is seldom any desire to leave the central station free to change the system. Changes in the number of hours seldom occur during the life of a contract, and when a company is supplying only one city, and no change in the number of hours is expected, there is no need of providing for such a change. If, however, a city has any idea of changing from a moonlight-midnight to an all-night schedule, or anything between, the method used by the Boston Edison company of a fixed price per lamp plus a running charge per lamp-hour accomplishes this perfectly. The latter gives a municipality the option of changing the schedule of hours without dickering for a new price.

A fixed charge alone is seldom used for cooking rates as it allows so much waste. The use of electric ranges and heaters designed to remain in service twenty-four hours a day has been suggested, but these have not been produced commercially, and probably never will be, because even with the best designs and the best insulation the wasted heat will be far more expensive than any saving which is possible by the use of such twenty-four-hour devices. The charge for cooking must, therefore, include some price per kilowatt-hour. The charge must decrease with quantity, since it will always cost the central station less to deliver in quantities than to supply in small lots, and the user of large lots will be able to use other means of cooking and pay nothing, rather than pay the retail price. Besides the charge depending on the energy used, it is possible to have another charge depending on the maximum demand or connected load, or some other feature. Neither of these methods has met with much success in getting electric-cooking business, as a charge depending on a maximum demand is apt to keep off business which has a high demand. If such business is absolutely unprofitable—that is, brings in less income than the whole increase in expenses—it is undesirable. If, however, it brings in more income than the increase in expenses, it is better to get some profit from it rather than none.

So long as a customer has a range that he may use, so that the meter and transformer have to be big enough, the extra cost to the central station of actually using 5 kw for one hour, as compared with 1 kw for five hours, is negligible. The better diversity-factor of the short-hour customer will in such cases balance the better load-factor of the long-hour customer. In the author's opinion, the future of the cooking and heating business lies in large units that will do the work quickly and remain on only a short time. A charge depending on the kilowatts will discourage such business and be undesirable. The best form of cooking rate is a straight kilowatt-hour rate with wholesale blocks. The first block should be the same as the lighting rate, so that there will be no temptation for the customer who only wants 1 kw-hr. a month for a heating pad to ask for this rate. A minimum will prevent this, but minima are undesirable. Generally in making electric-service rates prices can be cut until the company gets to a point

where any lower price will not bring in enough more business to pay for itself, and that is the lowest price to which the company can go without discrimination. Whenever a central station can make more money by discriminating between classes, and thereby reduce prices, it should be done. Discriminating between individuals will not make increased revenue if their conditions are alike. Prices for cooking and heating should be reduced until the business can be obtained, provided that the company makes a profit when it gets it. Cutting should continue until any further cut would increase expenses more than the increase in income.

In street lighting, a cut in price will bring but little more business. In Boston the cut in price of commercial and house lighting from 62.5 cents per 1000 cp-hr. to 20 cents, which is an average price to-day, has resulted in an immense increase in business. The cut in street lighting from \$300 for, say, 400 cp to \$103 for, say, 1100 cp has hardly increased street-lighting income at all, certainly not in proportion. The street-lighting and the ordinary business on the maximum rate are to-day least affected by competition. City councils can make a stronger effort than the scattered retail men, but it would seem that a low maximum price would do more good to the community than a low street-lighting price. If it could be brought home to the people that these balance each other and that every time a street-lighting price is forced down house-lighting reduction is postponed, it would help greatly.

### Discussion

Mr. J. E. Gray, Providence, R. I., contended that the first cost of electric ranges limits their rapid growth in popular favor. On account of the investment required to supply service to electric ranges scattered about a large territory, there should be a service or minimum charge combined with a low price for energy. The service charge should be low enough to encourage the use of the smaller sizes of ranges. The Providence contract permits the consumer to discontinue the use of an electric range after six months if he desires to do so, provided that he meets the cost of removing the service installation. Mr. A. E. Hibner, Portland, Maine, urged making rates on the basis of service cost instead of by comparing different classes of service. Mr. A. J. Campbell, Waterbury, Conn., agreed with Mr. Hibner, stating that a low price for cooking is the least justified of any of his company's rates. A motor-service rate of 1.5 cents bears as large a proportion of the expense the corresponding service creates as does a 10-cent lighting rate. A cooking rate can be justified only on the basis that if it pays any profit at all it is desirable. If the efficiency of electric ranges increases, it may be possible to raise the electric cooking rate per kilowatt-hour and still compete with gas. The speaker agreed with the author that large cooking units working quickly are likely to do the bulk of the work of the future. Mr. Campbell favored reducing street-lighting rates and keeping up the general lighting rate, as the cuts in the former tend to reduce agitation. Mr. W. P. Schwabe, Thompsonville, Conn., favored a block rate for street lighting in small communities, which enables the number of lamps to be varied in a flexible manner and offers the municipality the benefit of a decreased price per lamp on extensions to the system. Dr. A. S. McAllister, editor *Electrical World*, New York, pointed out the difficulties involved in charging separate cooking and lighting rates to the same customer, from the standpoint of explaining to the customer the reasons for the discrimination. He stated that the author presented a most logical argument for discrimination in rates but ignored the ammunition supplied thereby to agitators who may use it to the disadvantage of the industry.



## Illumination and Wiring

### Exterior Illumination of Ohio Capitol to Be Permanent

The electrical equipment which was employed to illuminate the exterior of the Capitol at Columbus, Ohio, during the recent State fair will be left as a permanent installation so that the building may be illuminated every night hereafter, thereby adding to the attractiveness of the central part of the city. High-power lamps outline the projecting cornice and the series of windows contained in the dome. The flagstaff is tipped with a 1000-cp nitrogen-filled unit, while the flag itself is illuminated by concealed lamps so that it can be seen from afar even at night. Energy for lighting the lamps will be supplied by the State from its state prison generating station.

### The Illumination of Coal Mines

By R. P. BURROWS

The application of the principles of industrial illumination in the lighting of a coal mine must be made in the face of conditions unusual and difficult to overcome. In fact, all of the conditions looked upon with disfavor by the illuminating engineer are rampant—low black ceilings, black walls, dust, smoke, and damp-

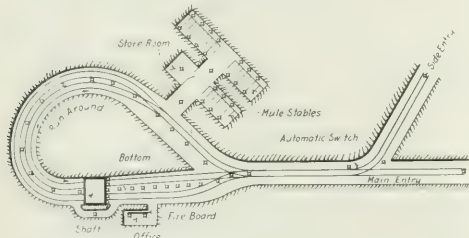


FIG. 1—PLAN OF MINE, SHOWING LOCATION OF OUTLETS

ness—but in spite of these very satisfactory results have been obtained.

An ordinary mine can be considered as composed of six parts, the bottom, the run-around, main entry, side entries, the mule stables, and offices, all of which are shown diagrammatically in Fig. 1. The lighting requirements of each of these divisions are distinct and will, therefore, be discussed separately. Since it is the means of entrance and exit for both men and coal, and accommodates more traffic than any other part of the mine, the bottom should receive the most attention of the lighting expert from the standpoint of both safety and convenience. In the main entry, through which all the cars must pass, the function of the lamps is not so much to furnish illumination as to silhouette objects which may obstruct the passageway. The side-entry ways, which are simply spurs extending out from the main entry, are lighted only where there is an exceptional amount of traffic, and even then only silhouette lighting need be employed. It is in this part of the mine that the actual work of coal mining is performed. The miners' cap lamp furnishes the necessary illumination for this work. The junction of the side entry and the main entry should receive special attention, for at this point there are switches and dangerous cross-over trolley wires to be brought into prominence. The run-around requires only sufficient light to make visible obstructions in the path of the empties as they leave the cages.

Fig. 2 shows a portion of a well-illuminated bottom and shaft opening of a typical mine, the view being from the bottom through the shaft into the run-around. The lighting of the shaft in this case was accomplished by employment of 40-watt tungsten-filament lamps equipped with angle reflectors placed above and across



FIG. 2—ILLUMINATION OF MINE WITH TUNGSTEN-FILAMENT LAMPS AND REFLECTORS

the shaft opening so as to direct the light on the cages, signal whistle, and beyond into the run-around. The maximum intensity is at the near edge of the cage, and the eyes of the workmen on this side of the shaft are not subjected to the glare of the lamps. Fig. 3 shows this same portion of the mine lighted by means of bare carbon lamps. It will be readily seen that these lamps do not distribute the light where it is needed, and in addition the glare of the bare lamps obscures that portion of the mine which lies beyond them.

The method of lighting that portion of the bottom where the "spragging" or braking and switching of the cars is done is shown in Figs. 2 and 4. Forty-watt lamps with shallow dome reflectors are placed above and between the two tracks. These units are spaced at 7-ft. intervals and are about 7 ft. above the floor. It



FIG. 3—ILLUMINATION OF MINE WITH BARE CARBON LAMPS

will be noted from Fig. 4 that the car wheels are well illuminated and that there is practically no glare. The lighting of this part of a mine should ordinarily be designed on the basis of from 4 to 5 ft.-candles at the floor, not so much because the nature of the work demands this intensity, but because of the greater safety

which results from ample illumination, and because the dust collects on the reflectors and lamps to such an extent as to decrease greatly the amount of light delivered. Another reason for using a high intensity as the basis of design is that in most mines the voltage fluctuates through wide ranges and the voltage drop is frequently of such magnitude as to cause excessive dimming of the lamps.

The run-around, which is shown in Figs. 2 and 4 beyond the shaft, is illuminated with 25-watt lamps equipped with shallow dome reflectors, spaced 15 ft. apart and 7 ft. from the floor.

The main entry is lighted with shallow-dome reflectors and 25-watt lamps spaced at intervals of about 300 ft., the height depending upon the height of the entry.



FIG. 4—ILLUMINATION OF CARS AND TRACKS

When the spacing falls near a side entry, use is made of two units, one to illuminate the switch and the junction, while the other illuminates a portion of both the main and the side entries and thereby tends to eliminate collisions.

The mule stables, being little more than caves with low roofs, are illuminated by means of 40-watt lamps equipped with angle reflectors placed against the back wall and as high as possible, one unit to each two stalls. In front of the stalls, opposite the angle units, 25-watt lamps with deep bowl reflectors are used to illuminate the feed boxes and the passageway.

The mine offices are small rooms usually containing a telephone. One 25-watt lamp equipped with a shallow dome reflector will furnish ample illumination for the interior, but some means should be employed for lighting the entrance, either an angle or a shallow dome reflector with a 25-watt lamp, so that it can be easily located in case of fire or accident. The fire-board in the office at the foot of the shaft should be well illuminated with one or two 25-watt lamps equipped with angle reflectors, the number depending upon the size of the board.

Frequent whitewashing of the walls of the bottom, offices, mule stables and run-around, and the walls for 3 ft. on each side of a unit in the entries, will greatly increase the illumination in these parts of the mine.

In order to obtain sufficient and properly directed light where the use of wall and ceiling reflection cannot

be relied upon, to keep the load on the generator as low as possible, and to maintain the most nearly constant intensity of illumination in spite of voltage fluctuation, only tungsten-filament lamps should be used in coal mines. Weather-proof enameled reflectors are necessary on account of the dampness, smoke and dirt. The reflectors in the bottom should be cleaned at least twice a week, and those farther in the mine not less than once a week.

The installation just described has proved highly satisfactory. With the adoption of modern methods of illumination by some of the more representative mines, considerable improvement may be looked for everywhere in the lighting of this important branch of industry.

### Separable Cable Connector

Very often in electrical work separable cable connections are desirable, especially in testing work or in making temporary connections. A mere makeshift is oftentimes worse than useless and may result in damage. The accompanying illustration shows a connector which is as simple as it is useful and possesses the advantage that when insulated it can be dragged about the floor with impunity. The cable ends to be connected are bared in the usual manner and inserted in

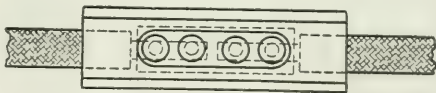


DIAGRAM OF SIMPLE CABLE CONNECTOR

the device, where they are held in place by duplicate set screws. For insulation a piece of rubber hose slightly larger in inside diameter than the connector is slipped over the device after one cable end is connected, and when the other cable end is inserted and fastened the hose is centered over the connector. It can then be held in place by ordinary friction tape.

### Recent Telephone Patents

A combined jack and mechanically restored drop has been patented by Mr. R. M. de Vignier, of Hollis Terrace, N. Y., his patent being assigned to the Western Electric Company. The tubular drop shell carries a lug which supports the jack springs. This shell is secured to the rear of a face plate to the front of which the shutter is fastened. A restoring spring is elevated through the deflection of one of the jack springs as a plug is inserted.

Mr. Louis Steinberger, of Brooklyn, N. Y., has patented an improved receiver shell, the cap end of which is molded within a threaded metal ring adapted to register with a corresponding internally threaded metal ring molded into the cap piece.

A combined advertising and mouthpiece-closing device for transmitters is the invention of Mr. C. Ross, of Chicago. This consists of a sheet-metal cover adapted to clamp upon the mouthpiece.



## Letters to the Editors

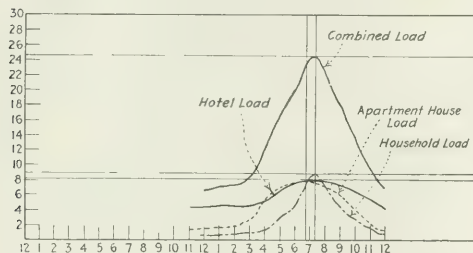
### Discrimination in Public Service Rates

To the Editors of the *Electrical World*:

SIRS:—At its recent June session the National Electric Light Association officially approved a principle or basis for rates for energy for lighting and motor service, in accordance with which "charges should be based on the value of the service to the user" and this value "should be determined by the amount at which the customer could serve himself."

The accompanying typical curves illustrate roughly the relative amounts of energy delivered to household, apartment and hotel customers of a central station during the peak hour at about 7 p. m. All of the energy is produced by the same engine, with the same fuel and supplies, and transported on the same wires at the same time. Each kilowatt-hour costs approximately the same amount whether it is consumed by those who live in private homes, apartments or hotels.

In Denver, Indianapolis, New York, and generally throughout the entire country, rates for electric energy vary from 2 cents to 10 cents per kw-hr., the lowest invariably being offered to hotels and apartment houses, and the highest to isolated domestic consumers—a difference of 400 per cent in the charge made for like and contemporaneous public services rendered "under similar circumstances and conditions."



CURVES SHOWING RELATIVE DISTRIBUTION OF ENERGY

The difference in the rate to the single householder and to the hotel or apartment customer is obviously based on the impracticability of the isolated family "serving itself"—or, in commercial phraseology, on "competition." The customer whose limited use does not justify the installation of an independent plant pays the highest, while the hotel or apartment which offers this (potential) competition invariably secures the lowest rate. Yet competition does not afford excuse for discrimination, since public service operations "are for the common and equal benefit of all persons wishing to avail themselves of the facilities which they afford." (Hardy vs. Cleveland & Marietta Railroad.) "This principle of equality forbids any difference in charge which is not based on a difference in service, and even when based on a difference in service must have some reasonable relation to the amount of the difference and cannot be so great as to produce unjust discrimination." (Western Union vs. McCall Publishing Company.)

The National Electric Light Association has gone on record as indorsing a principle for electric energy rates—"the value of the service to the user"—which manifestly means "unjust discrimination" and ignores or violates accepted judicial rules for making public service rates. According to fundamental accepted judicial opinion, all public service rates "must have some reasonable relation to the amount of difference" of the cost of the service rendered, and the value of the serv-

ice "to the user" does not warrant any difference whatever in the rates which such a corporation is authorized to impose.

The announcement of the "use value" theory as the basis of electric rates quickly developed a champion—the occasion afforded the opportunity to project the public utility into municipal politics. Mayor Blankenburg of Philadelphia has proposed a municipal league "which shall constitute an offensive and defensive alliance among the cities." The league has been formed to insure that rates and service for public utilities shall hereafter be based on the actual cost of providing and furnishing such services and "not on the power of a monopoly to extort what rates it will."

The domestic and isolated consumer is no less alive to the social injustice of selling a public service product, "under similar circumstances and conditions of cost," at prices which discriminate against him by 400 per cent. Whether the individual lives in a hotel, an apartment or an isolated house makes little difference in the cost of the energy which each class uses, and any attempt to impose a discrimination of 100, 200 or 400 per cent in price is obviously "unjust" and can hardly be defended either in social or political law.

Toledo, Ohio.

H. W. ASHLEY.

### Simplified Hyperbolic Calculations for Transmission Lines

To the Editors of the *Electrical World*:

SIRS:—The article by Mr. H. B. Dwight appearing on page 473 in the issue of the *Electrical World* for Sept. 5 is interesting as showing the different ways in which one and the same numerical problem may present itself to different engineers for solution. One computer will select one method of attack and another another. These preferences are likely to be found in all branches of applied mathematics and engineering. They will naturally depend upon the personality, training and mental habits of the different workers. The method cited in the article, following the line proposed in 1909 by Prof. T. R. Rosebrugh, will doubtless be useful in many practical cases, especially in dealing with transmission lines at ordinary working frequencies. The formula given is that of a hyperbolic cosine expanded in the form of a series according to Taylor's theorem, and with only a very few terms retained as necessary in such favorable cases.

It seems desirable in a discussion of this nature to consider more particularly the points under consideration on which all parties are likely to agree, and to eliminate, if possible, the matters on which differences of opinion are likely to multiply. We may perhaps all be able to agree to the following propositions if I correctly interpret the article of Mr. Dwight:

(1) The simplest fundamental formulas relating to high-frequency, long, uniform alternating-current lines in the steady state essentially involve hyperbolic functions.

(2) On short lines, at low frequencies, these formulas may be much simplified by expansions such as those of Professor Rosebrugh or those of Dr. Pender.

(3) Ordinary transmission lines, operating at standard frequencies, do not need to be dealt with by hyperbolic formulas if higher harmonics can be left out of consideration.

(4) Suitable sectional artificial lines of lumped resistance, inductance and capacity may advantageously be used in the laboratory, for the study of the behavior of actual transmission lines in the steady state.

Cambridge, Mass.

A. E. KENNELLY.

# Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

## Boilers for Peak-Load Conditions

In plants that are to be worked at high rates of evaporation it is important to select only those types of boilers which are free from stress due to temperature changes and which permit of easy renewal of tubes. It has been pointed out by engineers who have given this subject close study that when boilers are to be worked during peak-load periods at from 7 lb. to 10 lb. of water per sq. ft. of heating surface—that is, from two to three times the rating—the total cost of the boiler plant will be so greatly reduced that the very best boiler structure for the purpose can be selected without greatly increasing the cost of the plant. The cross-drum type of boiler offers advantages for high rates of working as the discharge from the upward circulation of steam and water is near the center of the cross drum and therefore near the normal water level, thus liberating the steam near the surface of the water, which permits of freer and more rapid circulation.

## First-Aid Equipment for the Injured

By G. O. SMITH

Every electric-service company should provide itself with equipment for giving relief to injured persons. Many of the first-aid kits which are being employed, however, are cumbersome, unsanitary or else do not contain enough articles to be useful on every occasion. Equipment should be selected which will serve as many purposes as possible. It should be inclosed preferably in a sanitary case, which, to be serviceable, should be small, portable and strongly made.

After investigating the first-aid equipments used by



FIG. 1—LARGE-SIZED FIRST-AID KIT

public utility organizations as well as those obtainable from manufacturers, H. L. Doherty & Company, New York City, have designed two sets which combine the advantages of all. One is a large kit intended for use in generating stations and substations or where construction work is going on. It can also be carried on service

trucks with a pulmotor to answer emergency calls. The other set, which is intended for use where the complete outfit would not be required, can be carried in the pocket or attached to a motorcycle when the trouble-man is provided with this means of transportation.

The large kit, which weighs only 3.5 lb., consists of

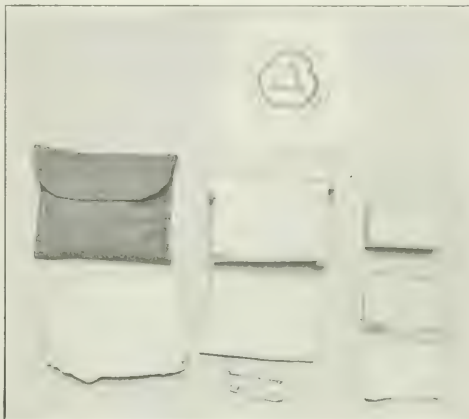


FIG. 2—SPECIAL FIRST-AID PACKAGE

forty articles inclosed in a strong metal case measuring 8.25 in. by 5.5 in. by 4.25 in. In the case are the following articles: Five collapsible drinking cups, one pair of wooden-tongue forceps, two sealed towels, one case of twelve vials of "Vaporole" aromatic ammonia, one jaw wedge, six 3-yd. rolls of 2.5-in. gauze, five 3-yd. rolls of 1-in. gauze, two 0.25-oz. tubes of "Borofax," two 0.25-oz. tubes of carron oil, two 2.5-yd. rolls of 0.5-in. adhesive plaster, one special first-aid package, four 0.25-oz. rolls of absorbent cotton, one 1-oz. package of sodium bicarbonate, one 2.5-yd. roll of 1-in. zinc-oxide adhesive plaster, one tourniquet, two tubes of effervescent sodium phosphate, one 1-oz. vial of aromatic spirits of ammonia, one spoon and one book of first-aid instructions.

The pocket-size kit weighs only 1.5 lb. and measures 7.5 in. by 1.875 in. by 4.5 in. It contains five drinking cups, one pair of tongue forceps, one towel, one case of twelve vials of "Vaporole" aromatic ammonia, one jaw wedge, two 3-yd. rolls of 2.5-in. gauze, two 3-yd. rolls of 1-in. gauze, two 0.25-oz. tubes of "Borofax," two 0.25-oz. tubes of carron oil, one 2.5-yd. roll of 0.5-in. adhesive plaster, one first-aid package, one 0.25-oz. roll of cotton, and one instruction booklet. The same sizes of units are employed in both sets to simplify the task of restocking the outfits.

The special first-aid packages inclosed in each of the aforementioned kits consist of a jaconet inclosing one triangular bandage, two sublimated-gauze compresses, one cambric bandage and two safety pins. Each employee may be equipped with one of these packages, which can be used to give temporary relief to an in-



jured person when the more complete kits are not available. The jaconet, which is made of special linen, protects the contents of the package from infection.

In order that each kit may be kept perfectly sanitary, only enough material is included in each unit for one dressing. The cases are sealed by the claim department or supervisor of safety of each company and are then distributed to the various departments. Whenever a kit is used the seal is necessarily broken, and hence it must be returned at once to the general office for replenishing. In the meantime a fresh kit is substituted so that there is always a complete kit on hand.

### Overcoming Difficulties in Paralleling Generators

Special switching apparatus is installed in the municipal electric plant at Owensboro, Ky., to facilitate paralleling the older reciprocating engine-driven units (rated at 300 kw and 500 kw) with the newer turbine-driven generator (rated at 1250 kva). This apparatus was required as it had proved impossible to raise the

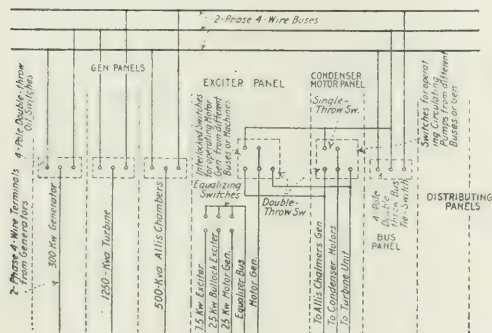


FIG. 1—DIAGRAM SHOWING SWITCH CONNECTIONS

frequency of the loaded reciprocating units to that of the incoming turbine-driven set, while, on the other hand, the turbine governors would not permit of lowering the turbine speed sufficiently for synchronizing. The system employed to synchronize the machines is to subdivide the distribution circuits into lamp and motor feeders so that the load may be divided between the

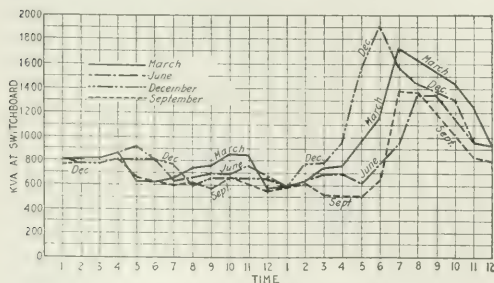


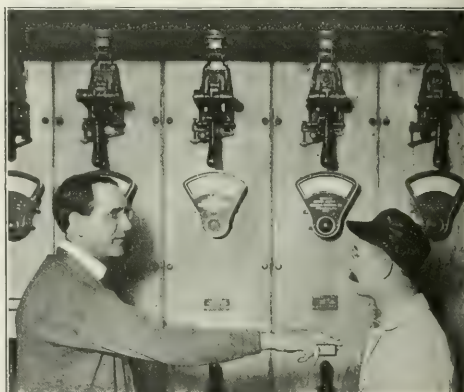
FIG. 2—TYPICAL LOAD CURVES

loaded and incoming machines to make their frequencies correspond, after which the units can be easily synchronized. In dividing the load before paralleling the machines only the lamp circuits are thrown over onto the incoming machines since in this way none of the synchronous apparatus need be thrown out of step and the lamps are subjected to only a momentary interruption of energy.

The switching equipment for the operations described above is shown in Fig. 1. It consists of (1) three sets of four-wire two-phase buses, one for each generator when operated separately or prior to synchronizing; (2) four-contact double-throw oil switches for each generator, permitting the connection of each unit to either one of two buses; and (3) a four-pole double-throw bus-tie switch. Each feeder switch is also arranged to feed its circuit from either one of two buses. These switches are connected so that load may be distributed over the three buses. Typical daily load curves for different times of the year are shown in Fig. 2.

### Don't Point at Anything Electrical

Pointing at electrical apparatus is dangerous, for the man making the gesture may overestimate the distance of the object singled out or his arm may come in contact with some other energized apparatus while his attention is distracted. The Rochester (N. Y.) Railway & Light Company has therefore instructed its employees not to point at anything electrical. When a man feels that he must point it should be at the person spoken to. The accompanying illustration, which



THE ONLY WAY TO POINT

shows pictorially the correct way to point—if point one must—is posted in conspicuous places about the system and leaves a more lasting impression in the minds of employees than would result from verbal instructions on the same subject.

### Effect of Reactance on Low-Power-Factor Feeder Circuits

Is it advisable to install protective reactors on feeder circuits feeding heavy induction-motor loads? How will the regulation be affected? S. C. L.

Reactors placed on low-power-factor feeder circuits affect the regulation by increasing the line drop to a greater extent than on high-power-factor circuits. In general, the higher the reactance, wherever placed, the poorer the regulation. To avoid trouble from this source a short-circuiting switch is oftentimes installed to shunt the reactor. This switch is provided with an automatic instantaneous device to open the switch and cut in the reactor in case of short-circuit. This arrangement is open to the objection that it does not protect the system from shock when surges occur. Better operating results will be obtained by improving the power-factor of the system. The main generators by this means will also be able to carry more load.

# Digest of Current Electrical Literature

## Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

### Generators, Motors and Transformers

**Magnetizing Current in Alternating-Current Magnet Systems.**—RUD. CZEVEK.—In presence of iron the magnetizing current of an alternating-current system is not sinusoidal on account of change in permeability. The author describes an approximate method of calculating the magnetizing current if the static magnetizing curve is known. The author makes use of the fact that the distortion of the magnetizing current is chiefly due to the third harmonic.—*Elek. u. Masch.* (Vienna), Aug. 2, 1914.

**Operating Characteristic Curves.**—An article by C. A. M. Weber giving operating characteristic curves of squirrel-cage and wound-secondary induction motors from actual tests, and an article by K. L. Hansen and C. G. Lewis on the speed characteristics of direct-current series, shunt and compound motors.—*Elec. Journal*, September, 1914.

**Transformer Design.**—H. DE PISTOYE.—An illustrated article on the calculation of the cooling surface of an oil transformer, giving a practical method for the calculation.—*La Lumière Elec.*, July 18, 1914.

**Engineering Evolution of Electrical Apparatus.**—In the present instalment of this illustrated serial J. S. Peck discusses the evolution of the transformer.—*Elec. Journal*, September, 1914.

**Mercury Vapor Converter.**—MAURICE LEBLANC.—An English translation of his French article on recent developments of the mercury-vapor converter in Europe and America.—*London Electrician*, Aug. 14, 1914.

### Lamps and Lighting

**Starting Current of Half-Watt Lamps.**—A. J. MAKOWER AND U. A. OSCHWALD.—An account of an ex-

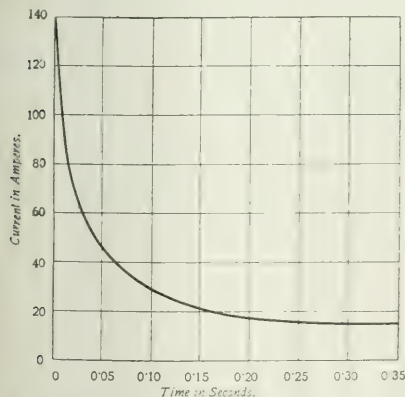


FIG. 1—CURVE SHOWING STARTING CURRENT FOR 1500-WATT, 100-VOLT HALF-WATT OSRAM LAMP

perimental investigation of the starting currents of two half-watt lamps, namely, a 1500-watt, 100-volt lamp and a 500-watt, 100-volt lamp. The resistances of these lamps measured cold were 0.5 ohm and 1.8 ohms, which would give maximum possible initial currents of thir-

teen and one-third and eleven and one-tenth times the respective normal currents. The actual maximum values of the currents obtained when switching on are about 70 per cent of these values. The oscillograms for the starting currents of the two lamps shown in Figs. 1 and

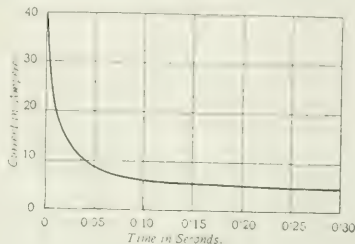


FIG. 2—CURVE SHOWING STARTING CURRENT FOR 500-WATT, 100-VOLT HALF-WATT OSRAM LAMP

2 were obtained photographically by a Blondel oscillograph driven by a special gearing to reduce the speed so as to get the whole starting period recorded on the plate. The maximum currents recorded in these figures are 140 amp and 37.5 amp, or nine and one-third and seven and one-half times the normal currents of the lamps. These figures are somewhat in excess of the values published for the older types of metallic-filament lamps, but the main difference in the behavior of the half-watt lamps lies in the length of time required for the current to reach its steady value. This time appears to be about 0.3 second and 0.2 second respectively for the two lamps under test, the length of time taken for the current to settle down being so much in excess of the time taken for the ordinary metallic-filament lamp with exhausted bulb that circuit-breakers are more liable to operate when switching on. To make the switching on certain the setting of the circuit-breakers must be much higher. In order to test this a circuit-breaker with adjustable time limit was set so as just to operate when switching on the 1500-watt lamp, and tests were made to determine the loads that would just operate the breaker with the same setting, (1) with a load that would give a steady current when switching on, and (2) with a load of ordinary metallic-filament lamps. It was found that with the setting that would just operate with the 15-amp half-watt lamp it took a steady current of 90 amp, continuing for about twelve seconds, or a load of metallic-filament lamps having a steady value of 28 amp, to cause the breaker to operate. Thus it appears that, comparing the adjustment of the circuit-breaker for both the types of metallic-filament lamps with the steady current adjustment, the circuit-breaker has to be set with the exhausted lamps for a current equal to two and two-fifths times the steady load, and with the half-watt lamps for a current equal to six times the steady load. This fact is of some importance in the design of protective gear for circuits supplying energy to half-watt lamps, and will necessitate the introduction of circuit-breakers with a specially long time-lag in their operation.—*London Electrician*, Aug. 28, 1914.



*Arc-Lamp Electrodes in England.*—Practically all of the electrodes in arc lamps used in English cities are imported from Germany and Austria. The (British) General Electric Company is capable of supplying from 10 per cent to 15 per cent of the electrodes used. Since the outbreak of the war its plant has been at work night and day practically manufacturing only for the British Admiralty, but now it is turning its attention to meeting the needs of the railways and the municipal authorities for street lighting. The expectation is to keep going that portion of public street lighting in which the more modern flame-arc lamps are employed. The use of the older open-type arc lamps will perhaps be no longer possible as the stocks of electrodes become exhausted, but in any case they would be superseded by either flame-arc lamps or metallic-filament incandescent lamps in the course of time.—*London. Elec. Eng'ing*, Aug. 27, 1914.

#### Generation, Transmission and Distribution

*Electric Disturbances in Transmission Lines.*—DAVID B. RUSHMORE and ERIC LOF.—A discussion of the disturbances which occur in the operation of transmission lines. In the first part the authors deal with the abnormal conditions resulting from excessive currents and in the second part with the abnormal conditions due to excessive voltage.—*Gen. Elec. Rev.*, August and September, 1914.

*Corrosion of Condenser Tubes.*—E. BATE.—A critical discussion of the cause of condenser-tube corrosion troubles from the author's experiences. The author's investigation leads him to the conclusion that pit-holes are formed by local action due to electro-negative particles on a surface positive to it. Such conditions can be set up in two ways—first, by segregation in the tube alloy, and, second, by deposit of external electro-negative particles on the tube surface. The author's evidence is in favor of the second explanation. The sea water is drawn in his case through considerable lengths of cast-iron tubing often quite untreated internally and thus liable to continuous corrosion. In this way, for instance, carbon particles may get into the condenser tubes and start corrosion. By paying proper attention to the cast-iron pipe system supplying the sea water the corrosion troubles could be remedied.—*Gen. Elec. Rev.*, September, 1914.

#### Traction

*Signaling on Railway Trains in Motion.*—Six brief descriptive papers read by French engineers before the (British) Institution of Mechanical Engineers, giving descriptions of methods in use by various French railways. The Northern Railway (Chemin de Fer du Nord) is dealt with in a paper by A. Sartiaux, who gives a description of the fixed ramp, the electro-automatic whistle on locomotives, and the electro-automatic indicator for trains passing distant signals. The Eastern Railway (Chemin de Fer de l'Est) is covered in a paper by F. Lancrenon, who gives a description of electrical warning and recording apparatus. A. Herdner describes electro-automatic warning and danger signal-recording apparatus on the Southern Railway (Chemin de Fer du Midi). A. Claveille states that on the state railways four safety devices are employed, namely, the Cousin system, the Van Braan system, the Augereau system and the "Est" type of apparatus. These different systems are still in the experimental period. The Paris, Lyons & Mediterranean Railway (Chemin de Fer de Paris à Lyon et à la Méditerranée) is covered in the paper by L. Marechal. E. Solacroup describes audible signals intended to repeat signals along the line, used on the Orleans Railway (Chemin de Fer de Paris à Orléans).—*London Eng'ing*, Aug. 14, 1914.

*Railway Signals.*—L. KOHLFUEST.—A long and pro-

fusely illustrated article on signal systems used in Germany on single-track street railways and light railways to indicate whether there is a car on a certain section of the road.—*Elek. Kraftbet. u. Bahnen*, June 24 and July 4, 1914.

#### Installations, Systems and Appliances

*Limiting Conditions for the Safe Use of Electricity in Coal Mining.*—W. M. THORNTON.—A paper read before Section G of the British Association at the recent meeting in Australia. The paper is a summary of recent researches on the limits of electric ignition of inflammable mine gases and coaldust. Electric signaling bells have inductance up to 0.5 henry and ignite gases at the trembler spark or signaling point. All electric lamps and fuses, however small, must be inclosed. Oscillations on a cable sheath caused by short-circuits on the conductor will not ignite gas, but maintained leakage arcs from armoring are only slightly more active than break-sparks. Neither static discharges from 6-in. high-speed belting nor the blue brush discharge from high-pressure conductors could be made to ignite gas. Movements of clouds of dust have been shown to give electrification and to cause sparks, but in order that this shall become dangerous the energy must be much greater than can be obtained experimentally. Wireless-telegraph operations on the surface do not induce sparking potentials underground.—*London Electrician*, Aug. 28, 1914.

#### Wires, Wiring and Conduits

*Air-Break Switch Tests.*—W. L. HAMMOND.—Air-break switches have been used for a number of years for opening high-voltage circuits. Owing, however, to their characteristics of producing large, long-sustained, flaring arcs when interrupting such circuits, electrical engineers have been reluctant to use them on important lines. Their characteristics require great spacing between adjacent phases for satisfactory isolation and also a comparatively long time for successful circuit interruption. It has, therefore, been the standard practice to use oil-break switches for practically all important switching operations, since they will successfully confine an electric arc to narrow limits and thus permit a great concentration of power-control apparatus and a more rapid interruption of the circuit. The recent development, however, of the small outdoor substation has opened an extensive field of application for air-break switches. In this case the low first cost of maintenance and simplicity of operation of the air-break switch makes it ideal, since it is used only occasionally for operations equivalent to emergency service. The author gives a description of some air-break switch tests conducted at Gainesville, Ga., for the Virginian Power Company. The switches tested consisted of one 110,000-volt switch and four 44,000-volt air-break switches of different types.—*Gen. Elec. Rev.*, September, 1914.

#### Electrophysics and Magnetism

*Effect of a Longitudinal Magnetic Field on Spark Potentials.*—R. F. EARTHART.—An account of an experimental investigation. The chief results are as follows: Spark potentials for pressures above the critical pressure are unaffected by a longitudinal field. Spark potentials below the critical pressure are decreased by a longitudinal field. When the pressure exceeds the critical one the existence of a longitudinal field requires a higher potential to maintain the discharges than if no field existed. These variations are increased with increasing fields and become larger as the gas pressure is increased.—*Phys. Rev.*, August, 1914.

**Hardening Steel.**—ANDREW MCCANCE.—A (British) Iron and Steel Institute paper in which the author gives an account of an experimental investigation into the variations in the properties (electric resistance, remanent magnetism, etc.) of steel of different carbon content, with the temperature of quenching, and investigates theoretically the actions which take place during the quenching.—*London Eng'ing*, June 12, 1914.

#### Electrochemistry and Batteries

**Copper Leaching.**—Abstracts of several papers presented at the Utah meeting of the American Institute of Mining Engineers on extended experimental work made in recent years on the leaching of copper ores. Among the methods of precipitating the copper from the solution electrolytic precipitation is discussed and compared with other methods.—*Met. and Chem. Eng'ing*, September, 1914.

#### Units, Measurements and Instruments

**Instruments.**—J. REYVAL.—The conclusion of his illustrated report on the recent annual exposition of the French Physical Society. In the present instalment descriptions are given of apparatus exhibited by Da and Dutilh (insulation tester, voltmeters and ammeters, frequency meters) and of apparatus exhibited by J. Carpentier (recording micro-galvanometer of Abraham, induction phase meter of Ferrié and Pestarini, a direct-reading instrument for measuring the resistance of rail joints, large-scale ammeters and voltmeters for switchboards, 100-megohm ohmmeter, universal electro-dynamometer and synchronizing apparatus).—*La Lumière Elec.*, July 4, 1914.

**Measuring Instruments.**—E. STACH.—An illustrated description of new measuring instruments for determining the pressure, speed and density of gases. An instrument for analyzing the ammonia content of liquids is also described.—*Glückauf*, Aug. 1, 1914.

#### Telegraphy, Telephony and Signals

**Experimental Studies of a Telephone Receiver.**—LEON BOUTHILLON AND LOUIS DROUET.—An account of an experimental investigation in which the displacement or vibration of the diaphragm of a telephone receiver under the action of an electric current was studied by fixing a little pin in the center of the diaphragm perpendicular to its surface and observing in the microscope its displacement or its vibrations. The authors studied the displacement of the diaphragm under the action of direct current, then the vibration of the diaphragm when sinusoidal alternating current was passed through the receiver winding, and finally the sensitiveness of the telephone receiver.—*Comptes Rendus*, June 2; *La Lumière Elec.*, July 4, 1914.

**Resonance Telephone Receiver.**—M. ALIAMET.—At the exposition of the French Physical Society the Camillerapp "resonance telephone receiver" was exhibited. As shown in Fig. 3, it consists of a vibrating diaphragm

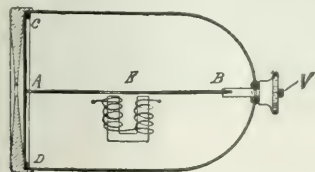


FIG. 3.—DIAGRAM OF "RESONANCE TELEPHONE RECEIVER"

CD, the center A of which is connected with the steel wire AB, the tension of which can be adjusted by means of a screw V. The telephone magnet and its coils shown at E act on the wire AB, which transmits its vibration to the diaphragm CD. The vibrations are

amplified by this method, which is analogous to that used in hot-wire voltmeters. By varying the tension of the wire it is possible to regulate the frequency proper of the diaphragm and to produce resonance for current of a given frequency.—*L'Electricien*, July 25, 1914.

**Wireless Telegraphy.**—A map showing the wireless-telegraph stations in America with special reference to Central America and South America.—*Elek. Zeit.*, July 30, 1914.

**Wireless Telegraphy.**—CAPTAIN FRACQUE.—The first parts of his lecture delivered before the officers of a regiment of the French Engineers' Corps. In the first instalments the author sums up various mathematical theorems the knowledge of which is necessary for a clear comprehension of the theory of wireless telegraphy.—*La Lumière Elec.*, July 25 and Aug. 1, 1914.

## Book Review

**APPLICATION OF ELECTRIC POWER TO MINES AND HEAVY INDUSTRIES.** By W. H. Patchell. 333 pages, illus. New York: D. Van Nostrand Company. Price, \$4 net.

This book is the outcome of a special course of lectures delivered by the author at King's College, University of London. It treats in a practical manner of the machinery and systems of distribution of special interest to the electrical engineer who specializes in mining work or who is interested in the applications of electricity to steel works or to machine tools. The last chapter in the book treats briefly of electric welding and electric furnaces. As indicated by the title, the writer is concerned with the applications of electric power and not with the theories of electric phenomena. Reference is made to the laws and regulations governing the use of electricity in mines. Such information is not only interesting but essential to the engineer engaged on the electrical equipment of mines; and this—and, indeed, other sections of the book also—is, of course, of special interest to the British engineer, since it is the practice of Great Britain that the author has mainly in mind. It is not suggested, however, that the book may not be of great interest to engineers in every part of the globe, notwithstanding that the installations referred to or illustrated are mainly in Great Britain or on the continent of Europe. There is an unfortunate tendency among engineers to suppose that the general practice in a particular country or district is necessarily the best under the conditions there encountered, whereas the fads of the day, the machines held in stock by local manufacturers and the want of initiative on the part of the engineer himself are frequently factors of considerable importance in the choice of plant or system. For these reasons a book such as the one before us, although it may treat the subject from the European point of view, should be welcomed by American readers. The language is clear and the descriptions simple and to the point, while the illustrations are on the whole excellent. The ground covered includes cables, coal cutters, hauling gears and winding engines, ventilating fans, air compressors and pumps. Chapter X is devoted to rolling mills, and it includes references to the reversing rolling-mill equipment of the Algoma Steel Company, of Sault Ste. Marie, Ontario, and to the continuous rail mill at Gary. Chapter XI treats exclusively of the applications of electricity to machine tools, cranes and heavy lifting magnets. The amount of ground covered is considerable, and the treatment is necessarily far from being exhaustive; but the material is well arranged and presented in an attractive manner.



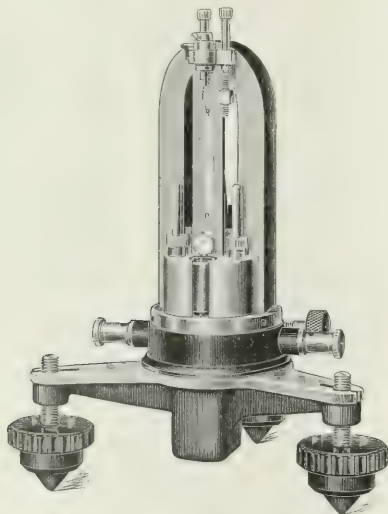
# New Apparatus and Appliances

## An Illustrated Descriptive Record of Recently Developed Manufactured Products of Interest to Electrical Readers

### High-Sensitivity Galvanometer

A high-sensitivity galvanometer of the D'Arsonval type is shown in the accompanying illustration. It is claimed by the manufacturers that with an instrument of 12 ohms internal resistance and an external critical damping resistance of 25 ohms in series a sensitivity per microvolt of 11 mm on a scale one meter away can be attained. The period of this instrument is 7.5 seconds. For work involving a high-resistance galvanometer it is declared that a sensitivity of 1 mm per volt across 10,000 megohms can be attained. The period for this instrument is 17.5 seconds.

The magnet is of steel with pole pieces of Swedish iron so shaped as to produce a radial field. Rough adjustment is effected by a thumb-screw on top of the



HIGH-SENSITIVITY D'ARSONVAL GALVANOMETER WITH COVER REMOVED

instrument. By turning a second thumb-screw on the base of the galvanometer a fine adjustment is secured without jarring the instrument. Under the small cap on the top of the case beside the screw used for rough adjustments is another screw by means of which the coil can be clamped to prevent damage to its suspensions when the instrument is being moved. The galvanometer is inclosed in a cylindrical nickel-plated case with a large window in front. In the illustration this case is removed. The instrument is mounted upon a hard-rubber base attached to a tripod. The tripod is supported upon three petticoat-insulated leveling screws, which, in addition to the hard-rubber base upon which the galvanometer is mounted, insure high insulation. As the air-gaps are large in comparison to the size of the coil, the instrument, it is declared, is quite easily leveled.

This galvanometer has been developed by the Leeds & Northrup Company, 4901 Stenton Avenue, Philadelphia, Pa.

### 1915 Model Electric Coupé

In the 1915-model, five-passenger car of the Buffalo Electric Vehicle Company, Buffalo, N. Y., the driver's seat is placed in the middle of the car, as shown in Fig.

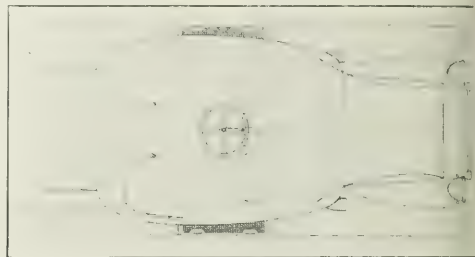


FIG. 1—SEATING ARRANGEMENT OF FIVE-PASSENGER ELECTRIC AUTOMOBILE

1. The control lever on top of the steering wheel is similar to the gas throttle of a gasoline car and is connected to an inclosed drum-type controller at the base of the steering column. In starting, use is made of a foot pedal which closes a switch, connecting the motor with the batteries through a resistance. This resistance is cut out step by step until a speed of 9 miles per



FIG. 2—FIVE-PASSENGER COUPÉ

hour is attained. For speeds above 9 miles per hour and up to 20 miles per hour the drum controller is used. When the foot pedal is pushed forward the energy supply is cut off and the brakes are applied. Five individual seats are provided. The two seats in the front are of the revolving type. On each side of the driver's seat slightly to the rear are two fixed seats.

### Shade Holders, Receptacles and Covers for Outlet Boxes

Various types of shade holders, receptacles and covers for outlet boxes have just been placed on the market by the National X-Ray Reflector Company, 235 West Jackson Boulevard, Chicago, Ill. The shade holders are made of stamped steel and are held in place by two screws

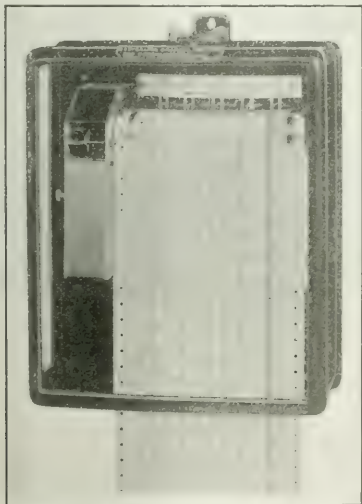


RECEPTACLE, SHADE HOLDER AND COVER WITH REFLECTOR ATTACHED

which thread into the box cover and keep the porcelain receptacle in place. Three types of holders are available. The receptacles are equipped with either sealed terminals or clamping terminals. The box covers are in 3-in. or 4-in. sizes and are punched and tapped for the receptacles.

### Service-Recording Instrument

An electrically operated instrument designed to record the production by machines in factories or the movement of rolling stock on railroads at certain points is being manufactured by the Esterline Company, Indianapolis, Ind. The instrument is equipped with elec-



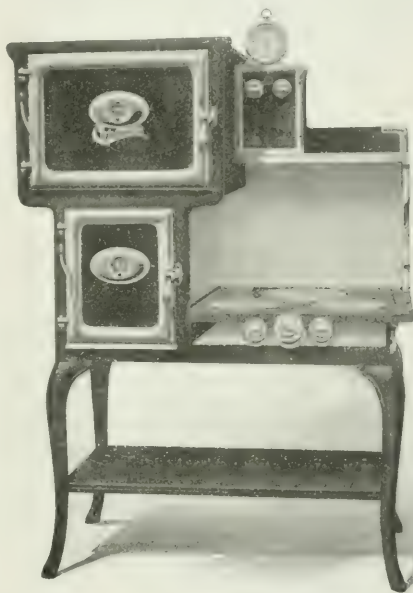
INSTRUMENT FOR RECORDING MACHINE PRODUCTION

tically controlled pens resting on a strip of paper which is driven through the meter at a constant rate by an eight-day clock. When a record is made the pen moves in a horizontal direction about 0.125 in., the pen returning to the zero position when the recording operation is completed. The resulting record is a series of short lines, the spacings of which represent the rate at

which operations are finished. This instrument can be installed in an office some distance from the machine. By means of a counting device the total number of operations for a certain length of time can be recorded.

### Electric Range with Elevated Ovens

An electric range with two elevated ovens is being placed on the market by the Copeman Electric Stove Company, Flint, Mich. The ovens are 18.5 in. wide, 13.5 in. high and 16 in. deep, and 10.375 in. wide, 13.5 in. high and 11.5 in. deep, respectively, and the larger oven is placed above the smaller as shown in the accompanying illustration. In the larger oven one heating element is used. This heater can be placed in the bottom for baking and boiling or in the top for broiling. This oven has two degrees of heat—high and low—which may be controlled automatically or by hand. A single heating unit is also used in the smaller oven, but



ELECTRIC RANGE

it is employed only for baking and boiling. The platform of the stove is equipped with two 8-in. heaters and one 10-in. heater, each having three stages of heat. The over-all dimensions of this range are: length, 43 in.; height, 59 in., and depth, 25 in., and its weight crated is approximately 400 lb.

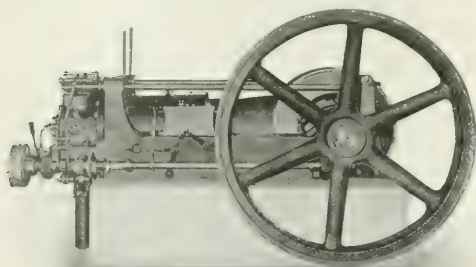
### Heavy Oil Engine

A horizontal four-stroke-cycle oil engine designed for heavy-duty operation is being made by the Wygodsky Engine Company, 115 Broadway, New York. By using a compression of not more than 300 lb. the manufacturers claim that they have been able to build an engine of comparatively light weight.

The engine bed is braced by steel tie rods which can be seen in the accompanying illustration. These tie rods serve as rails for a small device which acts as a traveling crane, thus permitting one man to replace or



remove heavy parts of the engine. The fuel is atomized by means of a hydraulically operated sprayer. At starting the gases are ignited by a hollow ring inclosed in the water-cooled cylinder head which is heated by a torch burning some of the same fuel used to operate the engine. As soon as the engine has made a few revolutions the heat of the piston plus the heat of the com-

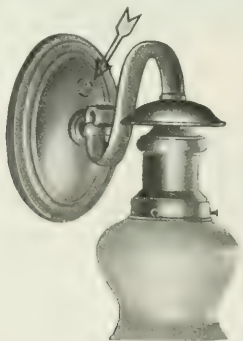


OIL ENGINE DESIGNED FOR HEAVY DUTY

pressed air in the cylinder is sufficient to ignite the oil. The governor is fixed directly to the cam shaft and is so designed that in case the engine should be reversed it automatically cuts off the supply of fuel. One of the features of this engine, the manufacturers declare, is its principle of self-starting.

### Canopy Fixture Switches

Formerly with the small push-and-pull canopy switches made by the Cutler-Hammer Manufacturing Company, Milwaukee, the circuit was closed when the button was pushed in, while when it protruded the circuit was open. There has been a demand also for switches operating in just the opposite way, and switches of this type have now been added to the company's standard line. These new switches are for use chiefly on wall brackets controlled with the ceiling chandelier by a wall switch. The wall brackets being



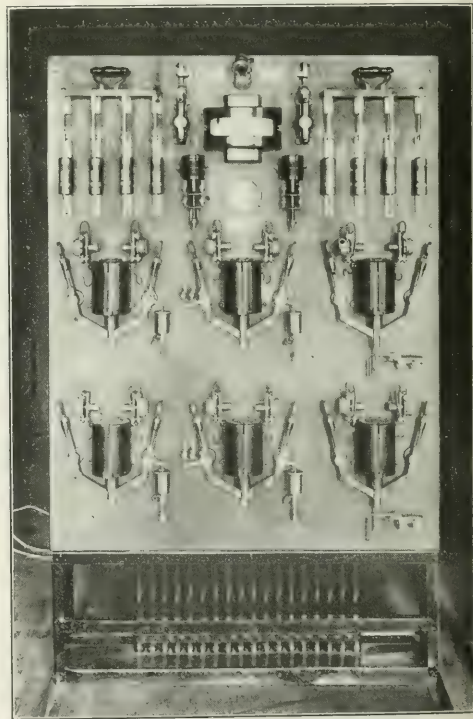
WALL-BRACKET LAMP WITH CANOPY SWITCH

used only occasionally, the buttons therefore remain pushed in. When the chandelier is lighted the circuit to the wall brackets is not closed unless the buttons are pulled out. The bracket shown in the accompanying illustration, which was made by R. Williamson & Company, Chicago, is equipped with one of these canopy switches having a reverse mechanism.

### Control Board for Air Compressors

In the accompanying illustration is shown one of two panels recently built by the Automatic Switch Company, 131 Liberty Street, New York, for the Pacific Flush-Tank Company, Chicago, Ill., for use in connection with a sewage-disposal system at Tampa, Fla. Each panel is equipped with two 30-hp, two-phase, slip-ring, pressure-regulating controlling devices.

In the center are shown a pilot lamp, wattmeter and pressure gage. On each side at the top are the Sylphon pilot pressure regulators, which operate on the bellows principle. Immediately below the regulators are single-phase relays for energizing the magnet main-line switches. The magnet main-line switches for the controllers are at the extreme right, and each is provided with a dash-pot "time element" for energizing the mag-



CONTROL PANEL FOR OPERATING COMPRESSORS

net of the first resistance-bridging switch shown immediately to the right. This switch is also provided with a dash-pot "time element" for timing the third switch, which is shown in the illustration at the extreme right of the panel.

When the third switch closes all resistance is cut out, and at the same time a valve is closed, setting the valves of the air compressor which the motor drives, thus putting the load on the motor as soon as all the resistance has been short-circuited. The timing of these switches is easily accomplished by changing the consistency of the oil in the dash-pots. The resistance is of the Whittingham sand-packed tubular type, placed beneath the frame, each unit being separately removable without disturbing the other units. The entire panel is supported by a channel-iron frame and stands clear from the wall without bracing.

### Loom Bushing

A bushing designed to hold flexible non-metallic conduit or loom in metal switchboxes or outlet boxes with  $\frac{5}{8}$ -in. knockouts is being made by the Chicago Fuse Manufacturing Company, 1014 West Congress Street, Chicago, Ill. The device consists of a single piece of metal as shown in Fig. 1. No screws or tools are neces-

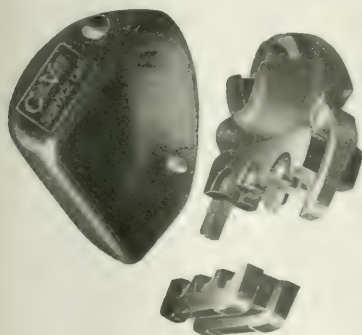


FIGS. 1 AND 2—LOOM BUSHING DETACHED AND IN POSITION IN SWITCHBOX

sary in its installation. This bushing may be inserted either from the inside or outside of the box. If the former, it is installed by pushing the loom in from the outside, spreading the bushing enough to let the sharp points pass over the end of the loom to the desired position, and then closing the bushing together until guiding prongs pass through the hole. A sharp pull on the loom from the outside will then draw the bushing into place. It cannot be pulled entirely through because of stops inside the box. It cannot be pushed back because the elastic fingers bear against the outside of the box. The loom cannot be moved in the bushing because it is held by sharp prongs forced into its outer surface. If it is desired to remove the bushing, the three elastic fingers on the outside of the box are depressed and the process of installing is reversed. To insert from the outside, the bushing is turned around and slipped over the loom, and the loom is then pushed into place from the outside. The bushing is made of spring steel and is plated to prevent corrosion.

### Service Cap

A galvanized-iron service cap for conduit fittings is being made by the Gillette-Vibber Company, New London, Conn. In installing this cap the frame portion is first screwed to the end of a conduit. The wires are



GALVANIZED-IRON SERVICE CAP DISASSEMBLED

then bent down into the two-part insulator, with which the cap is used. The grooves holding the insulator make insulator screws unnecessary. The cover is next applied by loosening one of the screws, placing it on the frame and tightening only one screw. The screws are burred over so that they cannot fall out. This cap can also be employed after the wires are connected if the

reduced section in the frame is cut out. The wires can then be slipped through the gap and the cap screwed on the pipe.

### Decorative Outdoor Receptacle

The outdoor receptacle shown herewith was designed for use on the Garden Pier, Atlantic City, and it was

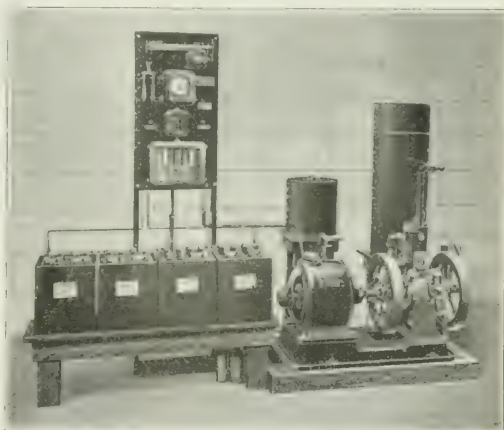


OUTDOOR RECEPTACLE

glazed a dark brown to harmonize with the tiling. The binding screws are well protected and are center-spaced so that the two wires can be bared at the same place. The wires are carried 1 in. above the surface. Drip holes are provided for the screw shell. The center contacts are of phosphor bronze. This receptacle was made by the H. T. Paiste Company, Philadelphia, Pa., for which the Hart & Hegeman Manufacturing Company, Hartford, Conn., is sole selling agent.

### Small Lighting Plant

A small lighting outfit with a continuous rating of 900 watts is shown in the accompanying illustration. The engine and generator are direct-connected, and they operate at 750 r.p.m. A sixteen-cell, 80-amp-hour battery is used. The switching mechanism is designed to start the engine and generator when the battery is half discharged or when a heavy load is thrown on the line, regardless of the condition of the battery, and to stop the engine when the battery is fully charged. A warning signal is given in case the engine stops on account of



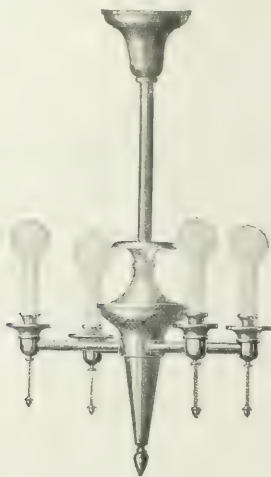
ELECTRIC-LIGHTING OUTFIT

lack of fuel or imperfect ignition. A voltage regulator designed to keep the emf constant within 2 per cent is employed. The total space required by this apparatus is 3 ft. by 7 ft. or 3.5 ft. by 6 ft., and the total weight is approximately 1240 lb. This lighting outfit is being placed on the market by the Strong Electric Company, Des Moines, Ia.



### Bottom-Outlet Pull Switches

In the accompanying illustration is shown an application of bottom-outlet pull switches on a multi-arm electrolier. This switch is also well adapted for use on wall brackets equipped with metal candles. The

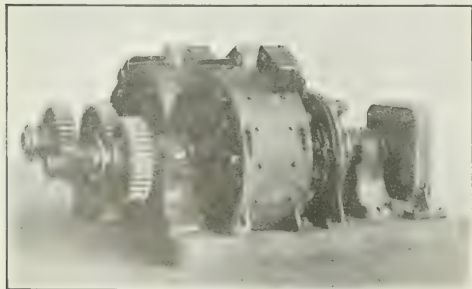


MULTI-ARM ELECTROLIER EQUIPPED WITH PULL SWITCHES

wires are threaded through a tubular supporting arm and thence through a 0.125-in. side bushing to the binding screws of the mechanism. This pull switch is made by Harvey Hubbell, Inc., Bridgeport, Conn.

### Electric Steering Motors

For the steering of large ships the Diehl Manufacturing Company, Elizabeth, N. J., has brought out the apparatus shown herewith, consisting of two 150-hp, 120-volt direct-current motors which operate singly or in unison as occasion requires. This apparatus is fitted with clutches so that an auxiliary steam set can be used in case of emergency. The motors can pull the rudder from "hard over" to "hard over," the manufacturers declare, in twenty seconds when the vessel is moving at full speed. Electric brakes are automatically applied in case the armatures are de-energized. When the rudder

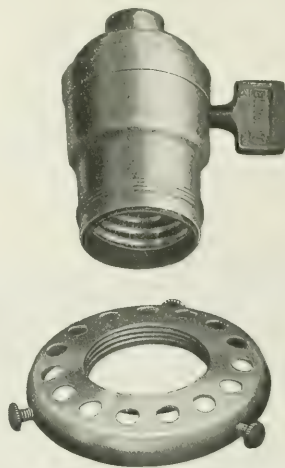


MOTORS FOR STEERING LARGE SHIPS

der is turned through 35 deg. it is automatically stopped by a device which cuts off the supply of energy; this does not prevent the motors pulling the rudder back to its central position and returning it to that point.

### Screw Shade Holder

A one-piece shade holder which can be screwed onto brass-shelled sockets or receptacles is being manufactured by the Bryant Electric Company, Bridgeport, Conn. All the brass-shell sockets and receptacles made



THREADED SOCKET SHELL AND SCREW SHADE HOLDER

by the above company are now equipped with threaded beads which, it is claimed, are as useful as ever for attaching old-style shade holders. In the accompanying illustration is shown a key socket with shell provided with threaded bead and a threaded "Uno" shade holder, as it is called. This shade holder is usually finished in old brass or brush brass, although polished-brass, rich-gilt, gold, silver and sand-blast finishes are sometimes employed.

### Pressed Steel Standards

Die-made standards are being placed on the market by the Union Metal Manufacturing Company, Canton, Ohio. The structure of these standards is massive, although the weight is comparatively light. The center of gravity falls within the base. The base, shaft and head are separate. The base is fastened to the ground by steel anchor rods, and the three parts of the standard are held firmly together by three tie rods. The bases, shafts and heads are interchangeable so that it is possible to use a number of different combinations. In the illustration is shown a single-unit standard for high-efficiency tungsten lamps.

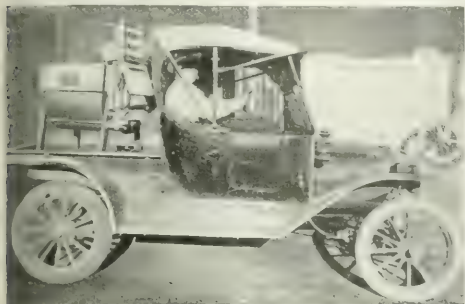


Since the advent of the high-efficiency lamps the sectional construction of these standards has made it easy to change from the cluster head to single-lamp units. In like manner, the manufacturers claim, it will be possible to take care of any new arrangement of street lighting that the future may bring forth. The manufacturers also declare that on account of the combined built-up, fluted, pressed-metal shafts, the steel anchor and the tie rods, the standards are shock absorbers, thus insuring safety and long life to the lamps and glassware.

## Jobber, Dealer and Contractor

### Selling Washing Machines by Automobile

A hustling believer in the value of live advertising is Mr. A. B. Keaton, of Santa Rosa, Cal., an agent of the Western Electric Company, who is reaping the benefits of quick sales, it is said, owing to his practical method of demonstrating washing machines by automobile.



AN UP-TO-DATE WASHING-MACHINE CAMPAIGN

Mr. Keaton travels from town to town with the washing machine in his automobile, as shown in the accompanying illustration. It can be easily removed and taken into the home of a prospective customer for a demonstration or left for a ten or fifteen days' free trial.

### Contractors of Louisville Organize

Permanent organization of the Electrical Clearing House of Louisville, which has been loosely organized since last March, was effected at its last meeting. This organization involved adoption of a constitution and by-laws, while the officers previously elected will hold on until the regular annual election, set for next June. Mr. C. C. Childers, of Childers & Waters, is president; Mr. F. G. Burdorf, of the Burdorf-Brecker Company, is vice-president, and Mr. E. C. Knoop, of the Kentucky Accrual Bureau, is secretary-treasurer.

The objects of the Electrical Clearing House are set forth as follows in one of the articles of the constitution:

"The fostering of trade among the electrical contractors; to reform abuses and to secure freedom from unlawful and unjust exactions; to settle differences between its members; to promote more enlarged and friendly intercourse between its members, and to diffuse accurate and reliable information among its members, better understanding between contractors and inspectors as to interpretation of the code."

The constitution sets forth that "the term 'electrical contractor' shall include all individuals, firms or corporations engaged in the electrical contracting business, who supply houses and local inspectors and representatives of the Louisville Gas & Electric Company." Eligibility is further limited, however, by the provision that before admission the applicant shall have been engaged in business for at least a year, unless some special dispensation is granted by the consent of the membership.

Nominal dues are provided to defray current expenses of the organization, and provision is made for appointment of standing committees which shall look to the publicity side of its activities, while there will be the usual other committees, including one on programs. It is planned to increase the attractiveness of the programs.

### Merchandising and Advertising

At the Narragansett Pier convention of the New England Section of the N. E. L. A., Sept. 2 to 4, there was an extended discussion of the report of the committee on merchandising and advertising of the association, as presented at the recent Philadelphia convention. Mr. R. N. Lee, Co-operative Electrical Development Association, New York, commended the space given in the report to window displays. He touched upon the large number of house-lighting campaigns now under way in New England which are bringing forth good results and advocated the demonstration rather than the sale of supplies directly by central stations. Mr. A. P. Maynard, Boston, outlined the relations between customer, buyer, salesman and advertising mediums, urging the selection of electrical goods as wedding presents and speaking from the standpoint of experience in the jewelry trade. An electric kitchen has been established in the Dexter Building, Boston, to facilitate merchandising. Mr. E. R. Davenport, Providence, R. I., recommended selling appliances at list prices and criticized jumbled displays. He commended using national advertising in windows. The profit on sales of portable lamps at Providence pays the rent of the Narragansett company's electric shop. Six thousand electric flatirons marketed at \$3.50 have been sold on the basis of \$1 down and 50 cents per month. The company designates a week each year in which appliances are sold at half price, and during this week 1130 electric stoves were marketed.

### Central Station Co-operates with Contractors to Wire Old Houses

The Louisville (Ky.) Gas & Electric Company has been conducting an old-house-wiring campaign in which its solicitors have until recently turned over all contracts to one electrical contractor for execution. This arrangement, as might be expected, did not meet with the favor of other contractors who were receiving no benefit, so the contracts are now divided among all members of the local Electrical Contractors' Association.

The electric-service company's new-business solicitors continue, as they have been doing since the campaign started in February, to make estimates on house-wiring installations and to sign contracts. These are turned in to the manager of the commercial department, who apportions them among the association contractors. A record is kept of all business sublet in this manner so that any contractor participating in the campaign may get for himself any desired information regarding this matter.

Meetings are held at the company's office every Saturday afternoon, at which the contractors and solicitors are brought into contact and have an opportunity to discuss matters which may be of benefit to both. Under the old arrangement, whereby all of the work went to one concern, operations were hampered somewhat by the activities of the other contractors. Now, however, there is a tendency to leave the electric-service company's solicitors alone in the field while the contractors center their efforts on business houses and new construction. The solicitors canvass only the territory along old distribution lines and do not attempt to secure contracts for wiring new houses or buildings along recent extensions to the distribution system. From the time the campaign started up to the first of September, 1645 contracts, valued at \$71,322, were secured. Relations between the electric company and the contractors are pleasant and the best of feelings prevail.



# Industrial and Financial News

## Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

**Lamp Company's Increased Business.**—The Lux Manufacturing Company, 1328 Broadway, New York, has noted an increase in its tungsten-lamp sales, which is said to result on account of the European war and the consequent elimination of German and Austrian competition.

**Electrical Exhibit at the Panama-Pacific Exposition.**—Mr. W. J. Marland, electrical and mechanical engineer, Oakland, Cal., will have on exhibit in the palace of machinery at the Panama-Pacific International Exposition various electrical and mechanical appliances. This exhibit will be in charge of salesmen who are linguists and will be able to talk with foreigners interested in the devices on display.

**Electricity to Operate Gasoline-Engine Display.**—The irrepressible electric motor is used to operate a gasoline engine for window display purposes in a New York gas-engine dealer's store. The engine, which is of the four-cylinder marine type, is mounted conspicuously on a platform with a propeller connected to its moving shaft. Belt-connected to the flywheel is a small motor placed beneath the platform.

**New Refrigerator Company Working on Improvements.**—The Montclair Refrigerating Corporation, Woolworth Building, New York, which was formed last February, has been busy all summer making improvements on its electrically operated refrigerator until now the apparatus is about as complete as the manufacturers can make it. A large number of orders have been received, which presages well for the company's future business.

**Home Exhibition One-Tenth Electrical.**—An exhibition devoted to the exploitation of foods and household appliances was recently held at the Coliseum in Chicago and was well patronized by manufacturers of domestic electrical appliances. Motor-driven washing machines, ironers, pianos and vacuum cleaners were displayed in many booths, and the fact that approximately one-tenth of the exhibit space was occupied by these devices indicates how wide awake are the manufacturers of these household goods.

**Dish-Washing Machines for Department-Store Restaurants.**—The Bromley-Mercedes Manufacturing Company, Broadway and Thirty-fourth Street, New York, is selling a number of its large-sized, electrically operated dish-washing machines to hotels, restaurants and hospitals. Installations have recently been made in the stores of Lord & Taylor, Stern Brothers and B. Altman & Company, all of New York. These machines are often featured in conjunction with other electrical apparatus to exemplify the progressiveness of the firms.

**Mississippi Valley Co-operation.**—Addressing the Chicago Jovian League on Sept. 21, Mr. M. B. Trezevant, general manager of the New Orleans Association of Commerce, said that New Orleans is willing to co-operate with Chicago and the Central West to establish a great banking and trading corporation to foster export trade, particularly that with Central America and South America. He said that New Orleans has a serious purpose in establishing intimate relations with the manufacturing and banking interests of Chicago and the Central West.

**Banking and Credit in South America.**—A bulletin has been issued by the Bureau of Foreign and Domestic Commerce, Department of Commerce, giving information on the banking systems maintained in Argentina, Brazil, Chile and Peru. The bulletin contains lists of the principal foreign and native banks in these countries, a brief description of their monetary systems, a summary of their foreign trade, a brief outline of their banking laws, and a discussion of banking practice, credit-information service and exchange methods. A chapter is also devoted to a discussion of the

various methods suggested for establishing American banks in these countries and their field of operation.

**Gas-Filled Tungsten Lamp Contract Awarded.**—The Lincoln Park Commissioners, Chicago, Ill., have awarded a contract for 3000 15-amp, 400-cp gas-filled tungsten lamps dividing the order equally between the Westinghouse Lamp Company and the Edison Lamp Works of the General Electric Company. Quoting on the entire 3000 lamps, all bidders asked \$4.15 a lamp and offered 31 per cent discount. Since the order has been divided, however, it is understood that the discount will be reduced to 29 per cent. Delivery of the first 200 lamps is to be made within two weeks of the date on which the contract was awarded, 100 lamps a week being furnished thereafter till 1000 are delivered, and the remainder are to be supplied at the rate of fifty lamps a week. Mr. Claude H. Shepherd, electrical engineer for the Lincoln Park Commissioners, says that specifications for compensators to be used with these lamps have been practically completed.

**Silent-Call Signal System for Hospitals.**—A lamp signal system designed particularly for use in hospitals has been developed by the Bryant Electric Company, Bridgeport Conn. The patient presses a push-button attached to the end of a cord which simultaneously lights incandescent lamps at various points—outside the room or ward door, at the nurse's desk, and elsewhere if desired. The registration of the call is indicated to the patient by an illuminated bull's-eye. All the signal lamps incident to a given call remain lighted and cannot be changed until reset by the attendant at the calling station by the bedside where the call originated. Thus a check can be maintained on the attendant's service and those in charge can determine whether the patients are receiving proper attention. Among the hospitals using this system are the Samaritan Hospital, Troy, N. Y.; the Swedish Hospital, Minneapolis, Minn.; the Lakeside Sanitarium, Oshkosh, Wis.; the Robert W. Long Hospital, Indianapolis, Ind., and the Cincinnati General Hospital, Cincinnati, Ohio.

**Waterwheels for Many Uses.**—Among the more important and recent sales of the Trump Manufacturing Company, Springfield, Ohio, are those to the Susquehanna County Light & Power Company, for three low-head wheel with overhead harness work; the United States Government, for four special turbines to be installed at Lock and Lock 9 on the Ohio River, and the Bark River Electric Light & Power Company, Sullivan, Wis., for two turbine with bevel-mortise gears and harness. Other purchasers were the Whiting-Plover Paper Company, Menasha, Wis. three 62-in. vertical wheels; the Oswego River Paper Mill Company, one 56-in. wheel, and the Yeazell Baldwin Flouring Mills and the M. R. Grinnell Flouring Mills, one unit each for flouring mills in villages near Springfield, Ohio. This company has also just received an order for five large sized turbines and accessories from Karachi, India. For this order the company had to compete with German manufacturers, who, however, were eliminated on account of the European war. It is expected that this equipment will be ready for shipment Dec. 1.

**Lake Copper Versus Electrolytic Copper.**—In a paper read at the Chicago convention of the American Institute of Metals on Sept. 10, Mr. Lawrence Addicks, of Douglas, Ariz., in comparing Lake copper and electrolytic copper said: "It is now generally admitted that high-conductivity Lake copper cannot be distinguished from electrolytic copper, while low-conductivity Lake is really an alloy of copper with arsenic, which has certain desirable properties for special uses." Mr. G. H. Clamer, of Philadelphia, asked

why Lake copper sells at a premium over electrolytic if there is no actual difference. Mr. W. H. Bassett, of the American Brass Company, Waterbury, Conn., in answer said that the electrolytic people contend that there should be no premium. The Lake people have argued that inasmuch as Lake copper is a natural deposit it has a longer grain than the electrolytic. Mr. Bassett thinks that probably the whole difference lies in the care with which the product is handled in the refining process. Buyers soon ascertain by experience the reliability of the producers.

**Model Home Electrical Kitchen for New York Show.**—Wells, Mowbray & Newman, Inc., 125 West Forty-second Street, New York, manufacturers of electric ranges, will have on display at the electrical show in New York, Oct. 7-17, a model kitchen equipped with electric range, electric dishwasher, cook's table with electric plate warmer, electrically heated steam table, electric refrigerator and ice-making machine and other up-to-date apparatus. Emphasis will be placed on efficient arrangement of the different appliances. It is the contention of Mr. Wells, of the above firm, that the kitchen of the average home is not what it ought to be and in most places it is fifty years behind the times. With the kitchens in most hotels, he states, it is different, and the hotel managers have made the most of their equipment and the space available. In the salesroom of this firm at the above address there is a model hotel kitchen equipped with various electrical devices. Frequent demonstrations are made to chefs of leading hotels and other interested persons to point out the advantages of electricity for cooking purposes.

**The Recently Organized Wisconsin-Minnesota Light & Power Company.**—Some further information of interest in relation to the new Wisconsin-Minnesota Light & Power Company is given in the recent annual report of the American Public Utilities Company, to which the former company is subsidiary. The Wisconsin-Minnesota company is the successor of the La Crosse (Wis.) Gas & Electric Company. It has further acquired all the properties of the Chippewa Valley Railway, Light & Power Company and the Chippewa Valley Construction Company. There was issued for the acquisition of the new properties and for the retirement of the outstanding bonds of the La Crosse Gas & Electric Company and the Chippewa Valley Railway, Light & Power Company \$3,750,000 of bonds, \$1,500,000 of 7 per cent preferred stock and \$538,000 of common stock. The American Public Utilities Company retained the common stock. The increase in earnings of the Chippewa Valley Railway, Light & Power Company has been very rapid during the last five years, the gain in earnings from 1905 to 1912 being 367 per cent. On the Chippewa River there are three water-power sites, with an aggregate head of 132 ft., said to be capable of producing 85,000 electrical hp. It is stated that these sources of energy are only 90 miles from St. Paul and Minneapolis. On the Menomomie River, 65 miles from St. Paul, the company owns three water-power sites with an aggregate head of 102 ft., said to be capable of developing 30,000 electrical hp. The directors of the American Public Utilities Company say: "The importance of this water-power, the only large undeveloped power within equal transmission distance from the Twin Cities, can hardly be overestimated." The Railroad Commission of Wisconsin has approved the organization of the Wisconsin-Minnesota Light & Power Company and has agreed to issue additional securities as water-powers at present undeveloped are utilized.

#### NEW YORK METAL MARKET PRICES

	Sept. 15	Sept. 22
Copper:		
Prime Lake	12 1/4 to 12 3/4	12 1/2 to 12 3/4
Electrolytic	12 1/4 to 12 3/4	11 7/8 to 12 1/2
Casting	12 1/4 to 12 3/4	11 7/8 to 12 1/2
Copper wire base	13.50 to 13.75	13.25 to 13.50
Lead	4 00 to 4 15	4 00 to 4 15
Nickel	40.00 to 45.00	40.00 to 45.00
Sheet zinc, f.o.b. smelter	8.50	8.50
Spelter, spot	5.40 to 5.50	5.25 to 5.35
Aluminum, 98 to 99 per cent	19.00 to 19.50	18.50 to 19.00

#### COPPER EXPORTS

Total tons to Sept. 22	11,897
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†Nominal.

Note.—The New York Metal Exchange and the London Metal Exchange have been closed until further notice. No reliable quotations on old metals can be obtained for the present. There is no buying in this market.

## Corporate and Financial

**Washington Water Power Company's Dividend.**—The Washington Water Power Company, Spokane, Wash., declared a quarterly dividend of 1% per cent, payable on Oct. 1. This is a reduction of 25 cents a share, making a total of 7% per cent in dividends for 1914.

**Deferred Action on Common Dividend.**—The United Light & Railways Company, Grand Rapids, Mich., has deferred action on the common dividend indefinitely on account of unsettled conditions. Mr. Frank T. Hulswit, president of the company, stated in respect to the dividend: "We have earned sufficient to pay it and we have the cash, but prefer to take the conservative course now and cannot say when the next common dividend will be declared."

**Electric Utilities Declare Regular Preferred Dividends.**—The following companies have declared their regular quarterly dividends on preferred stock, payable on Oct. 1: The United Light & Railways Company, Grand Rapids, Mich.; the Asheville (N. C.) Power & Light Company, the Carolina Power & Light Company, Raleigh, N. C. and the Eastern Michigan Edison Company, Detroit, Mich. The Detroit (Mich.) Edison Company has declared the regular quarterly dividend, payable on Oct. 15.

**Peruvian Company's Income.**—The income of the Lima (Peru) Light, Power & Tramways Company, known in Peru as the Empresas Electricas Asociadas, for 1913, amounted to \$1,974,844, being an increase of \$165,002 over 1912 as compared with the \$5,404 excess of 1912 over 1911. Operating expenses and other charges amounted to \$1,056,665 in 1913 and \$981,105 in 1912. Thus the net profit in 1913 was \$918,179, as against \$823,737 in 1912. The increase in gross profits from the electrical service department for 1913 amounted to \$28,118, while the operating costs were \$2,127 less in 1913 than in 1912. The decrease in operating expenses was attributable to a smaller fuel oil consumption owing to the increased power secured from the River Rimac and the advantageous operation of the high-tension lines between Chosica and Lima. The company has recently been reorganized with Dr. Prado y Ugarteche as general manager and practically has a monopoly in Lima, Callao and suburban towns.

**Monterey Railway, Light & Power Company.**—The annual statement of the Monterey Railway, Light & Power Company, Monterey, Mexico, covering as it does the time that it was in the midst of the Mexican war, is of great interest. Net earnings for 1913 amounted to \$444,251. After meeting fixed charges and interest and providing for a 5 per cent dividend of preferred stock there remained a balance of \$127,251, thus increasing the surplus to \$601,098. From this was taken \$150,000 and placed to reserve for contingencies, making that fund \$450,000 and leaving a credit to profit and loss of \$451,098. The directors consider the fact that, apart from the question of exchange, the interest on the outstanding debenture stock was earned exceedingly satisfactory. It was stated that the year promised to show a large increase over 1912, many large contracts having been signed. However, the disturbance in commercial affairs overcame all of this. During the period of hostilities operation of the plant was not discontinued.

**Idaho-Oregon Light & Power Company.**—In regard to the plan of the bondholders of the Idaho-Oregon Light & Power Company, of Boise, Idaho, to bid in the property at the sale Sept. 30, as noted in our issue of Sept. 12, Mr. W. J. Ferris, receiver for the company, has made the following statement: "The court's decision removes all question as to the stability of the Idaho-Oregon company. Another factor that will add to the strength of its position is the completion of the Oxbow power plant. It will be in operation for some time prior to the sale. This means that when the bondholders bid on the property they will be bidding on a concern fully equipped to render the service required of it. At present the company is buying during the irrigation season 3000 hp. With the completion of the Oxbow plant it will have a surplus of 2000 hp, since the Oxbow plant will develop 5000 hp. Thus the company is able to cover its field, and with Judge Dietrich's decision on the disputed bonds the way is cleared for the Idaho-Oregon company's bondholders to bid in the property and protect their investment."



**English Company Defers Interest.**—The Alabama Traction, Light & Power Company deferred the interest due on Sept. 1 on its \$10,914,400 first-mortgage 5 per cent fifty-year bonds. The company now has its hydroelectric plant in operation, and the board of directors feels confident the motor-service contracts now on hand and the other utilities' earnings will be sufficient to cover bond interest and operating expenses. However, additional capital must be expended on the distribution circuits before several of these contracts will become productive. The board considers that it has resources enough for that expenditure and that they should be reserved for that purpose. The board feels warranted in assuring bondholders that the condition is but temporary and that it is justified in conserving all its cash resources in such abnormal times. The bondholders will be notified, as soon as the situation permits, of definite plans for the payment of the deferred interest.

**Electric Utility Bonds and Notes.**—A compilation published in the *Wall Street Journal* shows that by the end of 1915 \$48,878,000 in notes and bonds of electric utility companies will have matured. Of this amount \$6,270,000 mature in 1914 and \$42,608,000 mature in 1915. The largest issue maturing this year is the 6 per cent note issue of the United Light & Power Company of New Jersey for \$2,150,000, due Dec. 1. During 1915 the large issues maturing are the Pacific Gas & Electric Company's 5 per cent collateral trust notes amounting to \$7,000,000, due March 25; the United Gas & Electric Company's 5 per cent notes amounting to \$6,264,000, due April 1; the Portland Railway, Light & Power Company's 5 per cent notes amounting to \$5,000,000, due May 1, and the Pacific Light & Power 5 per cent collaterals amounting to \$6,238,000, due July 1. The smallest issue is for \$220,000, being the United Light & Railways 6 per cent notes due Jan. 1.

**Public Service Corporation of New Jersey.**—At the last meeting of the board of directors of the Public Service Corporation of New Jersey, at which the regular dividend was declared, Mr. Thomas N. McCarter, president of the company, took occasion to refer to what he considered the excellent condition of the company in view of existing general business conditions. He pointed out that while a number of steam railroads and utility companies were showing decreases in gross earnings, the Public Service properties for eight months in the year showed actual increases which, though not so large as normal annual gains, were very gratifying as compared with the statements of similar properties. Taking the records of this year and recalling the conditions which existed during the period of depression in 1907, when the company's business stood up in a gratifying manner, Mr. McCarter expressed the opinion that these facts could be taken as an evidence of the inherent strength of the property and an indication that its securities will appeal with greater force to the investing public when business conditions can reach a normal state.

**Utah Securities Corporation Buys Property.**—The Utah Securities Corporation, a holding company controlled by the Electric Bond & Share Company, has acquired from the Oregon Short Line Railroad 98 per cent of the capital stock of the Utah Light & Railway Company, of Salt Lake City. The other 2 per cent is held elsewhere, and the Utah Securities Corporation is seeking to acquire the remainder on the terms accepted by the Oregon Short Line. The securities company also owns the Utah Light & Power Company, of Salt Lake City. Pending the decision of the city on franchise consolidation the two companies are to be kept entirely separate, however. The two companies do not compete in Salt Lake City. The Utah Power & Light Company has never pushed its franchise privileges in that city. In Ogden, Utah, however, the two companies will continue to compete until a consolidation is effected. The new company which has been organized to take over the Utah Light & Railway is called the Salt Lake Light & Traction Company. Should Salt Lake City permit the consolidation of the franchises of the two companies, they will then probably be consolidated in one company of two departments—the light and power department and the railway department. The properties as acquired in Ogden from the Oregon Short Line were in excellent condition with the exception of the gas department, which had not been developed as well as the other departments.

## EASTERN COMPANIES' GOOD SHOWING

### July Returns from Central-Station Companies Operating in Atlantic States Best for Half-Year Period

In reviewing the returns received by the *Electrical World* from the electric utility companies operating in the Atlantic States over a six-month period, July is seen to have been the best month for central stations in that region. Although May showed up exceedingly well in income increase—in fact, better than did July—a glance at Table II will reveal this to be due entirely to the activity of three large companies in New York, New Jersey and Pennsylvania. The rest of the industry for May, while showing good increases, was not in such a prosperous state as it was in July. Also, during July the separate companies seemed each to be growing at the same rate, namely, about 12 per cent.

During June the Middle Atlantic companies were not growing nearly so fast as the South Atlantic companies. Their actual growth in income and output, to be sure, was larger, but their percentage rate of growth was smaller. In July the Middle Atlantic companies improved and almost tripled their growth rate, thereby bringing the two sections of the Atlantic States more nearly into unison.

The figures found in Table I are not comparable. They represent all the returns received by the *Electrical World*, starting with the month of February. However, they do for the most part represent the same companies. The great

TABLE I—RETURNS RECEIVED FROM CENTRAL STATIONS IN ATLANTIC STATES OVER A HALF-YEAR PERIOD

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
July (70 per cent of industry) . . . . .	\$6,179,186	\$5,483,319	12.7	264,856,199	236,068,939	12.2
June (70 per cent of industry) . . . . .	6,067,780	5,728,381	6.0	244,936,886	221,315,464	10.8
May (68 per cent of industry) . . . . .	6,492,767	5,628,718	14.5	259,098,542	238,733,320	8.4
April (65 per cent of industry) . . . . .	6,731,495	6,106,634	10.3	261,133,882	252,069,127	3.7
March (60 per cent of industry) . . . . .	6,021,269	5,661,027	6.4	246,306,123	223,156,161	10.5
February (54 per cent of industry) . . . . .	7,288,792	6,655,011	9.8	231,790,165	205,726,060	12.6

difference is in the smaller companies. Even were the differences greater than they are, one would hardly expect such an enormous month-to-month difference in growth. This is due entirely to the activities of the larger companies in the Middle Atlantic States. Table II shows a jump from 7.6 per cent growth in income in April to 28.2 per cent in May, and then back again to 3.7 per cent in June, only to jump to 10.8 per cent in July. On the output side the differences are by no means so pronounced, the greatest jump being from 5.7 per cent in June to 9.5 per cent in July.

Tables II and III offer an opportunity for comparing the Middle Atlantic with the South Atlantic States. Each table represents the operations of the three largest companies in that region from which the *Electrical World* is receiving returns. Moreover, no two companies are in the same state. In that way we are able to show a state of affairs representing conditions in the large cities of the Atlantic group. Previous to July the South Atlantic companies had been showing a decreasing growth in output. On the income side the growth has varied from 10.2 per cent in May to 12.8 per cent in July. The differences, however, are not startling and show a gratifying condition. With an output growth of over 25 per cent maintained for five months and

an income growth of over 10 per cent maintained for that period, the central-station industry of the South Atlantic States appears to be flourishing.

As noted above, the data for the large companies in the Middle Atlantic region show a fluctuating character—the fluctuations being always on the side of growth and expansion. While the income increase did get as low as 3.1 per cent in March, it got as high as 28.2 per cent in May. For the six months from February to July inclusive these three companies' income from the sale of energy was \$19,755,605

TABLE II.—OPERATIONS OVER A HALF-YEAR PERIOD OF THREE LARGE COMPANIES IN MIDDLE ATLANTIC STATES REPRESENTING OVER 50 PER CENT OF THE CENTRAL-STATION OUTPUT OF NEW YORK, NEW JERSEY AND PENNSYLVANIA

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
Edison	\$2,933,019	\$2,648,625	10.8	106,607,151	97,450,526	9.3
West.	2,952,454	2,844,643	3.7	103,013,271	97,628,941	5.7
Del.	3,173,526	2,476,781	28.2	108,171,896	104,267,718	3.8
Pa.	3,437,634	3,194,160	7.6	112,894,803	105,328,705	7.2
Del.	3,492,149	3,386,190	3.1	113,897,901	114,136,574	4.2
Edison	3,766,823	3,497,948	7.8	112,892,266	108,302,262	4.2

or 1914, as compared with \$18,048,347 for 1913, or an increase of 9.7 per cent. For the five-month period from March to July inclusive the South Atlantic companies, as shown in Table II, gave an income increase of 11.4 per cent. Thus it is seen that over a long period the two sections of the Atlantic region were growing at approximately the same rate. It must not be forgotten, however, that a 1 per cent growth in the Middle Atlantic States means a much larger gross increase than a similar percentage in the southern States.

No tables were made out for the small companies in this region since they told practically the same story as the large companies. The larger companies predominate in

TABLE III.—OPERATIONS OVER A FIVE-MONTH PERIOD OF THREE LARGE COMPANIES IN THE SOUTH ATLANTIC STATES REPRESENTING OVER 50 PER CENT OF THE CENTRAL-STATION INDUSTRY OF THAT REGION

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
Fla.	\$551,631	\$488,982	12.8	43,345,399	35,247,104	27.8
Ala.	552,289	496,641	11.4	43,452,961	34,743,542	25.1
Miss.	574,160	520,981	10.2	43,967,670	34,547,286	27.0
La.	604,065	537,670	12.3	44,545,161	34,308,432	29.9
Fla.	642,658	579,350	10.9	45,860,568	34,912,792	31.4

this group, and what are here small companies in other regions would be large companies.

July marks the beginning of the upward trend of the load curve. The decreasing length of the days means a greater energy consumption for lighting. The heat of mid-summer brings with it an increasing demand for electrical appliances. The electric fan takes an appreciable amount of energy. The electric flatiron replaces the old irons heated by the coal range. Other small appliances, such as the toaster, the egg cooker, small hot-plates, etc., are used to diminish the discomforts of summer. The vacuum cleaners, dish washers, washing machines and large electric ovens become very popular in the summer months. These are the most part consume energy at lighting rates. These facts mean a much greater percentage increase in income compared with previous months than would be shown on the input side.

## Business Notes

Walter B. Snow, publicity engineer, has changed his address from 170 Summer Street to 136 Federal Street, Boston, Mass.

The Titan Storage Battery Company, of Newark, N. J., has opened a Chicago office at 2332 Michigan Avenue. D. M. Simpson, an experienced engineer, is in charge.

The Philadelphia Electrical & Manufacturing Company, Philadelphia, Pa., has appointed L. F. Johnston, formerly with the Lewis-Roth Company and the Richmond Motor Company, as special sales representative in Philadelphia and New York City.

## New Industrial Companies

The Western Utilities Company, Milwaukee, Wis., has been incorporated to manufacture electric motors. The capital stock is \$25,000. The incorporators are C. M. Sandon, E. E. Hill and F. A. Johnson.

The Kirkman Engineering Corporation has been incorporated to deal in machinery and electrical devices. The capital stock is \$25,000 and the incorporators are T. W. Kirkman, G. Whittlesey and R. P. Hart, 130 East Sixty-seventh Street, New York.

The Hallbauer, Hardman Manufacturing Company, of Schenectady, N. Y., has been incorporated to manufacture lamps. The capital stock is \$10,000, and the incorporators are A. F. Hallbauer, 337 State Street, Schenectady, and Thomas Hardman and A. B. Van Vost, also of Schenectady.

## Trade Publications

**Electric Products.**—An attractive 208-page catalog and handbook has been published by W. N. Mathews & Brother, Inc., St. Louis, Mo.

**Mechanical Stoker.**—Automatic mechanical stokers are the subject of a catalog put out by the Wetzel Mechanical Stoker Company, Trenton, N. J.

**Portable Electric Bench Drills.**—The Electric Star Devices Company, Pittsfield, Mass., has issued a leaflet describing its portable electric bench drills.

**Electric Wiring Devices.**—Pass & Seymour, Inc., Solvay, N. Y., have published a small vest-pocket-size catalog which is a photographic reproduction of their Catalog No. 9.

**Armored Cable.**—The Trumbull Electric Manufacturing Company, Plainville, Conn., has issued a leaflet containing a price list of its armored cable and flexible steel conduit.

**Centrifugal Pumps.**—Various types of steam and electric centrifugal pumps are described and illustrated in Catalog No. 132 issued by the American Well Works, Aurora, Ill.

**Oil Engines.**—Bulletin No. 34-W, issued by the Chicago Pneumatic Tool Company, Chicago, Ill., contains information on and illustrations of an oil engine operating with low-grade fuel.

**Hospital Signal System.**—A lamp signal system for hospitals is described in an attractively illustrated thirty-two-page catalog recently issued by the Bryant Electric Company, Bridgeport, Conn.

**Direct-Current Meters.**—A direct-current instrument of the moving-coil type is described in a circular issued by the Record Electrical Company, Ltd., Caxton House, Westminster, S. W., London, England.

**Residential Telephone System.**—A folder entitled "Home Talk" describes a telephone system for use in various parts of one building. This folder has been published by the Western Electric Company, New York.

**Large Stock of Tools.**—A leaflet has been published by the Smith & Hemenway Company, 150 Chambers Street, New York, announcing that a large stock of tools is being kept on hand in anticipation of heavy buying this fall.

**Steam Engines and Boilers.**—Steam boilers are the subject of Bulletin No. 127, long-stroke throttling engines of Bulletin No. E126, and steam engines for direct connection to electric generators of Bulletin No. 128, issued by the Chandler & Taylor Company, Indianapolis, Ind.



## Personal Mention

Mr. K. E. Norton has succeeded Mr. W. F. Frederick as superintendent of the electric light and water plant at Coldwater, Mich.

Mr. W. H. Fellows, manager of the Leavenworth (Kan.) Light, Heat & Power Company, has tendered his resignation, effective Oct. 1.

Mr. Charles W. Amidon has been appointed district superintendent for the Central Illinois Public Service Company, with headquarters at Macomb, Ill.

Mr. F. S. Armstrong, of Macomb, Ill., has resigned his position of district superintendent for the Central Illinois Public Service Company, effective Oct. 1.

Mr. Archibald R. Gibbons, formerly advertising manager for the Federal Sign System (Electric), has resigned to associate himself with the Curtis-Johnson Printing Company, of Chicago.

Mr. D. M. Simpson is in charge of the recently opened office of the Titan Storage Battery Company in Chicago. Mr. Simpson was formerly engineer for the Electric Storage Battery Company.

Mr. A. B. Marsden resigned as manager of the Manchester (Vt.) Light & Power Company Sept. 1, after an association with the company extending over ten years. Mr. Marsden will enter the electrical business in Manchester.

Mr. Hogan Burud has been appointed manager of the Big Falls (Minn.) Manufacturing Company, superseding Messrs. A. L. Shipley and William Beard, who formerly held, respectively, the positions of manager and superintendent.

Mr. Charles W. Jordan, superintendent of the La Porte (Tex.) Water, Light & Ice Company, has succeeded Mr. T. V. Buckholz as vice-president of the company. Mr. Jordan's former title of secretary-treasurer is now held by Mr. M. B. McNitt.

Mr. Robert S. Orr, general manager of the Duquesne Light Company, Pittsburgh, Pa., recently suffered a bereavement in the death of his wife, Mrs. Beryl R. Orr. Mr. Orr is one of the best known central-station men in the State of Pennsylvania, and his loss will be learned of with regret by his many friends.

Mr. D. W. Low, former general manager of the Michigan Power Company, Lansing, Mich., is now directing the Berrendo irrigated farms development near Roswell, N. M. His company is developing a large tract and has taken over the Roswell Gas & Electric Company in order to obtain the necessary power for the irrigation project.

Mr. H. J. Hoover, who has been head of the gas commercial department of the Union Gas & Electric Company, Cincinnati, Ohio, for some time, has been placed in charge of the combined electric and gas commercial departments since the resignation of Mr. Parker H. Kemble, formerly manager of the electric commercial department.

Mr. Fletcher Easton, who has been manager of the Selma (Cal.) district of the San Joaquin Light & Power Corporation for some time, has assumed charge of the San Luis Obispo and Santa Maria districts of the Midland Counties Public Service Corporation, superseding Messrs. George L. Howard and A. M. Frost. Mr. Frost will become manager at Selma.

Mr. F. I. Woltz has resigned as commercial engineer of the Great Shoshone & Twin Falls Water Power Company, Twin Falls, Idaho, to fill a similar position with the Union Gas & Electric Company, Cincinnati, Ohio. He is a graduate of Pennsylvania State College and an associate member of the A. I. E. E. and a member of the Idaho Society of Engineers.

Mr. Truman P. Gaylord, retiring district manager of the Chicago office of the Westinghouse Electric & Manufacturing Company, was a guest at a dinner given in his honor at the Midway Club, Chicago, on Sept. 18. The hosts were the men in the Chicago and branch offices, who presented to Mr. Gaylord a gold watch, with a chain and gold pocket-knife attached.

Mr. Bion J. Arnold returned home on Sept. 17 after summer in Europe. With other Chicagoans Mr. Arnold went abroad to study railroad terminal facilities, electrolysis and other subjects. The war of the Old World interfered to some extent with the objects of the visit but after the other commissioners had departed Mr. Arnold continued investigations on his own account, and, with Mrs. Arnold, visited friends in England. He and his wife were entertained by Col. R. E. Crompton, Dr. R. T. Glazebrook and others.

Mr. Fred B. Corey, who for the past three years has been engineer of inspection and tests of the Union Switch & Signal Company, Swissvale, Pa., has resigned that position and opened a consulting engineering office at 404 Arnot Building, Pittsburgh, Pa. Mr. Corey was for eleven years in the engineering department of the General Electric Company. In his new work Mr. Corey will make a specialty of inspection methods and organizations for manufacturing companies and will also give attention to electric-railway signaling and allied subjects.

Mr. Henry W. Young, until recently editor of *Popular Electricity* (now merged in *Modern Electrics*), has opened an office with Mr. C. E. Young in the First National Bank Building, Chicago, as a technical advertising writer and counselor. Mr. Young is a graduate of the electrical engineering course of the University of Wisconsin. He has been employed by the Western Electric Company, was a one time member of the editorial staff of the old *Western Electrician*, and for a year and a half was connected with the advertising department of the Ohio Brass Company. Mr. Young is a member of the Jovian Order, the Electric Club of Chicago and other electrical societies.

Mr. Charles E. Young, formerly a director and advertising manager of the Ohio Brass Company, of Mansfield, Ohio, has resigned and has opened an office with Mr. H. W. Young in the First National Bank Building, Chicago, to give technical advertising service. Mr. Young was a member of the class of 1901 of Washington and Jefferson College. After leaving college he was employed first in the advertising department of the Western Electric Company and later in a similar capacity by Porter & Berg (Electric Service Supplies Company). For the last ten years he has been in charge of the advertising department of the Ohio Brass Company, where his work has attracted attention.

Mr. Louis Cohen has engaged in the practice of consulting and research engineering at 1855 Calvert Street, Washington, D. C., and will give his entire time to the mathematical aspects of the subject. Mr. Cohen is a graduate of Armour Institute, and studied mathematics, physics and advanced electrical engineering in the University of Chicago and Columbia University, completing work for a Ph.D. degree in 1905. From 1905 to 1909 he was on the scientific staff of the Bureau of Standards, and he also served as assistant professor of the George Washington University from 1909 to 1909. He was chief of the research department of the National Electric Signaling Company from 1909 to 1911, since which time he has made independent investigations in high-frequency alternating currents. He is the author of "Formulas and Tables for the Calculations of Alternating Current Problems" and a number of scientific and technical papers.

## Obituary

Edward J. Hall, vice-president of the American Telephone & Telegraph Company and a pioneer in long-distance telephony, died at Watkins, N. Y., Sept. 17. Mr. Hall was born in Perth Amboy, N. J., March 31, 1853. When in 1877 the parent company of the Bell system was organized, he secured the right to operate under the Bell patents in Buffalo. At the request of Mr. T. N. Vail, Mr. Hall took charge of the development of long-distance telephony on Jan. 1, 1885. Mr. Hall was a director in the New York Telephone Company, the Western Union Telegraph Company, in which he was also chairman of the executive committee; the Cumberland Telephone & Telegraph Company; the Southern Bell Company, and the Market & Fulton National Bank of New York.

## Construction

### New England

**MECHANIC FALLS, MAINE.**—The Mechanic Falls El. L. Co. expects to make a number of extensions to its plants, including a new penstock. A. C. Barker is superintendent of the plant.

**CAMBRIDGE, VT.**—A survey is being made of the water-power on the property of R. T. Redmond, of this town. Mr. Redmond plans to develop the water-power and furnish electricity for the villages of Jeffersonville, Cambridge, Underhill and Juchau.

**GARDNER, MASS.**—Within the next two months the Gardner El. Co. expects to purchase eighteen ornamental lighting standards. J. D. Whittemore is manager of the company.

**GREAT BARRINGTON, MASS.**—Within the next six months the Great Barrington El. Co. expects to purchase wire, meters, transformers and lightning arresters. H. Clyde Parrish is superintendent of the plant.

**MELROSE, MASS.**—The inauguration of the new "white way" in this city recently was made the occasion of an imposing celebration.

**NORTH ATTLEBORO, MASS.**—A new 250-hp. Heine water-tube boiler is shortly to be installed at the city waterworks plant here. Within the next three months 200 street-lighting fixtures of the pole-socket type will be purchased for the plant, and the work of William Plattner is superintendent and manager.

**NORTHAMPTON, MASS.**—The city lighting committee has under consideration the changing of the street-lighting system on Main Street from arc lamps to nitrogen-filled lamps. It is said. The proposed installation would give 20,000 cp as compared with 8320 cp from the present arc system, and at a reduced cost.

**WESTFIELD, MASS.**—A 600-kw Curtis turbo-generator, a Heine boiler and an Alberger condenser have recently been installed in the plant of the Westfield Gas & El. Lk. T. T. Logie is manager.

**DANBURY, CONN.**—Sealed proposals will be received at the office of the supervising architect, Washington, D. C., until 3 p. m. Nov. 4, for the construction complete (including mechanical equipment, including electrical fixtures and approach) to be installed at the United States post office at Danbury. Drawings and specifications may be had after Sept. 30 from the custodian of the site or from O. Wenderoth, supervising architect, Treasury Department, Washington, D. C.

### Middle Atlantic

**AUBURN, N. Y.**—The Empire Gas & El. Co. of this city, is engaged in preparing specifications for all the municipal work included in its various plants. These specifications will be sent to the company's superintendents, and in the future all material ordered for construction and maintenance will be uniform. L. C. Reynolds, Auburn, N. Y., general superintendent, is directing this work. C. H. Pierce is purchasing agent.

**NIAGARA FALLS, N. Y.**—A decorative lighting system from Falls Street along Third and Main and along Main to connect with the North Main Street system at Michigan Avenue is under discussion. The Niagara Falls El. & Pwr. Co. regarding this ornamental system, which will cost about \$20,000, it is said. The expense of the installation will be divided between the property owners and the city. E. Montague is general manager of the lighting company.

**UTICA, N. Y.**—Proctor Boulevard, a newly developed section near Utica, has installed a modern lighting system. All the wires are underground, and the posts, which are of classic design, are equipped with 300-cp tungsten lamps with large globes. The installation is exceptionally complete and artistic for a new section.

**AMBRIDGE, PA.**—With the expiration of the present street-lighting contract this month it is proposed to change a number of the arc lamps to 100-cp tungsten filament lamps at a cost of \$35 per annum. The Interboro El. Co., which is controlled by the West Penn Tract. Co., operates in Ambridge.

**CARLISLE, PA.**—The bungalow colony at Bellaire Park has planned many improvements, the principal one being an electric-lighting system throughout the entire park. The installation will include sufficient illumination to make night bathing possible. J. P. Cuberton is manager.

**DILLSBURG, PA.**—The Dillsburg El. Lk. & Pwr. Co. has been awarded a contract to furnish street lighting. Arc lamps will continue to be used.

**HIGH SPIRE, PA.**—The lighting system to be installed in this town, mentioned Sept. 15, will require 50 wooden posts, with incandescent lamps ranging from 45 cp to 100 cp. Energy will be furnished by the Harrisburg (Pa.) Lk. & Pwr. Co. For further information address the secretary of the borough, S. A. Book.

**KITTANNING, PA.**—It is reported that plans are being prepared by A. M. Morgan, 111 West Monroe Street, Chicago, Ill., for an electric-light plant and water-works, to cost \$125,000.

**MAUCH CHUNK, PA.**—It is reported that the Mauch Chunk Hl. Pwr. & El. Lk. Co. has purchased a plot from the Wentz east-west, and plans to erect a plant and substation. Steel towers will be erected from the substation of the Lehigh Navigation El. Co., from which the Mauch Chunk company purchases its energy.

**NEW CASHTOWN, PA.**—The contract for installing a street-lighting system here has been awarded to the Western El. Co. of Pittsburgh, it is said, for the sum of \$3,690. Electric lamps will be placed along Washington Street and County Line Street to Greenwood Avenue.

**PITTSBURGH, PA.**—Sealed proposals for furnishing and installing an electric-light plant at Lock 4, Monongahela River, will be received at the United States engineer's office, Pittsburgh, Pa., until Oct. 15. For further information address Francis R. Shunk, Lieut.-Col. of Engineers, Pittsburgh, Pa.

**PITTSBURGH, PA.**—A lighting system is being installed in Frankstown Avenue, between Penn and Lincoln Avenues, following much agitation by the property owners in that district, directed by W. A. Warh, a real estate broker and East End property holder. Forty-four lamps are to be attached to trolley poles along each side of the street. The prospective "white way" of East End is being received with much enthusiasm by the residents.

**BAYONNE, N. J.**—The Board of Education will receive bids up to Oct. 1 for electric and gas fixtures for Public School No. 2. Plans and specifications are at the office of Guilbert & Betelle, 665 Broad Street, Newark, N. J.

**CHATHAM, N. J.**—The Commonwealth Wtr. & Lt. Co. has applied to the Chatham Township Board for a 50-volt electric light and power franchise for private, commercial and municipal service throughout the township.

**PERTH AMBOY, N. J.**—At the general election of the 3rd of the proposed municipal plan will be submitted to the voters, and also the matter of issuing bonds to the amount of \$120,000 for the construction of such a plant.

**TRENTON, N. J.**—Charles F. Stout and other members of the Chamber of Commerce are agitating the subject of improved street lighting along State and Broad Streets.

**KIRKOV, VA.**—The Consolidated Lt. & Pwr. Co. expects to install within the next three months three 500-hp B. & W. boilers. The equipment has already been purchased. W. W. Magoon is general manager and W. R. Power is superintendent.

**KIMBALL, VA.**—The Kimball Lt. & Wtr. Co., it is said, will petition the City Council for a franchise to construct and operate an electric-light plant and water-works.

**WHEELING, VA.**—A transmission line from Woodsdale to Elm Grove will be erected by the Wheeling Valley Lt. & Pwr. Co. within the next few months. G. W. Davis is superintendent of the plant.

### North Central

**COLDWATER, MICH.**—Within the next six weeks an additional 15-kw regulator will be installed in the municipal electric light and water-works. The street-lighting system in which arc lamps have been used will be changed to 600-cp incandescent lamps. The installation of additional street lighting on 1400 ft. of roadway is under consideration. E. Norton is superintendent of the plant.

**FENTON, MICH.**—The plans for the ornamental lighting system mentioned Sept. 13 call for the multiple single-unit system. From 25 to 30 posts will be required, 100-cp incandescent lamps will be used and three-wire system, underground construction, will be employed. The contract for this installation has not yet been placed. Joseph Mount is chairman of the lighting committee, and Ross McCurdy is city clerk.

**GREENVILLE, MICH.**—The R. J. Tower El. Co. has recently completed rebuilding its plant. S. L. Tower is manager.

**LANSING, MICH.**—The Board of Light and Water Commissioners has entered into a contract with the Western El. Co. of Chicago for all the electrical appliances the city will require for a year.

**SAGINAW, MICH.**—No action has as yet been taken by the City Council relative to the erection and maintenance of an electric light and power plant. H. S. Gay is city clerk.

**ST. CLAIR, MICH.**—At St. Clair there will be installed some additional ornamental street-lighting equipment, probably 12 five-lamp clusters similar to those already installed in the park. W. M. Barron is superintendent of the St. Clair electric-light plant and water-works.

**BELLAIRE, OHIO.**—The Wheeling Tract. Co. has agreed to extend its lines from Barton to St. Clairville within the next eighteen months.

**CINCINNATI, OHIO.**—The building at 612-614 Race Street, seven stories in height, will be remodelled by Charles F. Dickson, for the Arnold & Co. Co., and an electric elevator will be installed.

**DAYTON, OHIO.**—The City Council has given favorable attention to the complaint of the citizens in Vernon place (a suburb of Dayton) for improved lighting.

**IRONTON, OHIO.**—It is reported that the Tri-State El. Laundry Co. will build a modern laundry in Ironton, the machinery for which will be motor-driven. Sam Brewster and others are interested.

**BOWLING GREEN, KY.**—The Kentucky Pub. Serv. Co. expects to purchase within the next twelve months transformers of various sizes to the extent of \$4,500, meters to the extent of \$5,000, and miscellaneous material, approximately \$1,000. H. D. Fitch is manager of the company.

**CARLISLE, KY.**—A new franchise is being drafted for the Carlisle El. Lt. & Pwr. Co. An improved system of lighting is planned for Carlisle, and the lighting company will be organized.

**HAZEL, KY.**—Machinery for the electric-light plant, the franchise for which was recently purchased by Claude Orr and A. E. Roane, has been purchased and will be installed as soon as the new structure is completed.

**MUNFORDVILLE, KY.**—It is reported that the Munfordsville El. Lt. & Pwr. Co. has been taken over by the New El. Lt. & Pwr. Co.

**NEWPORT, KY.**—The Bell Tel. Co. has made application to the Fiscal Court for a franchise permitting the extension of its lines to every part of the county. It is probable that the franchise will be granted if suitable arrangements regarding rates can be made.

**CLINTON, IND.**—The Clinton El. Lt. & Pwr. Co. is installing at the present time a 500-kw turbine generator and auxiliaries. C. M. Poor is superintendent of the plant.

**EVANSVILLE, IND.**—A ten-year contract at \$50,000 a year for lighting the streets of Evansville has recently been awarded by the City Council to the Evansville Pub. Serv. Co.

**FORT WAYNE, IND.**—It is reported that George Smith, for ten years proprietor of the boat line running on Tippecanoe Lake, is purchasing machinery to equip a plant to supply energy to the cottages on the south side of the resort for electric lighting next year.

**FOWLDER, IND.**—The new street-lighting system will be placed in operation Oct. 1.

**GAS CITY, IND.**—In the municipal lighting plant within the next month there will be installed a 100-hp boiler to return incandescent lamps. Within the next six months it is planned to purchase an engine-connected alternating-current generating unit of about 100 kw, 240 volts, 60 cycles, three-phase. T. S. McKee is superintendent of the plant.

**GOSHEN, IND.**—The City Council at a recent meeting made an appropriation of \$5,000 toward improvements in the municipal lighting plant.

**HUNTINGTON, IND.**—Contracts amounting to \$36,615.72 have been closed for the erection of a municipal lighting plant at Huntington. This sum does not include the piping, foundation work and wire extensions. A \$50,000 bond issue has been made, which, it is estimated, will provide for this installation.

**WALKERTON, IND.**—The municipal electric-lighting plant has been discontinued and energy for this city is being purchased from the Plymouth (Ind.) El. Lt. & Pwr. Co. A. L. Freyer is superintendent of the electric-light department at Walkerton.



**NEWTON, ILL.**—Within the next two months there will be purchased for the municipal electric-light plant a 150-hp tubular boiler. John W. Mathery is city clerk at Newton.

**PRAIRIE DU ROCHER, ILL.**—The contract for the erection of an electric-light plant and water-works (mentioned Aug. 22) has, it is said, been awarded to Monie & Dunbar at \$18,24.

**PRINCETON, ILL.**—Sealed proposals will be received at the office of the supervising architect, Washington, D. C., until 3 p. m. Nov. 5, for the construction complete including mechanical equipment, interior lighting fixtures and approaches) of the United States post office at Princeton. Drawings and specifications may be obtained after 10 a. m. from the custodian of the site or from O. Wenderoth, supervising architect, Treasury Department, Washington, D. C.

**WATAGA, ILL.**—At the Wataga mill and lighting plant a new switchboard will be erected within the next month. A garage has been added to the plant. H. J. Kunkle is president and manager of the plant.

**BERLIN, WIS.**—The Berlin Public Service Co. has been authorized to issue \$10,500 in bonds for the purpose of redeeming certain outstanding notes.

**GREEN BAY, WIS.**—Work is progressing rapidly on the new transmission line between Wrightstown and Appleton, which is being erected by the Wisconsin Pub. Serv. Co.

**MADISON, WIS.**—The Southern Wisconsin Ry. Co. has received authorization to issue \$20,000 in bonds in order to carry out the recent decision of the Railroad Commission ordering the company to double-track a portion of its street-railway system in Madison.

**MOUNT HOREB, WIS.**—Within the next two months the Mount Horeb H. L. & Pwr. Co. expects to erect 26 miles of 13,200-volt, three-phase, 60-cycle transmission line to furnish energy to Mazomanie, Black Earth, Mount Horeb and possibly other towns, and to give service to farmers along the route. Poles, insulators, wire, step-up and step-down transformers, lightning arresters and other material necessary for the building of the extension will be purchased. M. C. Mathison is president of the company.

**NEW LONDON, WIS.**—Within the next thirty days several improvements will be made in the municipal electric-light and water-works plant. A change will be made from single-phase to three-phase, and a new pumping station will be installed. Two 40-hp motors and the necessary switchboard equipment have been purchased. O. H. Pribnow is superintendent.

**RIB LAKE, WIS.**—A new engine will be purchased within the next year for the municipal electric-light plant. J. Steffek is village clerk.

**WAUPACA, WIS.**—The Waupaca El. Lt. & Ry. Co. recently installed a street-lighting system for the city of Waupaca, consisting of 20-in. concentric Holophane-Doller reflector lamps. The plant is equipped with 100-cp, 6.6-amp series nitrogen-filled lamps. These lamps replaced 6.6 amp inclosed series arc lamps. Irving P. Lord is president and general manager.

**WEYATOWGA, WIS.**—The Weyatowga El. Lt. Co. has been authorized to issue \$10,000 in stock and \$40,000 in 6 per cent bonds for the purpose of acquiring a dam and power site with the necessary water rights, station and equipment.

**WITTENBERG, WIS.**—The Wittenberg El. Co. has just installed a Leffel water-wheel and expects to purchase a water-wheel governor for some time next spring. Edmund Leffel is president and treasurer of the company.

**ELBOW LAKE, MINN.**—The municipal electric-light plant of Elbow Lake has been sold to the Otter Tail Pwr. Co., Fergus Falls, Minn.

**HENDRICKS, MINN.**—The Hendricks Lt. & Pwr. Co. expects to purchase within the next two months an oil or gas engine to replace steam equipment.

**KENYON, MINN.**—The Gunderson Milling Co. (formerly the Kenyon Flouring Mills & El. Lt. & Pwr. Co.) expects to purchase shortly one 100-kva, 2300-volt, 720-r.p.m., three-phase, 60-cycle synchronous motor complete with exciter, starting auto-transformer, oil switches, control panel, etc., and about 100-hp induction motors of various sizes; also 100-kw transformers, one series arc regulator, about 200 meters and some switchboard instruments. M. T. Gunderson, president of the Kenyon company, has recently announced the purchase of a half interest in the business by his son, Raymond T. Gunderson, who is now manager of the business establishment.

**NEW PRAGUE, MINN.**—Within the next year or so there will be purchased for

the municipal electric-light plant and water-works, a 60-kw directly connected unit generator, 230-volt, two-wire, the engine of the four-valve type, and the necessary switchboard equipment for this addition. Joseph T. Rynda is superintendent of the plant.

**ST. CROIX, MINN.**—There has recently been purchased for the municipal electric-light plant and water-works a 100-kva General Electric alternator, three-phase, 60 cycles, 2300 volts, direct connected to a General Electric 125-hp, 1725-r.p.m. Corliss engine, and a four-stage high-pressure centrifugal Platt pump directly connected to a General Electric three-phase 100-hp, 1725-volt motor. F. N. Wilson is superintendent of the plant.

**ADEL, IA.**—A temporary structure raised since the destruction by fire of the lighting plant in this place recently enabled the town to have lighting service resumed very shortly after the conflagration.

**AMES, IA.**—Charles E. Warsaw, manager of the municipal electric-light plant, reports that within the next six months it is planned to purchase for the plant one 100-hp boiler-tube boiler, 1500 psi, one chain-grate stoker for this boiler, and coal and ash-handling material. The entire plant will be rebuilt.

**ATLANTIC, IA.**—Within the next two months there will be purchased for the municipal lighting plant a 300-hp boiler-fed pump, a 25-kw transformer, and about five miles of pole-line material. T. E. Nichols is manager of the plant.

**CHARLOTTE, IA.**—At a special election held recently the citizens voted to sell the municipal lighting plant to the Union Co. of Omaha, 344 First National Bank Building, Omaha, Neb., it is reported, and this company will extend and improve the service in Chariton.

**DUBUQUE, IA.**—The Union El. Co. is changing the Dubuque street-lighting system from arc lamps to nitrogen-filled lamps. About one hundred lamps will be installed. The material has been purchased. E. M. Walker is general manager of the company.

**FARNHAMVILLE, IA.**—A municipal electric-light plant was recently placed in operation at this place. Governor Clarke spoke at the dedication ceremonies.

**OELWEIN, IA.**—The Oelwein Lt., Ht. & Pwr. Co. was recently burned to the ground, causing a loss of \$50,000.

**SAC CITY, IA.**—The Sac City El. Co. is completing the erection of a complete new power plant, including a 110-ft. concrete smokestack, and has purchased and recently installed two 200-hp boilers designed for 1500 psi pressure, 300 hp Corliss engine, two Allis-Chalmers alternators, rated at 175 kw and 150 kw respectively, and the necessary switching equipment. The companies just finished a 30-mile transmission line to Lake View. It is installed as 13,200-volt, three-phase, 60-cycle transmission system. W. W. Deininger is manager of the company.

**BUTLER, MO.**—A new electrical pumping plant will be purchased during the next year for the municipal electric plant here, which will make the equipment electrically controlled all through. Among other equipment that will be purchased are motor-generating sets, remote-controlled valves and five miles of transmission line material. H. M. Cameron is manager of the plant. E. E. Harper, Grand Central Temple Building, Kansas City, Mo., is consulting engineer.

**GREENFIELD, MO.**—Within the next twelve months the Greenfield El. Lt. & Pwr. Co. expects to purchase a small generator as auxiliary.

**KIRKWOOD, MO.**—For the municipal electric light and power plant there have recently been purchased one 150-hp boiler, one 100-kva and one 150-kva Westinghouse generators, directly connected to Corliss engine, and three generator panels for switchboards. No bonds were voted for this new equipment, but it was purchased with the cash profit of the plant. W. A. Taylor is superintendent.

**MARYVILLE, MO.**—The Maryville El. Lt. & Pwr. Co. has recently purchased a 300-hp Stirling boiler.

**MONROE CITY, MO.**—Within the next two months the municipal electric light, power and water plant is being expanded to erect a switchboard panel and one mile of line which will connect with Hunnewell. The material has been purchased. O. R. Emerson is superintendent.

**SPRINGTOWN, MO.**—Within the next four months there will be purchased for the Tipton electric light and power plant a 40-kw alternator, a 50-hp low-speed engine and a 3-kw exciter. C. E. Clark is city electrician.

**WIMBLETON, N. D.**—The new lighting plant has begun operations, and the streets

are now lighted by electricity. Forty buildings have already been wired, and it is expected to double this number in a very short while.

**HECLA, S. D.**—A petition is being circulated for a new electric-lighting system at this place.

**PARKER, S. D.**—The City Council has awarded the contract for the municipal electric-light plant to the E. M. Fisher Co., Fort Dodge, Ia., it is reported, for \$19,987. The plant is to be completed within ninety days.

**SIOUX FALLS, S. D.**—It is reported that the A. H. Savage Co., St. Paul, Minn. has been awarded the contract for \$28,885 for the installation of a new system of street lighting in Sioux Falls.

**LINCOLN, NEB.**—Bids will be received until Oct. 15 for improvements to the electric light and water plant. T. H. Berg is city clerk.

**COFFEYVILLE, KAN.**—The diminish in supply of natural gas here may result in the building by the municipality of a water-power plant. The cement dam across the Verdigris River below the pumping station, it is estimated, would furnish the power for the city. The city works for at least eight months of the year.

**LEAVENWORTH, KAN.**—The installation of the new street-lighting system call for 150 standards of three-lamp and five lamp clusters. Bids will be taken by the city engineer for the installation complete and the contract awarded within the next thirty days. Specifications can be obtained from the city engineer, Dr. R. E. Nelson. Chairman of the lighting committee; E. W. Crancer is Mayor. W. H. Fellows is manager of the Leavenworth Lt., Ht. & Pwr. Co., which has the lighting contract.

**SOUTH HAVEN, KAN.**—The South Haven El. Lt. Co. (municipal) expects to purchase within the next six months a 50 hp internal-combustion engine. The purchase of this engine has not yet been decided. J. R. Britton is manager of the company.

**TOPEKA, KAN.**—After reading a report showing that 90 per cent of the communities served by automatic telephone were favorable to the plan, the Topeka City Council adopted a resolution approving a proposed issue of bonds for the installation of a municipal automatic telephone plant.

## Southern States

**WALLACE, N. C.**—It is reported that J. L. Boney, contemplates the installation of a lighting plant.

**WALNUT COVE, N. C.**—It is reported that the equipment for the new lighting plant at this place is being installed. The plant will be in operation within a short while.

**CAMDEN, S. C.**—The Camden Wtr., Lt. & Ice Co. is defunct and the municipality now operates the lighting plant. L. S. Baxter, who for four years managed the Camden company, has now charge of the municipal plant.

**MACCLENNEY, FLA.**—An election will soon be called for the purpose of voting on a proposed issue of bonds for the construction of an electric-light plant here. The MacCrary Co., Atlanta, Ga., is drawing plans and specifications for the plant. A. G. Powell is city clerk.

**PABLO BEACH, FLA.**—The citizens voted on Sept. 15 to issue bonds for \$10,000 for an electric-light plant. The bond trustees will immediately advertise the bonds for sale and will advertise for bids on the work to be done in accordance with specifications prepared by the J. B. McCrary Co., Atlanta, Ga.

**ZEPHYRILLS, FLA.**—The Zephyrills El. Co. during the next three months expects to purchase a few small transformers and some switchboard instruments. Waldo M. Francisco is president of the company.

**DANDRIDGE, TENN.**—The Dandridge Pwr. & Lt. Co., recently organized, has begun operations. The old Bettie mill, at Meeting and River Streets, has been bought, and the site will be occupied by a new plant for which the machinery has already been purchased.

**FLORENCE, ALA.**—The Allentown Pwr. Co., recently incorporated with a capital of \$50,000, it is reported, will develop the water power on Cypress Creek and build two hydroelectric plants. Col. N. F. Thompson, of Birmingham, is president. T. H. Allen, Florence, Ala., is secretary and treasurer of the company.

**CANTON, MISS.**—New equipment recently purchased for the Canton El. Lt. & Wtr. Wks. includes a 100-kw Skinner engine, an Ingersoll Rand compressor, a Lawrence centrifugal pump. John T. Sharp, Jr., is superintendent of the plant.

**BUNKIE, LA.**—It is reported that the Bunkie Ice Co., Ltd., is negotiating for the municipal lighting plant at the Bunkie brick works and expects to install an internal-combustion engine directly connected to a 30-kva generator and to change from direct current to alternating current.

**GIBSLAND, LA.**—H. M. Smith has been granted a franchise for the erection of an electric light and power plant. It is planned to have the plant in operation by November, 1914.

**MUSKOGEE, OKLA.**—Sealed proposals will be received at the supervising architect's office, Treasury Department, Washington, D. C., until Sept. 29, for the installation of an electric light and power elevator in the United States post office and court house at Muskogee.

**SHATTUCK, OKLA.**—The municipal electric light and water plant expects to purchase within the next two months a 100-hp Diesel engine.

**AMARILLO, TEX.**—Sealed proposals will be received at the supervising architect's office, Treasury Department, Washington, D. C., until Sept. 28 for the construction of a building including mechanical equipment, lighting fixtures and appliances, of the United States post office and court house at Amarillo, Tex.

**MARBLE FALLS, TEX.**—The proposition to issue bonds for the erection of an electric-light plant and water-works was defeated at the recent election by a vote of 76 to 54.

**PITTSBURG, TEX.**—The Home Lt. & Ice Co. has installed new machinery and made improvements approximating in cost \$15,000.

## Pacific States

**NORTH YAKIMA, WASH.**—The pumping plants at Outlook and Grandview are to be constructed under the supervision of the U. S. Reclamation Service at an estimated cost of \$200,000. The equipment will include a combined turbine and pump installation, generators, motors, etc. O. H. Emsign, Los Angeles, Cal., is chief electrical engineer of the U. S. Reclamation Service, and R. K. Tiffany is project manager at North Yakima.

**SEATTLE, WASH.**—Bids will be received until 1.30 p. m., Sept. 30, for the installation of the lighting system division of Smith's Cove dock improvement. For particulars address C. E. Remsburg, secretary of the Port Commission, Central Building, Seattle, Wash.

**SEATTLE, WASH.**—Councilman Cooley has submitted data to the City Council on the power sites of the Sauk and Snohomish Rivers, asking that a thorough investigation be made before the city purchases additional power. It is stated that this project can be developed at 100 hp and that a single unit will develop approximately 100,000 hp at a minimum flow. A power plant can be erected near Derrington, Snohomish County, and the two rivers could be brought together by means of a canal and a tunnel three-quarters of a mile long. It is thought that this project will be investigated at the time the Lake Cushman and other plants are examined.

**STILLACOOM, WASH.**—It is reported that the \$100,000 bonds recently authorized by the voters to build an electric transmission system have been sold. Work has already begun on the plant and energy will be secured from the municipal plant at Tacoma.

**WILLAPA, WASH.**—The Willapa Pwr. Co. began operations recently, supplying 95 per cent of the residents of the East End with lighting service. Work has begun in Eklund Park, and it is hoped to furnish service to that section in a short time.

**ASTORIA, ORE.**—Property owners and merchants of Clavagh Street propose to establish a "white way" from the waterfront to Exchange Street. F. C. Harley, of the Astoria Harbor Improvement Co., is the prime mover in the project. The work will be submitted by the property owners.

**ANDERSON, CAL.**—At a recent election the citizens of this place voted to establish a lighting system and the town has now closed a contract with the Northern California Pwr. Co., San Francisco, which will supply the lighting of every street crossing in Anderson with a 40-cp tungsten lamp. There will be seventy lamps.

**OAKLAND, CAL.**—The City Council passed a resolution Sept. 15 authorizing the erection of electroliners on College Avenue, from the intersection of every street crossing in Anderson with a 40-cp tungsten lamp. The Vernon-Rockridge Improvement Club has been agitating this improvement for some time. The electroliners will be installed at the expense of the club, and the city will pay for the lighting.

**PETALUMA, CAL.**—It is reported that the proposition to issue bonds amounting to \$10,000 for bridge lighting will be voted upon Sept. 29.

**PORTOLA, CAL.**—The electric-light plant is expected to be in operation shortly. R. B. Young obtained the franchise.

**UKIAH, CAL.**—The Snow Mountain Wtr. & Pwr. Co. is reported to be reconstructing its plant at this place. Application has been made to the Railroad Commission for permission to lease a portion of its property to the California Tel. & Lt. Co.

**MALTA, MONT.**—It is reported that Shade & Levesconte, of Malta, have petitioned the City Council for a franchise to construct an electric light and power plant here.

**LA JUNTA, COL.**—The city engineer, it is reported, has been requested to prepare an estimate of the amount of bonds required for the building of a municipal lighting plant. At the time the franchise of the present lighting company (Arkansas Ry., Lt. & Pwr. Co.) expires, two years hence. At the next regular election the proposition to issue bonds for this purpose will be submitted to the voters.

**MONTEIRO, COL.**—The Western Colorado Pwr. Co., whose offices were recently moved from Durango to Montrose, has completed its new transmission line from Montrose to Delta, 10 miles. This work is part of the consolidation of several lines which will be extended to Ridgeway, Ouray and Silverton.

**WINNEMUCCA, NEV.**—A franchise has been granted to the Nevada Valley Pwr. Co., whose application was mentioned Sept. 5. It is planned to erect electric transmission

lines through the towns and villages of Humboldt County. Edson F. Adams is president of the company.

## Canada

**KAMLOOFS, B. C.**—The new hydroelectric plant, which will get its energy from the Barriere River, will be placed in operation by the end of this month. The first unit will produce 2600 hp, and later the rating of the plant will be increased to 3000 hp.

**REVELSTOCK, B. C.**—Escher, Wyss & Co., of Zurich, Switzerland, have been awarded the contract for improvements in the hydroelectric plant, which include a water turbine with a 44-in. valve. The Canadian Westinghouse Company was awarded the contract for a generator, exciter and switchboard. The total cost of the improvements will be \$17,000.

**STAVE FALLS, B. C.**—The Canadian Western Pwr. Co. is making important improvements and increasing equipment of its plant at Stave Falls, B. C. A new 13,000-hp turbine, a 9000-hp generator, a 3000-kw transformer and switchboards will soon be installed for use in connection with the third unit of the plant, the buildings for which are nearing completion. The company has now a rating of 25,000 hp, and with the installation of the fourth unit next year it will be generating over 50,000 hp.

## Miscellaneous

**HONOLULU, H. I.**—Sealed proposals will be received at the office of the supervising architect, Washington, D. C., until 3 p. m., Oct. 27, for the construction of a concrete water tower.

## New Incorporations

**DOVER, DEL.**—The National Hydro-electric & Conservation Co. has been incorporated with a capital stock of \$100,000, to establish irrigation and power plants in Western states.

**AMO, IND.**—The Amo Lt., Ht. & Pwr. Co. has been incorporated with a capital stock of \$3,000 by W. W. Cosner, E. B. Owen and J. E. Hodson.

**WEST TERRE HAUTE, IND.**—The West Terre Haute Utilities Co. has been incorporated with a capital stock of \$45,000. The directors are John Schwartz, J. A. Reel and G. L. Berry.

**HAMILTON, MO.**—The Hamilton Lt. & Pwr. Co. has been incorporated with a capital stock of \$30,000 by C. A. Martin, T. D. Farr and J. W. McLean.

**ONTARIO, WIS.**—The Farmers' Store Lt. & Pwr. Co. has been incorporated with a capital stock of \$100,000 by Charles M. Sandon, E. E. Hill and F. A. Johnson.

**PRAIRIE FARM, WIS.**—The Prairie Farm Electric Co. has been incorporated with a capital stock of \$5,000 by O. A. Osterich, L. A. Avery and Leona Westlake.

# Weekly Record of Electrical Patents

## UNITED STATES PATENTS ISSUED SEPT. 15, 1914.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York, N. Y.]

**1,110,326. RAILWAY SAFETY APPLIANCE:** J. L. Hoffman, Camas, Idaho. App. filed Jan. 6, 1914. Cab signal.

**1,110,345. ELECTRIC SWITCH:** G. B. Reischbach, Milwaukee, Wis. App. filed June 1, 1910. Drum type for motors.

**1,110,352. ALTERNATING-CURRENT MOTOR CONTROLLER FOR ELEVATORS:** A. Simon, Milwaukee, Wis. App. filed Feb. 21, 1907. Repulsion and induction motors of the Wagner type.

**1,110,359. ELECTRIC ZINC FURNACE WITH INTERNAL CONDENSER:** C. V. Thierry, Paris, France. App. filed May 21, 1913. Reduction of zinc oxide by means of carbon and condensation of liquid zinc.

**1,110,373. TELEGRAPH KEY:** R. L. Boulter, Los Angeles, Cal. App. filed Sept. 2, 1913. Transmitter or vibrator.

**1,110,374. ELECTRICAL SWITCH:** A. J. Bowie, Jr., San Francisco, Cal. App. filed Jan. 25, 1906. High-tension pole-line arc disruption.

**1,110,376. AUTOMATIC TELEGRAPH SYSTEM:** D. H. Cameron, North Sydney, Nova Scotia, Canada. App. filed Aug. 21, 1913. Single operator for receiving and transmitting.

**1,110,415. APPARATUS FOR PRODUCING IGNITION SPARKS WITHIN CYLINDERS OF INTERNAL-COMBUSTION ENGINES:** F. A. Zick, Evanston, Ill. App. filed Dec. 8, 1913. Common inclosure for several wires.

**1,110,418. SELECTOR:** W. S. Burnett, Milwaukee, Wis. App. filed Aug. 26, 1912. Signaling. (Improvement on patent No. 970,180.)

**1,110,420. MICROPHONE ATTACHMENT FOR TELEPHONES:** H. W. Christensen, Boston, Mass. App. filed March 19, 1913. Supplementary diaphragm.

**1,110,430. ELECTRICAL RELAY:** J. Erickson, Chicago, Ill. App. filed Nov. 28, 1906. Removable contacts.

**1,110,456. ELECTRICALLY LIGHTED LEVEL AND PLUMB:** W. E. O'Brien, Providence, R. I. App. filed June 28, 1913. Thumb switch.

**1,110,460. AUTOMATIC TELEPHONE-EXCHANGE SYSTEM:** F. Schoenwolf, Chicago, Ill. App. filed April 15, 1908. Long and short step travel selectors.

**1,110,475. ELECTRIC-CONDUCTOR COUPLING:** F. Eriker, Chicago, Ill. App. filed April 10, 1911. Ball and socket joint.

**1,110,477. THERMOSTAT:** J. Boekel, Philadelphia, Pa. App. filed Dec. 1, 1913. Circuit-closing float. (Improvement on patent No. 1,094,362.)

**1,110,478. BATTERY:** W. J. Britt, Jr., St. Louis, Mo. App. filed Dec. 15, 1913. Renewable-cartridge type.

**1,110,479. ELECTRIC SIGNALING SYSTEM:** A. Bull, Brooklyn, N. Y. App. filed June 25, 1910. Automatic registration from plural transmitters.

**1,110,485. SAFETY ATTACHMENT FOR TROLLEY POLES:** E. C. and E. E. Gossett, Jackson, Ga. App. filed Oct. 14, 1913. Automatic pneumatic retractor.



- 1,110,490. ELECTRIC-LIGHTING SYSTEM: L. R. Jewett, Lynn, Mass. App. filed July 1, 1913. Automatic gas lighter.
- 1,110,492. SELECTOR SWITCH FOR AUTOMATIC EXCHANGES: W. Kaising, Chicago, Ill. App. filed April 15, 1908. A single magnet for adjusting and selecting groups of wipers.
- 1,110,494. THERAPEUTIC APPARATUS: J. H. Kellogg, Battle Creek, Mich. App. filed July 13, 1912. A light-chamber for treating hands or feet.
- 1,110,495. INSULATOR SUPPORT: F. P. Kobert, New Haven, Conn. App. filed June 21, 1913. Sheet-metal and bolt construction.
- 1,110,496. INSULATOR SUPPORT FOR ELECTRIC WIRES: F. P. Kobert, New Haven, Conn. App. filed Jan. 10, 1914. Pole-arm clamp.
- 1,110,522. INCUBATOR: L. C. Byce, Petaluma, Cal. App. filed Sept. 30, 1913. Automatic regulation of heat.
- 1,110,578. HANGER FOR TROLLEY WIRES: H. Schütte, Pittsburgh, Pa. App. filed May 2, 1910. Loop-shaped link.
- 1,110,580. TEMPERATURE ALARM APPARATUS: H. R. Shirley, St. Paul, Minn. App. filed Feb. 10, 1913. Audible and visual signal.
- 1,110,611. IGNITING DEVICE: L. E. Brandon, Derby, Vt. App. filed Oct. 16, 1913. Hand device for cleaning out gas engine cylinders.
- 1,110,613. AUTOMATIC TELEPHONE SYSTEM: A. H. Dyson, Chicago, Ill. App. filed April 15, 1908. Controlling the driving magnet of groups of switches.
- 1,110,634. TELEPHONE SYSTEM: F. A. Lundquist, Chicago, Ill. App. filed Nov. 14, 1912. Collecting and refunding coins.
- 1,110,648. TYPEWRITING MACHINE: L. R. Roberts, Rutherford, N. J. App. filed Feb. 19, 1913. Electromagnetically actuated type bars. (Seventy-three claims.)
- 1,110,660. COIN COLLECTOR FOR TELEPHONES: A. E. Case, Chicago, Ill. App. filed Aug. 8, 1912. Automatic coin distribution.
- 1,110,676. ELECTRIC DISTRIBUTER: L. J. Flint, South Whitley, Ind. App. filed Jan. 10, 1912. For multiple-cylinder ignition, etc.
- 1,110,757. TROLLEY RETRIEVER: C. I. Earll, New York, N. Y. App. filed Sept. 13, 1907. Spring-drum type.
- 1,110,758. TROLLEY CATCHER: C. I. Earll, New York, N. Y. App. filed March 20, 1909. Spring-drum retriever.
- 1,110,759. TROLLEY RETRIEVER: C. I. Earll, New York, N. Y. App. filed June 17, 1909. Spring-drum type.
- 1,110,783. TROLLEY WHEEL: J. W. Homer, Greencastle, Pa. App. filed June 9, 1913. Tandem wheels.
- 1,110,784. SPEED CHECK: F. S. Howell, New Rochelle, N. Y. App. filed Feb. 25, 1914. Centrifugally controlled switch for governing a motor vehicle.
- 1,110,799. REGULATING MIXED-PRESSURE TURBINES: E. Pärmer, Charlottenburg, Germany. App. filed Feb. 15, 1911. For exhaust and live steam source.
- 1,110,805. ELECTRIC SADRIN: E. C. Loetscher, Dubuque, Ia. App. filed Aug. 31, 1911. Resistance ribbon.
- 1,110,809. AUTOMATIC CALL-DISTRIBUTER SYSTEM: F. R. McBeatty, Antwerp, Belgium. App. filed Jan. 6, 1913. Simultaneous multiple control.
- 1,110,821. MOTOR CONTROLLER: G. R. Radley, Milwaukee, Wis. App. filed June 3, 1912. Brake-pedal-controlled electric vehicle.
- 1,110,834. ELECTRIC BELT SYSTEM: S. C. Snow, Blakesburg, Ia. App. filed Dec. 12, 1913. Party telephony.
- 1,110,847. OPERATING VAPOR-ELECTRIC APPARATUS FROM AN ALTERNATING-CURRENT SOURCE: E. Weintraub, Schenectady, N. Y. App. filed Oct. 18, 1902. Supplemental means for producing ionized vapor.
- 1,110,848. VARIABLE RESISTANCE DEVICE: E. Weintraub, Lynn, Mass. App. filed Aug. 18, 1911. Boron and carbon transmitter.
- 1,110,870. ELECTRIC BELL RINGER: W. V. Bergen and G. C. Corbys, Hillsboro, Ore. App. filed April 5, 1913. Solenoid-operated hammer.
- 1,110,872. ELECTRIC DISPLAY SYSTEM: C. F. Borschneck, Knoxville, Pa. App. filed Jan. 11, 1913. Switch for producing traveling effects.
- 1,110,893. DOOR ALARM: C. P. Caulkins, New London, Conn. App. filed Sept. 16, 1913. Knob-operated device.
- 1,110,896. ELECTROSTATIC SEPARATOR: H. Comstock, Mineville, N. Y. App. filed June 9, 1911. Traveling belts.
- 1,110,900. SPEED MEASURING AND CONTROLLING DEVICE: J. H. Core, Nashville, Tenn.

- App. filed March 14, 1913. Indicator and encoder for automobile engine.
- 1,110,911. ELECTRIC DETACHING APPARATUS: S. Endel, United States Navy. App. filed June 3, 1913. For life-preservers, etc.
- 1,110,913. TRAIN DISPATCHER'S TELEPHONE CIRCUIT: H. C. Edgerton, Passaic, N. J. App. filed May 17, 1912. For two different kinds of receivers.
- 1,110,919. ELECTRIC HEATER: H. A. Gamble, Greenville, Miss. App. filed Feb. 20, 1913. For uniform heating of medicinal solutions.
- 1,110,924. INSULATOR: E. M. Hewlett, Schenectady, N. Y. App. filed April 20, 1907. Disk-strain type; rain-shedder. Priority awarded to Hewlett over Steinbraker (patent No. 904,876) by United States District Court affirmed by Circuit Court of Appeals.
- 1,110,947. INSULATING JOINT AND PROCESS OF MAKING THE SAME: H. J. Lampert, Chicago, Ill. App. filed Jan. 23, 1911. For light fixtures and strain insulators.
- 1,110,970. HOUSED CONTACT FOR RAILWAY SIGNALING SYSTEMS: B. F. Wooding, Denver, Col. App. filed July 15, 1912. Movable cover.
- 1,110,989. AUTOMOBILE HORN: R. H. Mansfield, Ohio. App. filed May 6, 1912. Electromagnetic.
- 13,800 (reissue). AUTOMATIC SIGNAL OPERATOR: E. R. Gill, Yonkers, N. Y. App. filed July 22, 1913. For high-speed telephone and telegraph work. (Original patent No. 1,024,444, dated April 22, 1912.)

The following thirty patents were issued to the Cooper Hewitt Electric Company, of Hoboken, N. J., on original, divisional, continued and renewed applications filed at various times beginning as early as April 11, 1898. Reference will be found to the Cooper Hewitt patents Nos. 632,690 to 682,699, of Sept. 17, 1901; patent of Dec. 3, 1901; patents Nos. 1,014,705, 1,014,965, 1,201,056 and 1,069,695; the Thomas patents Nos. 930,225 and 984,248; the Baker patents Nos. 762,114 and 784,149, and also to pending applications of Hewitt. No. 677,199, filed April 11, 1898, and Hewitt and Rogers, filed March 23, 1901. Detailed digest is omitted owing to lack of space.

#### PETER COOPER HEWITT PATENTS

- 1,110,543. STARTING AND CONTROLLING DEVICE FOR ELECTRIC-VAPOR APPARATUS. App. filed April 11, 1902.
- 1,110,544. ELECTRODE FOR VAPOR APPARATUS AND METHOD OF OPERATING THE SAME. App. filed Jan. 11, 1906.
- 1,110,546. DIRECTIONAL-CURRENT ARRESTER. Original app. filed Feb. 3, 1903.
- 1,110,547. METHOD OF TRANSMITTING AND UTILIZING ELECTRIC CURRENTS. Original app. filed April 5, 1901.
- 1,110,548. STARTING AND CONTROLLING DEVICE FOR ELECTRIC-VAPOR APPARATUS. Original app. filed April 11, 1902.
- 1,110,549. VAPOR CONVERTER. Original app. filed March 20, 1908.
- 1,110,550. MULTIPLE OPERATION OF TRANSLATING DEVICES. Original app. filed May 23, 1903.
- 1,110,551. STARTING AND OPERATING VAPOR-ELECTRIC DEVICES. App. filed April 25, 1905.
- 1,110,552. VAPOR-ELECTRIC DEVICE. App. filed July 1, 1905.
- 1,110,553. STARTING DEVICE FOR MERCURY-VAPOR ELECTRIC APPARATUS. Original app. filed Nov. 24, 1907.
- 1,110,554. SYSTEM OF ELECTRICAL DISTRIBUTION BY VAPOR CONVERTERS. App. filed Feb. 23, 1906.
- 1,110,555. VAPOR-ELECTRIC DEVICE. Original app. filed July 1, 1905.
- 1,110,556. ELECTRICAL DISTRIBUTION SYSTEM. Original app. filed May 2, 1903.
- 1,110,557. MERCURY-VAPOR RECTIFIER. App. filed Jan. 3, 1911.
- 1,110,558. VAPOR-ELECTRIC APPARATUS. Original app. filed May 13, 1904.
- 1,110,559. VAPOR-ELECTRIC LAMP AND CONNECTIONS. Original app. filed March 19, 1903.
- 1,110,560. VAPOR-ELECTRIC APPARATUS. Original app. filed Jan. 3, 1911.
- 1,110,561. VAPOR-ELECTRIC APPARATUS. Original app. filed Jan. 3, 1911.
- 1,110,562. ELECTRICAL PRODUCTION OF LIGHT. Original app. filed April 11, 1898.
- 1,110,637. ELECTRICAL DISTRIBUTION BY ALTERNATING CURRENTS. Original app. filed April 25, 1903.
- 1,110,688. ELECTRICAL DISTRIBUTION BY ALTERNATING CURRENTS. Original app. filed April 25, 1903.

- 1,110,780. ELECTRIC-VAPOR APPARATUS. App. filed April 17, 1905.
- 1,110,781. CIRCUIT-BREAKER. Original app. filed May 1, 1905.

#### MAX VON RECKLINGHAUSEN PATENTS

- 1,110,572. GAS OR VAPOR CONVERTER DEVICE. App. filed Nov. 12, 1903.
- 1,110,573. GAS OR VAPOR CONVERTER DEVICE. Original app. filed Nov. 12, 1903.
- 1,110,574. ELECTRODE FOR GAS OR VAPOR-ELECTRIC APPARATUS. Original app. filed Feb. 14, 1903.
- 1,110,575. VAPOR-ELECTRIC APPARATUS. Original app. filed Nov. 12, 1903.
- 1,110,576. MEANS FOR IMPROVING A VACUUM. App. filed July 29, 1913.

#### PERCY H. THOMAS PATENTS

- 1,110,582. SINGLE-PHASE GAS OR VAPOR-ELECTRIC APPARATUS. App. filed June 13, 1903.
- 1,110,583. ELECTRICAL DISTRIBUTION SYSTEM. App. filed Sept. 4, 1903.
- 1,110,584. MEANS FOR KEEPING VAPOR CONVERTERS ALIVE. App. filed Dec. 24, 1903.
- 1,110,586. MERCURY-VAPOR OUTFIT AND CIRCUITS THEREFOR. App. filed March 30, 1905.
- 1,110,587. ALTERNATING-CURRENT VAPOR LAMP. App. filed May 11, 1905.
- 1,110,588. OPERATION OF VAPOR CONVERTERS. App. filed Sept. 1, 1905.
- 1,110,589. ALTERNATING-CURRENT VAPOR DEVICES. App. filed Sept. 27, 1905.
- 1,110,590. REGULATION OF SYSTEMS OF ELECTRICAL DISTRIBUTION. Continuation of app. filed Dec. 22, 1903.
- 1,110,591. METHOD OF AND APPARATUS FOR STARTING VAPOR DEVICES. App. filed Dec. 24, 1906.
- 1,110,592. SYSTEM OF DISTRIBUTION BY VAPOR-ELECTRIC CONVERTERS. Original app. filed Feb. 17, 1903.
- 1,110,593. SYSTEM OF DISTRIBUTION BY VAPOR-ELECTRIC CONVERTERS. Original app. filed June 22, 1905.
- 1,110,594. OPERATION OF VAPOR CONVERTERS. Continuation of app. filed Jan. 24, 1903.
- 1,110,595. OPERATION OF VAPOR CONVERTERS. App. filed Sept. 1, 1905.
- 1,110,596. SYSTEM OF ELECTRICAL DISTRIBUTION. Original app. filed Jan. 21, 1903.
- 1,110,597. STARTING DEVICE FOR VAPOR CONVERTERS. Original app. filed May 11, 1905.
- 1,110,598. ALTERNATING AND DIRECT CURRENT ELECTRIC DISTRIBUTION. Original app. filed Jan. 22, 1903.
- 1,110,599. MEANS FOR STARTING VAPOR CONVERTERS IN SERIES. Original app. filed March 8, 1907.
- 1,110,600. VAPOR-ELECTRIC APPARATUS. App. filed Dec. 6, 1911.
- 1,110,601. COATING DEVICE FOR VAPOR-ELECTRIC APPARATUS. Original app. filed March 28, 1904.
- 1,110,602. VAPOR-ELECTRIC APPARATUS ADAPTED FOR OPERATION IN SERIES. Original app. filed Nov. 22, 1906.
- 1,110,603. MERCURY-VAPOR APPARATUS. App. filed Feb. 3, 1913.
- 1,110,658. THREE-WIRE SYSTEM OF ELECTRICAL DISTRIBUTION. Original app. filed Jan. 21, 1903.

#### CHARLES ORME BASTIAN PATENTS

- 1,110,607. VAPOR-ELECTRIC APPARATUS. Original app. filed Dec. 19, 1905.
- 1,110,608. ELECTRIC-VAPOR APPARATUS. Original app. filed Jan. 27, 1913.
- 1,110,609. VAPOR-ELECTRIC APPARATUS. Original app. filed Dec. 19, 1905.
- 1,110,985. VAPOR-ELECTRIC APPARATUS. Original app. filed Dec. 19, 1905.

#### STANWOOD E. FLICHTNER PATENTS

- 1,110,617. ADJUSTABLE SUPPORT FOR VAPOR LAMPS. Original app. filed July 23, 1904.

#### FREDERICK H. VON KELLER PATENTS

- 1,110,630. HIGH-TENSION VAPOR CONVERTER. App. filed Dec. 5, 1905.
- 1,110,631. APPARATUS FOR OPERATING MERCURY-VAPOR LAMPS. Original app. filed Aug. 6, 1908.

#### JOSEPH C. POLE PATENTS

- 1,110,644. RECTIFIER FOR LAMPS. App. filed Aug. 4, 1910.
- 1,110,645. MERCURY-VAPOR APPARATUS. App. filed Sept. 5, 1912.

# Electrical World

The Consolidation of *Electrical World* and *Engineer and American Electrician*

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**Operating Costs of Electric Vehicles** Real progress in the industry being predicated on authoritative results, the *Electrical World* has begun a country-wide campaign to determine and publish as a contribution to the art the actual operating costs of electric vehicles. It is our purpose to collect and collate data on equipments now in service together with the characteristic operating conditions attending their use, and to have a critical analysis made of the material thus gathered by a vehicle expert of recognized ability and integrity. So much of half truth and half fiction has been circulated on the performances of electric vehicles that the whole industry has been hampered in its legitimate growth. What we seek and hope to establish beyond the shadow of doubt are the facts known to those engaged in merchandise transportation. Already we have met with very gratifying co-operation, convincing us of the need of such statistics and of their ultimate value to the manufacturer, user and electric-supply company.

**After Two Months of European War** After two months the effect of the terrible European conflict upon our industry is easier to judge. So far as central stations are concerned this effect is twofold: First, in volume of gross earnings there is still every indication that most of the properties have held well; second, in new financing the companies are still restricted by the unwillingness of bankers to further capital commitments. There are, of course, many exceptions to this statement of approximate average conditions. In the language in which one public utility holding-company official discussed the affairs of a subsidiary operating property: "In that section of the country people do not know from any commercial sign that there is a war." Other properties, established in centers that are seriously dependent on imports or exports, naturally show some results from lessened industrial activity. Similarly, the situation regarding capital expenditures is not wholly one-sided. The company at Elmira, N. Y., has sold a small block of bonds, \$284,000. Likewise some established properties were financed so far ahead that, unless they changed their program, they have been able to provide for reasonable construction requirements. Properties still in the development stage have progressed or suspended activities according to whether or not they were prudently financed well in advance of actual requirements. The information that comes from all directions appears to warrant the conclusion that current business with the central stations has been maintained in a way that is

not only encouraging but is characteristic of that inherent strength of the industry on which we base our faith. The uncertain point about the situation, as at the beginning of trouble, is the condition of the banks. At this time it is idle to speculate on the probable date of relaxation of banking precautions. Until it is clear to the principal banking authorities that victor and vanquished are ready for peace, or there is pretty definite certainty that further demoralization in security prices is impossible, it is unlikely that, in any substantial degree, banking restrictions will be loosened.

**Electricity in the Steel Industry** The magnitude of electrical application in the iron and steel industry is not without interest or surprise.

Data published elsewhere in this issue show that the installed horse-power of motors used last year by sixty-two steel companies was more than 1,250,000 and the number of motors in service was 45,512. More startling was the amount of energy generated and purchased by these companies, 1,641,564,000 kw-hr. This is more than one-tenth of the total output of the central stations of the United States in 1912, and the rating of motors is almost equal to that receiving energy from the entire central-station industry of the country seven years ago. One plant alone used more electricity than was generated by the Edison systems of Brooklyn and Boston combined. When, as has been predicted, electricity shall have supplanted steam entirely as motive power, the electrical needs of the steel industry will be enormous. Only three of the companies purchase electrical energy. An abundant opportunity exists here for enterprising central-station managers to add to this number.

**The Pioneer Investors**

Mr. Philip J. Kealy pays tribute to "the courage and faith of the pioneer investors who formed and managed the early companies" in the historical part of his report on the fair value of the property of the Kansas City Electric Light Company and subsidiaries. Their daring support of the initial plants made possible the later development of a mighty industry. An investment in central stations in the early days was a highly speculative risk of capital. Even in 1888 the company was unable to sell \$50,000 of 8 per cent first mortgage bonds on a property having an investment of \$100,000 and earning a good return thereon. This experience is merely a duplicate of others which many men in the industry, speaking from personal knowledge, will confirm. The debt we owe to the pioneers is not easily



measured. It will not do to say grudgingly that if those who did this yeoman's service had not acted others would have stepped forward to supply the need. Looking back complacently from the heights to which the industry has ascended, we cannot fail honorably or truthfully to render tribute to all who ventured what they had to venture, who believed and went forward. To start a plant in the face of predictions of disaster, discouragement and doubtful support required qualities that are not to be treated lightly. To have been an electrical pioneer is a high commercial honor. It is not easy to tell how much of financial success or failure came to the early upholders of the industry. It is well known that many properties came to grief. The proportion that lost eventually, however, was smaller than the proportion that gained eventually. Some of those who lost were unable to recoup themselves. Others, commercially keener, built success from failures. That success should fairly have come to those who took the initial chance all will admit. Their claims are worthy of commercial reward as well as of honorable mention.

### The Big Creek Transmission System

The paper by Mr. Edward Woodbury on the 150,000-volt transmission system from Big Creek to Los Angeles, an abstract of which appears in this issue, is an extremely striking contribution to the art of long-distance transmission since it contains a description of the working features of one of the longest transmission system yet built, in which the capacity effects on the line, owing to its great length of 240 miles, rise to a magnitude which compels very serious consideration. In no other straight-away transmission system yet constructed has the distance risen to a material fraction of the fundamental wave-length and a considerable fraction of wave-lengths due to the lower harmonics. The operating qualities of the system, therefore, are of particular interest, for the electro-dynamic properties of the line involve serious problems of regulation. The inherent voltage regulation of the line, aside from any adjunct, is from 10 per cent above the rated powerhouse voltage at no load to 20 per cent below it at full load, and to keep this under control extreme measures are necessary. The emf, which is 137,000 volts at the generator under no-load conditions, rises to 150,000 at the receiving end, and calls for 21,500 kva load for the charging volt-amperes, or about 40 per cent overload on one of the 17,500-kva generators. The effect of the heavy leading current on the generator is to build up the excitation so that a single generator connected to an unloaded line, with the field switch open, gives considerably above its rated voltage.

In order to insure good service it was found necessary to provide automatic voltage regulators connected to the exciters of the generators so as not only to vary the field current from the maximum excitation to zero but actually to reverse the field excitation to hold down the no-load voltage. This was very ingeniously done in both of the Big Creek stations, different methods being

used. At the receiving ends of the line are installed for each a 15,000-kva rotary condenser, as our readers will remember from the earlier descriptions of the plant. These also are fitted with automatic regulators for varying the excitation so as to compensate for the lead or lag in the line current to such an extent as to hold the terminal voltage constant. As the plant is actually worked the condensers are operated with lagging current when the total load delivered is below about 20,000 kw, which ordinarily occurs from about 9 o'clock in the evening to about 6 o'clock in the morning. During the period of the day load the condenser current changes from lagging to leading, reaching a maximum, at the peak load, of some 60,000 kva. Thus, except for starting conditions, the regulation is transferred from the sending to the receiving end of the line, and during the periods of heavy load the generators are running at about 95 per cent power-factor, the power-factor at the condensers being automatically varied to maintain the constant line voltage at the receiving end. The combination appears to work out admirably in spite of the abnormally large line effects under the varying loads.

Interesting as it is, the regulation is only one of the striking features of operation due to the extraordinary length of the line. For example, the three conductors of each tower line are mounted in the same horizontal plane and hence are unsymmetrical when considered as a three-phase system. Under no-load conditions unbalancing in voltage amounting to 12 per cent is caused by this lack of symmetry, but under normal load conditions the unbalance falls to about 2 per cent. Similar unbalancing has been found by experience to be practically negligible under most circumstances, but the extreme length of this line brings it into prominence. Moreover, the large currents used involve heavy mutual induction between the two circuits so that in a 100-mile section of a dead line there has been detected an emf of 4200 volts produced in the inactive line by the magnetism surrounding the live line, although the systems are separated by 82 ft. from center to center.

In service the line seems to have acted very well as to continuity. A few short-circuits have been experienced, but none of them has been sufficiently serious to burn off the cable. Some of them have been caused by flash-overs at the insulators, a fact particularly interesting on account of the large factor of safety provided in these. Each chain of insulators consists of nine disks with a normal flash-over voltage of 420,000 when wet. This implies a factor of safety as regards the working emf of nearly 2.9. The possibility of there being a voltage on the line high enough to cause a flash-over in spite of the large factor of safety will well repay further investigation. Altogether the plant is a most notable one, particularly in showing the way to consistent and successful operation over a distance considerably greater than is within the ordinary range even of long-distance practice. Its successful operation is a matter for congratulation to both the builders and the engineering public.

### Advance of the Arc Lamp

The rivalry between the high-powered series incandescent and the arc lamp for the illumination of streets and large outdoor areas is sure to be intensified in the immediate future by the remarkable progress in the magnetite lamp chronicled elsewhere in this issue. The combined gains in luminous efficiency secured by recent developments in electrodes and by the application of the prismatic refractor are so great that even the gas-filled incandescent lamp has been distanced for the time being. When the losses in the lamp transformer are taken into account it is doubtful if the moderate sizes of gas-filled lamp can show much lower consumption than from 0.8 watt to 0.9 watt per mean spherical cp, while the new 5-amp luminous arc lamp equipped with the high-efficiency electrode consumes only 0.61 watt per mean spherical cp. Against this advantage must be set the cost of the personal attention each arc lamp demands. The arc lamp still consumes a sufficiently high wattage per lamp to preserve a considerable gap between itself and the sizes of series incandescent lamps ordinarily found in street-lighting service, but further improvements are pretty certain to come in time and the central-station manager or municipal official who thinks that the knell of the arc lamp was sounded by the advent of the gas-filled unit should lose no time in revising his views. The application of these improved lamps will furnish the industry with a large number of valuable data bearing upon desirable spacings, installation costs per mile and energy expenditure for specific illumination results on the street.

### The International Electrical Congress

Two epoch-making events have occurred in the world's history during 1914, namely, the opening of the Panama Canal and the beginning of the great European war. The first of these has been constructive and is destined to accelerate trade greatly by linking oceans. The second is destructive, as a test of what power shall control Europe and indirectly the ocean commerce itself. The first was the outcome of a steady, long-continued engineering effort. The second, although it was predicted and might have been clearly foreseen, came with great suddenness. It is, therefore, inevitable that the results of the war should interfere with plans made for the celebration of the canal opening.

The International Electrical Congress, as announced at various times in our columns, had been arranged to be held at San Francisco in September, 1915. The organization of the preparatory details for the congress was undertaken by the American Institute of Electrical Engineers, at the request of the International Electro-technical Commission. A committee on organization was formed some time ago, with various sub-committees to take charge of different branches of the work. At the end of last July, just before the outbreak of war, a considerable number of congress members had been enlisted and papers had been invited from electrical engineers all over the world. A very satisfactory number of papers had already been promised. Local committees

had been formed in Europe for aiding in the work of preparation. The moment war broke out all of this work naturally came to a standstill. If the war should continue next year, it is impossible to expect that electrical engineers from other countries will attend at San Francisco. The congress would in that event be merely a national convention from America and not an international gathering. Moreover, even if peace should be reached this year, there will be so much reconstructive work clamoring for accomplishment in all the countries next year that a truly representative international gathering at San Francisco could not be hoped for.

Under these circumstances, it seems likely that the American Institute of Electrical Engineers will postpone the congress. No official action has yet been taken by that body, but it is understood that such action is shortly to be looked for. Since America received the mandate to hold the congress in 1915, and since, as a neutral country, America would probably be a very suitable country for the next electrical congress after the war, it is to be hoped that the project will not be abandoned, but will merely be postponed until an opportunity arises for its resumption. In such a case we might hope to have the congress deferred, say, to 1917, and perhaps transferred to some city on the Atlantic seaboard.

### The Trade Press in Convention

The Federation of Trade Press Associations has reason to felicitate itself on the high character, the dignity and the seriousness of purpose of its ninth annual convention, which was held in Chicago last week. The real desire to serve which animates the publishers of a preponderating number of the class journals in this country was reflected in the kind of men who attended, in the character of the papers and addresses, in the intelligence and earnestness of the debates, and in honest co-operative effort. Educators, advertising managers, merchants, engineers, manufacturers and bankers—busy men of affairs—gave of their thought, their mental energy and their time to co-operate with their associates of the technical and trade press to discuss problems of common interest.

An attendance of about 400 was attracted by the convention. Probably every man present obtained a new conception of the importance and standing of the class-journal press. No man there was ashamed of his calling. It was evident that the class papers have made great strides in the last decade, and there was shown a firm determination to continue to keep step with the march of progress. The motto of the convention was given as "Business building through the business press," but the spirit of the assemblage might more comprehensively be expressed by the one word "Service." More than business was discussed. Clearer thinking, better living, a greater degree of unselfishness, the duties of the class papers to the state—these were some of the things that were subjects for consideration at the convention. It was a great convention of a great industry.



# The News of the Week

## Activities and Events in the Electrical Field— Reports of Meetings—Commission Findings, Etc.

### Patent Office Activity

In order to dispose of pending business, Commissioner of Patents Ewing has ordered that examiners make special every application for a patent which has been pending for five years and every application purporting to be a division or a continuation of an application which has been on file for more than five years. After Nov. 30 no amendment or other paper presented by an applicant shall be entered without having been called to the attention of the commissioner. Each examiner must report to the commissioner the applications falling under this order which are pending in his division.

### New York Electrical Show Begins Next Week

The New York Electrical Show, given under the auspices of the Electrical Show Company in the Grand Central Palace, New York City, will open Oct. 7 and remain open until Oct. 17. Approximately 150 exhibits have already been arranged, which will make the forthcoming exposition, the eighth annual one in New York, the largest of its kind ever held. Chief among the elaborate exhibits made by the government will be one showing the extensive use of electricity in modern warfare, including a new arsenal fully equipped and engaged in making ammunition. The electrically operated machinery for making bullets will come from the Frankford Arsenal at Philadelphia. The New York Electric Vehicle Association has perfected plans for a series of mileage tests during the show. Two cups, one for pleasure cars and one for motor trucks, are being offered for the road runs.

### Value of Kansas City Property

A report on the fair value of the property of the Kansas City Electric Light Company and subsidiaries, of Kansas City, Mo., has been made by Mr. Philip J. Kealy, of Kansas City, Mo., in accordance with orders of the Public Service Commission of Missouri.

Schedule 1 contains a history of the development of the company. In the introduction Mr. Kealy says that this company was one of the first companies, if not the first, engaged in the manufacture and distribution of electrical energy in America. The company in 1883 operated two circuits of forty arc lamps each through the means of one 60-hp engine and several small dynamos. To-day it has a connected load of over 84,000 kw, furnishing light, heat and power to approximately 30,000 customers. The values determined are as follows:

First, cost of reproduction: Cost to reproduce the physical property, \$7,265,272; cost of attaching business, \$1,056,738; plant development expense, \$525,913; total, \$8,847,923. Second, the actual investment in the property and the net returns had thereon: Cost new of existing property, \$7,471,130; accrued loss, \$1,851,491; total, \$9,322,621. Third, the fair market, exclusive of franchise, value, \$9,000,000.

Since the establishment of the company in 1883 annual receipts have increased from \$30,626 to \$2,400,000.

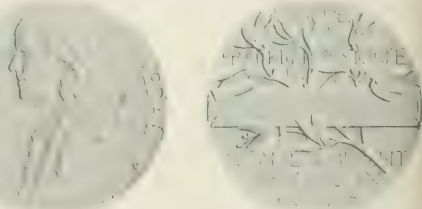
### Philadelphia A. I. E. E. Meeting

A meeting of the American Institute of Electrical Engineers will be held on Monday, Oct. 12, at Philadelphia under the auspices of the committee on use of electricity in marine work and the Philadelphia Section of the Institute. The headquarters will be in the Engineering Building, University of Pennsylvania, Thirty-third and Locust Streets.

At the afternoon and evening sessions the following papers will be presented: "Submarine Signaling," by Mr. R. F. Blake; "The Electrical Equipment of the Argentine Battleship *Moreno*," by Mr. H. A. Hornor, and "The Electrical Features of the United States Reclamation Service," by Mr. F. H. Newell. Mr. W. F. James, 1115 North American Building, is secretary and treasurer of the Philadelphia Section of the A. I. E. E., and Mr. H. F. Sanville, 1326 Chestnut Street, is chairman of the reception committee.

### The Franklin Medal

The accompanying illustrations show the obverse and reverse of the Franklin medal founded by Mr. Samuel Insull, of the Commonwealth Edison Company of Chicago, for the Franklin Institute of the State of Pennsylvania, to be awarded from time to time in recognition of distinguished achievements in science and technology. On March 24 Mr. Insull forwarded his check



OBVERSE AND REVERSE OF FRANKLIN MEDAL

for \$6,000 to the Franklin Institute, \$1,000 of which was to be used for paying for the design of the medal and the necessary dies and diploma plates. The medal is of gold, of an intrinsic value of about \$75, and has on one side a medallion of Benjamin Franklin taken from his portrait by Thomas Sully. The other side has a space for the name of the winner. The medal was designed by Dr. R. Tait McKenzie, of the University of Pennsylvania.

The sum of \$5,000 is to be held in trust in perpetuity as a foundation for the medal, the interest being used from time to time in awarding the medal to those workers in physical science or technology without regard to country whose efforts have, in the judgment of the Franklin Institute, done most to advance a knowledge of physical science or its applications. Any excess of income from the fund beyond the average annual sum deemed necessary for the number of medals may be used for premiums to accompany the medals.

### Check to Trust Legislation

The conference report on the Clayton anti-trust bill, presented last week, has been under consideration in the Senate this week, where it was made the "unfinished business" and has been meeting with determined opposition.

Following the presentation of the report, President Wilson allowed it to become known that the measure met with his approval and that if it came to him in the shape the conferees agreed upon he would sign it. During the week he also signed the Newlands federal trade commission act, and that measure is now a law, his signature having been appended just ten days after it was sent to him from Congress. He had waited before signing it, so that he might possibly be able to sign the Clayton measure at the same time. He was unable to delay longer signing the Newlands act, as that would have become a law without his signature.

Senator Reed, of Missouri, declares that the "teeth" of the Clayton bill were extracted in conference, and that its passage in its present form would be a betrayal of the promises of the Democratic party. He is of the opinion that the conference report makes no considerable change in the trust laws and declares that the Sherman anti-trust law fully covers everything in the conference report. Senator Reed addressed the Senate for five hours on Sept. 28, and continued his attacks from day to day, forcing roll-calls in order to require a quorum of Senators whenever the chamber emptied. In this he was assisted by Senator Norris, of Nebraska, a Progressive, and the Republican Senators have generally announced their opposition to the conference report. Senators Nelson, Borah and Kenyon, on the Republican side, particularly aided Senator Reed. All of Senator Reed's efforts were bent toward forcing a filibuster on the bill, with instructions to recommit the conference report to the conferees for "strengthening" the bill.

### E. V. A. Convention Program

The program of the Electric Vehicle Association convention to be held at the Hotel Bellevue-Stratford, Philadelphia, Oct. 19, 20 and 21, has been announced as follows:

Oct. 19—Address, Mayor Blankenburg of Philadelphia; president's address, Mr. F. W. Smith; executive secretary's and treasurer's reports; reports of the committee on constitution and bylaws; report of sections—"What the Sections Are Doing"; report of insurance committee; report of papers committee; report of committee on membership and formation of sections; report of garage and rates committee; "Progress of the Electric Vehicle," Mr. James H. McGraw; "European Development of the Electric Vehicle Industry," Mr. P. D. Wagoner; "Electric Fire Apparatus," Mr. George S. Walker; "Constant Potential System of Charging from Motor Generators," Mr. F. H. Dodge; "Electric Vehicle Charging," Mr. J. F. Lincoln; "Special Applications of Electric Trucks," Mr. F. Nelson Carle; report of the moving-picture-film committee, Mr. W. C. Andrews; moving picture—"Selling Electric Vehicles."

Oct. 20—Report of the traffic committee; report of good roads committee; report of committee on legislation; report of committee on educational courses; "The Cost of Electric Vehicles," Mr. George H. Kelly; "Educating the Public in the Field and Use of the Electric Vehicle," Mr. F. C. Henderschott; "The Motor Truck in Traffic Congestion," Lieut. W. D. Mills; report of the committee on central-station co-operation; report of the committee on parcel-post delivery; report of the committee on operating records; "A Wider Dissemina-

tion of Electric Vehicle Information," Mr. T. I. Jones; "A Practical Project of Securing Authentic Costs of Operating Commercial Electric Vehicles," Mr. William P. Kennedy; "Power-Wagon Operation in Central-Station Service," Mr. W. A. Manwaring; "Electric-Vehicle Performance," Mr. Robert B. Grove.

Oct. 21—Report of the standardization committee; "Calculations of Electric Motor Characteristics and Prediction of Vehicle Performance," Mr. A. A. Nims; "The Design and Performance of Electric Vehicle Motors," Mr. H. S. Baldwin; "Effects from the Utilization of the Kinetic Energy of an Electric Vehicle," Mr. T. H. Schoepf; report of nominating committee and election of officers; symposium on "The Electric Industrial Truck."

Messrs. H. H. Doering and Louis E. Burr are also expected to present papers.

### Electric-Vehicle Promotion

At the monthly meeting of the New York Section of the Electric Vehicle Association of America, Sept. 30, Mr. E. L. Howland, automobile editor of the *Journal of Commerce*, read a paper entitled "Practical Ideals in Electric-Vehicle Promotion." Mr. Howland recounted some of the earlier methods of selling motor vehicles and declared that salesmanship of the automobile type was hardly suited to the technical qualifications necessary for the electric-vehicle salesman. From a selling point, he stated, it is probably true that when it came to the commercial vehicle the gas-car salesman tried to sell his customers automobiles and the electric car salesman electrical machinery. The unit for judging motor trucks should be efficiency first and economy of operation second. Motor-truck designers know that progress will best be served by adapting the product to the business men's needs and not to their preconceived theories. Arguments of technique interest the buyer little, but requisite capacity and power are big factors. The electric vehicle is advantageous in that it is an aggregation of proved units, manufactured by specialists and more or less available in the market for quick repair and installation. Among most prospective buyers the idea seems prevalent that the prices of commercial vehicles are too high. Standardization is a step in the right direction, for if quantity production of whole trucks is delayed the quantity production of parts may solve the problem of bringing the truck within the range of the business man. Mr. Howland concluded his paper with a few pertinent remarks on commercial-vehicle advertising, and asserted that it was best to seek the most direct and concentrated channels to reach the business man.

In the discussion following, Mr. D. Beecroft said that it was necessary for the electric-vehicle salesman to form a certain atmosphere—call it an atmosphere of new transportation—around his prospect and to endeavor to sell what he has and not what he thinks the man wants. Mr. Beecroft also declared that the matter of service was being overdone.

Mr. W. P. Kennedy remarked that though in many cases the designer's fancy has been far ahead of the buyer's necessity, the latter has not always known what he needed. He asserted that the educational function of the electric-vehicle salesman was most important. Mr. Kennedy disputed the frequent statement that commercial vehicles are too high-priced. Mr. F. C. Carle suggested that the salesman state the gain the prospective customer will obtain by using an electric vehicle in the terms of the commodity the man is selling.



### A. I. E. E. New York Meeting

A meeting of the American Institute of Electrical Engineers will be held in the Engineering Societies Building, New York, on Friday, Oct. 9, at 8:15 p. m. The general subject of the meeting will be protective reactors. Two papers will be presented as follows: "Protective Reactors for Feeder Circuits of Large City Systems," by Messrs. James Lyman, Leslie L. Perry and A. M. Rossman, and "Use of Reactors with Synchronous Converters," by Mr. James McK. Yardley. The former paper contains an outline of the use and limitations of protective reactor coils in feeder circuits. When no feeder reactors are used, doubling the station equipment increases the number and severity of short-circuits. The insertion of feeder reactors reduces the severity of a short-circuit and practically renders the effect local so that beyond a certain point additional generator equipment does not appreciably increase the severity of short-circuits. In the second paper consideration is given to the use of reactors with synchronous converters to insure continuity of service and protect the apparatus. Three conditions of service are considered with regard to use of protective reactors as follows: (1) Where it is important to keep voltage on the lines at all times; (2) where heavy overloads are frequent but where to protect apparatus and maintain service the voltage may be allowed to drop during overloads; (3) where high momentary overloads are frequent without appreciable voltage drop but where brief interruptions are not objectionable.

### New Bedford (Mass.) Street-Lighting Improvements

At a meeting of the New Bedford (Mass.) lighting committee on Sept. 28 Mr. W. H. Snow, manager of the Edison Gas & Electric Light Company, appeared on behalf of a change in rating of lamps employed in street illumination. Mr. Snow stated that when the present contract was negotiated in 1912 tungsten lamps were manufactured and sold upon the basis of the wattage required for their proper operation. Within a few months the manufacturers have ceased to produce lamps on this basis and have substituted lamps graded according to candle-power delivered. The company, therefore, cannot perform its contract exactly and furnish lamps of the various types specified. The candle-power furnished by the lamps specified in the contract was 60, 80, 100 and 200, with a consumption of 1.25 watts per cp. The sizes now produced are 100 cp, consuming about 68 watts, and 250 cp, consuming about 166 watts. Mr. Snow suggested that a price of \$18.24 a year be made to apply to 100-cp lamps and \$44.40 per lamp a year to 250-cp lamps, giving the city much more light for the same money. The company offered to take out the old lamps from time to time and to install new lamps as ordered by the committee. Regarding gas lamps, Mr. Snow said that the Welsbach company has been inspecting those in New Bedford and finds that the single-mantle burners about the city are not getting enough gas for the best illumination. The Welsbach company has proposed to the Edison company that the gas consumption be increased in these lamps from 2.6 cu. ft. to 3.5 cu. ft. per hour, the Welsbach interests to pay half the cost of the increased consumption if the Edison company will bear the remaining expenses. Mr. Snow said that he suspected that the Welsbach proposition results in part from the increasing use of electric lamps, which has forced the Welsbach interests to utilize a mantle requiring an increased consumption of gas in order to make a proper showing. The committee decided that hereafter all incandescent lamps

ordered will be of 100 cp where 125 watts or less are to be consumed, and that 250-cp lamps will be specified for sizes above the foregoing. At an inspection trip following the meeting the committee ordered the replacement of ten 60-cp gas lamps by 250-cp tungstens, besides specifying the installation of a number of smaller incandescents.

### New Off-Peak Rates at Providence, R. I.

The Narragansett Electric Lighting Company, of Providence, R. I., instituted two new rates on July 29, one covering domestic heating and cooking and the other storage-battery charging and irrigating service. The first-mentioned rate consists of a service charge of \$2 per month for 4 kw of demand or less, plus \$1 per month for each additional kilowatt of demand or fraction thereof, plus an energy charge of 2 cents per kw-hr. for all energy used. These rates are net. The company installs one meter for each installation and requires the use of separate circuits in iron conduit in each instance. The second rate applies primarily to irrigation service, a class of business which the company is just beginning to develop. The rate applies from April 1 to Oct. 31 and also includes energy used exclusively for battery charging. A charge of 5 cents per kw-hr. is made for the first 100 kw-hr. used per month, 3 cents per kw-hr. for the next 200 units used per month, and 2 cents per kw-hr. for the excess over 300 kw-hr. used per month, this being the net rate. The minimum charges are \$1 per month for installations of less than 2 hp, 50 cents per hp per month from 2 hp to 10 hp, and \$5 per month for installations exceeding 10 hp. About 600 hp are at present used in irrigation in the Providence district, the usual service being by steam or gasoline engines.

### Convention of Electrical Contractors' Association of Massachusetts

More than 290 people attended the first annual convention held by the Electrical Contractors' Association of Massachusetts, note of which was made in last week's issue. The meeting closed on Sept. 25 with a banquet at the Hotel Bancroft, Worcester, and the feeling among those present was that the solidarity of the organization had been greatly improved, and that better days are in sight as a result of the co-operative spirit developed. It was voted to hold the next convention at Springfield, Mass., in 1915.

President John R. Galloway, of the National Electrical Contractors' Association, delivered a vigorous address on the importance of each contractor being an active rather than a passive member of the organization. He also advocated a larger co-operation between the contractors, jobbers and dealers. Mr. George E. Shepherd, of Wilkes-Barre, Pa., a director in the National Electrical Contractors' Association, contended that central stations should restrict their energies to the sale of electricity and should not engage in the merchandising of apparatus.

Mr. H. D. Learnard, of the Worcester Electric Light Company, pointed out the close interdependence between the various branches of the electrical industry, and Mr. J. A. Hixon, of Boston, pointed out that so-called constructive legislation designed to build up business cannot properly be put upon the statute books, the securing of such business being largely a matter of constitutional rights. The effect of low voltage on lamp service and energy consumption was discussed by

Mr. M. D. Cooper, of the National Lamp Works, Cleveland. Other speakers included Mr. Ralph Sweetland, of the National Board of Fire Underwriters, who spoke on the relation of the Electrical Code to the contractor, and Mr. Arthur R. Jones, of Cleveland, Ohio, who proved a strong advocate for the accounting system developed by the National Electrical Contractors' Association and who also spoke on matters of public policy. Mr. G. B. Muldaur described the work of the Society for Electrical Development, and the possibilities of economy through concentrated purchases were dwelt on by Mr. W. K. Tuohey, of Springfield, Mass.

Officers were elected as follows: President, Mr. W. K. Tuohey, Springfield; vice-president, Mr. C. W. Stiles, Milton; secretary, Mr. Henry D. Temple, Worcester; treasurer, Mr. Frank L. Barnes, Boston, and directors, Messrs. Samuel Cook, Northampton, and George D. Gibb, Dedham.

### New Committees of Commercial Section, N. E. L. A.

Chairman E. L. Callahan, of the Commercial Section of the National Electric Light Association, has made appointments to the committees of the Commercial Section for the ensuing year as follows:

Finance committee, Mr. Douglass Burnett, Consolidated Gas, Electric Light & Power Company, Baltimore, chairman; Joseph F. Becker, United Electric Light & Power Company, New York, vice-president, and E. A. Edkins, F. H. Gale, J. C. McQuiston and L. R. Wallis.

Membership committee, Messrs. John G. Learned, Public Service Company of Northern Illinois, Chicago, chairman; F. D. Beardslee, Union Electric Light & Power Company, St. Louis; L. D. Gibbs, Edison Electric Illuminating Company of Boston, and S. V. Walton, Pacific Gas & Electric Company, San Francisco, Cal., vice-chairmen, and W. R. Collier, E. R. Davenport, J. E. Davidson, W. A. Donkin, Norman B. Hickox, T. F. Kelley, S. M. Kennedy, H. N. McConnell, W. F. Neiman, G. C. Osborne, M. C. Osborne, P. D. Pembleton, H. C. Rice, C. G. Schluederberg, A. H. Sikes, C. N. Stannard, E. B. Walthal, T. G. Whaling, H. E. Hobson and Miss S. M. Sheridan.

Sub-committee on promoting Commercial Section activities in geographic and company sections, Mr. Homer E. Niesz, Commonwealth Edison Company, Chicago, chairman.

Publications committee, Messrs. E. A. Edkins, Commonwealth Edison Company, Chicago, chairman; Howard K. Mohr, Philadelphia Electric Company, vice-chairman; N. H. Boynton, National Lamp Works, Cleveland, Ohio, sales manager, and F. H. Gale, W. H. Hodge, D. H. Howard, H. N. McConnell, J. C. McQuiston, P. L. Miles, Cyril Nast, F. N. Pembleton, P. L. Thompson and H. C. Spaulding.

Handbook committee (sub-committee publications committee), Messrs. Charles J. Russell, Philadelphia Electric Company, chairman; E. F. Tweedy, New York Edison Company, vice-chairman, and W. H. Easton, E. J. Edwards, A. A. Gray, George H. Jones, Norman Macbeth, C. H. Stevens, S. V. Walton and George H. Stickney.

Committee on wiring of existing buildings, Messrs. R. S. Hale, Boston Edison company, chairman; S. E. Doane, National Lamp Works, Cleveland, Ohio, vice-chairman, and F. D. Beardslee, W. A. Donkin, G. Brower Griffin, F. H. Hill, R. W. Hoy, W. P. Lyon, C. E. Robertson, H. R. Sargent, M. E. Turner, George Weideman and J. E. Latta.

Committee on education of salesmen, Messrs. F. C. Henderschott, New York Edison Company, chairman; Fred R. Jenkins, Central Station Institute, Chicago,

vice-chairman, and R. H. Ballard, John A. Britton, Douglass Burnett, A. C. Einstein, C. A. S. Howlett, H. D. Shute and W. M. Skiff.

Committee on merchandising and recent development of energy-consulating devices, Messrs. R. R. Young, Public Service Electric Company, Newark, N. J., chairman, and F. D. Beardslee, Union Electric Light & Power Company, St. Louis, vice-chairman.

Sub-committee on electrical merchandising and energy-selling methods, Messrs. M. O. Dell Plain, A. Larney, A. S. McAllister, Howard K. Mohr, F. B. Rae, Jr., and C. N. Stannard.

Sub-committee on recent development of energy-consuming devices, Messrs. P. H. Booth, William Gould, A. A. Gray, J. D. Israel, W. H. McIntyre, S. L. Nicholson, M. S. Seelman, W. M. Stearns, W. G. Stetson, Glenn R. Trumbull, M. E. Turner, C. S. Walton, Roger Williams and Miss S. M. Sheridan.

Committee on motor-service sales, Messrs. Charles J. Russell, Philadelphia Electric Company, chairman; George H. Jones, Commonwealth Edison Company, Chicago, vice-chairman; C. H. Stevens, Edison Electric Illuminating Company of Brooklyn, secretary, and R. P. Burroughs, C. W. Bartlett, E. L. Crosby, J. M. Curtin, Frank A. Coffin, C. A. Greenidge, H. H. Holding, Thomas F. Kelley, L. R. McCleary, C. K. Nichols, John Meyer, John C. Parker, R. H. Tillman and G. B. Tripp.

Committee on commercial department terminology, Messrs. M. E. Turner, Cleveland Electric Illuminating Company, chairman, and J. F. Becker and John G. Learned.

Committee on foreign relations, Mr. E. L. Callahan, H. M. Bylesby & Company, Chicago, chairman.

Acceptances have not yet been received from all appointees.

## TWO VIEWS OF GOING VALUE

Commissioners Erickson of Wisconsin and Duncan of Indiana Discuss the Subject Before Indiana Lighting Men

At the sixth annual convention of the Indiana Electric Light Association, held at Indianapolis Sept. 22 and 23, two public service commissioners expressed their views on going value.

Characterizing going value as a storm center in modern business, the Hon. Halford Erickson, of the Wisconsin Railroad Commission, defined this intangible asset as the sacrifice borne by an enterpriser in constructing or building up a successful business. Among the sacrificial charges which must be borne are discount on bonds acquired in getting capital for plants. These charges are in the nature of interest charges and must be considered in appraisal. A few per cent must often be allowed for organization, legal expenses and the like in appraising utilities, but where lawsuits have been numerous and of long duration this account may grow beyond a few per cent and should be taken into consideration by every fair appraiser.

### Going Value Allowed by Courts

Considering the position of the courts in regard to going value, the speaker said that in all selling cases going value had been recognized, but in rate making many people seem to think going value ought not be considered. The courts, however, have allowed going value in the case of the Columbus (Ohio) Railway & Light Company and others. Going value should not only be allowed when found but should be accurately determined in each case, the amount of going value to be allowed being based upon the development charges borne during the unremunerative period. The speaker said further that he favors charging going value to the



capital account as it is in the nature of an investment. How much going value should be allowed, he said, is a question of judgment to be fixed after a thorough investigation by an honest and competent regulating body.

#### When Going Value Should Not Be Allowed

Judge Thomas C. Duncan, chairman of the Indiana Public Service Commission, declared that rates must be fair to both the public utilities and the people. If a company has had a fair return from the first, he said, and in later years has had more than a fair return, then the public has borne the expense of going value and going value should not be allowed in making an appraisal. This makes it necessary for a commission to know the entire life history of every plant, and for this reason the Indiana commission is making a complete study of every plant before making a rate.

Speaking of the hearings before the Indiana commission, Judge Duncan said that reputable expert witnesses have testified that after all possible expense had been provided for a profit of from 10 per cent to 15 per cent should be allowed. This rate, he considered, is too high and will not be countenanced by the public at large as it is more than the farmer or the ordinary business man is able to secure from his endeavors. Regulation, he said, should above all things be fair as it is probably the last experiment the state will try before going to state or municipal ownership. The plan of the Indiana commission is, as far as can be done with equity, to take care of the small user, that is, the customer whose bill of \$1 a month is a burden. In closing, the speaker dwelt upon the difficulties of meeting condemnation of the public and the utilities in a judicial attitude and asked the friendly co-operation of the companies with which the commission was dealing.

### INDIANA ELECTRIC LIGHT ASSOCIATION

Commission Regulation, Lightning Protection, Small-Customer Possibilities, Lighting and Public Policy  
Discussed at Indianapolis Convention

The sixth annual convention of the Indiana Electric Light Association was held at Indianapolis, Sept. 22 and 23. President Thomas F. English, of Muncie, in his opening address said that character of service, competency and courtesy of company employees and many seemingly minor details are the factors molding public sentiment. Commission regulation, he suggested, should bring about conditions to secure for the public fair and reasonable rates and adequate service. At the same time the economic waste of competition among utilities should be eliminated.

During the past year the membership committee, of which Mr. Thomas Donahue, of Lafayette, is chairman, succeeded in increasing the membership from 72 members to 117.

#### Accounting Club Formed

As the outgrowth of the accounting session, under the chairmanship of Mr. Fred L. Dennis, of South Bend, an accounting club was formed which will hold meetings at various cities throughout the State during the coming year.

#### Rural Electric Service

In a paper entitled "Rural Electrical Development in Indiana," Mr. A. R. Holliday, Indianapolis, stated that the population of Indiana in 1910 was 2,700,876, of which 1,257,777, or 46 per cent, lived outside of incorporated towns and cities. The average expense of reaching these prospective rural customers is about five times the line and transformer expense of reaching a

city customer. Investigation has shown that thirteen companies in Indiana have more than ten rural customers and only three have more than 100. Of the 214 customers at Noblesville, twenty-three have been connected for a full year, and the average yearly income from these consumers was \$17.58. After giving the details of the plan used at Noblesville (described in the *Electrical World* for Oct. 11, 1913), Mr. Holliday stated that until the bill of the farm customer averages nearly \$3 a month his account cannot be considered a profitable one.

Considering the advisability of encouraging future rural development, Mr. Holliday said that since there are 215,485 farms in Indiana, it is probably an underestimate to state that \$75,000,000 will be required as an investment on the part of the central stations to serve the rural population. Obviously, this vast sum cannot be taken from the earnings of the electric companies. Foreign capital must be solicited, but new capital for Indiana electric utilities cannot be obtained at 6 per cent. The strong large companies may obtain it for 7 per cent, but the smaller companies must pay 8 per cent or more. Ample and sure returns must be guaranteed to attract this capital, and the incorrect theory of physical valuation for rate-making purposes must be discarded. Until these things are accomplished rural developments must be held in abeyance.

Commissioners Erickson of Wisconsin and Duncan of Indiana both took part in the convention proceedings, as noted elsewhere in this issue.

#### Lightning Protection as Accident Insurance

In a paper entitled "Lightning Protection for Distributing Circuits," Mr. V. E. Goodwin, of the General Electric Company, said that only from a study of failures and a comparison with those of previous years can any idea be obtained of the economic requirements for protection and the amount of money that can be spent effectively for protective apparatus. He briefly classified the requirements for good protection as follows: First, efficient arresters installed at the terminals of the apparatus; second, grounding of the secondary neutral; third, thoroughly reliable grounds for lightning arresters and secondary neutrals; fourth, well-constructed and insulated line; fifth, keeping records of storms, failures of apparatus, and conditions of ground.

Discussion of the paper brought out the fact that the best ground is formed by driving two 1.5-in. galvanized-iron pipes in the ground about 2 ft. apart and to a depth of 6 ft. or 8 ft. A 2-in. pipe should be driven into the ground concentric with the 1.5-in. pipes to a depth of 4 ft. and should then be pulled out and the hole around the original ground should be filled with salt. Those who spoke in the discussion were Messrs. N. M. Argabrite, Muncie; W. E. Lowe, Connersville; G. H. Kelsay, Anderson; C. G. Smith, Muncie; W. D. Ray, Hammond; C. F. Harding, Lafayette.

#### Outdoor Substation Equipment

Mr. H. W. Young, of the Delta Star Electric Company, presented a paper on outdoor substations and weatherproof equipment, urging the adoption of standards in this type of apparatus. Included in the paper were many photographs of outdoor installations and data on the cost of substations and transmission lines.

#### High-Efficiency Street Lighting

In a paper profusely illustrated with lantern slides, Mr. W. P. Hurley, of the Westinghouse Electric & Manufacturing Company, discussed the subject of street lighting, fixtures and regulating equipment for gas-filled tungsten lamps. After describing in detail street-lighting systems for outlying districts, residence streets

and boulevards, the author concluded that constant current with any but a practically constant load can be obtained only with the moving coil regulator. This apparatus, he said, adjusts itself to within 2 per cent of normal current for any load from maximum to short-circuit within three seconds under the worst conditions.

#### How to Get the Small Customer

Mr. A. T. Holbrook, of the Excess Indicator Company, reading a paper entitled "Profitable Methods of Obtaining Old-House Lighting Business," stated that controlled flat rates have been introduced into about 200 communities in the United States. As typical of results obtained where companies have taken up this sort of campaign, offering customers service at the rate of 1 cent a watt a month and controlling the maximum demand, Mr. Holbrook cited the instance of the American Gas & Electric Company's properties in Indiana. These properties showed how great an increase in customers could be made with a flat-rate campaign. It is said that in Muncie 21 per cent of the flat-rate contracts secured were afterward changed to a meter basis.

Discussion of this paper indicated that there were several central-station men who doubted that excess indicator customers were profitable unless they paid considerably more than \$1 a month. The discussion of this paper was lively and full of personal experiences. Those participating were Messrs. J. A. Browne, North Manchester; N. M. Argabrite, Muncie; Thomas Donahue, Lafayette; P. H. Palmer, Kokomo; Thomas English, Muncie; Roy Thurman, Muncie; E. J. Condon, Angola, and T. F. Grover, Terre Haute.

#### Newer Tungsten Lamps and Their Applications

Mr. J. R. Colville, of the National Quality Lamp Division of the General Electric Company, pointed out the present applications of the new gas-filled tungsten lamp. The advantages of these units, he said, are their low first cost, dependability, steadiness of light, high efficiency, and the opportunity which they offer for taking advantage of future development without increasing the investment in lighting fixtures and distributing system.

The discussion which followed the paper was confined to citing comparative data showing the relative operating costs of the gas-filled tungsten lamps and various forms of arc lamps. Those who took part in the discussion were Messrs. Roy Thurman, Muncie; Thomas F. English, Muncie; N. M. Argabrite, Muncie; Thomas Donahue, Lafayette; P. H. Palmer, Kokomo; W. P. Hurley, Pittsburgh, Pa.; J. A. Browne, North Manchester; J. W. Robb, Clinton, and W. H. Palmer, Zionsville.

#### Public Policy of Utilities

The interest of the public in the utility at present, said Mr. G. E. Gaskill, Greenville, Ohio, is confined to two things, namely, service and rates. When the utility has made the first of these perfect and the latter reasonable and has convinced the public that it has done so the public policy of that company is a well-settled question. To apply a well-defined public policy to an electrical utility is difficult as it is a natural monopoly and the public has been taught that competition is the life of trade. One policy which every central station should adopt is to educate its customers to the fact that there is no town large enough for two central stations and that competition with other kinds of light keeps electric service rates reasonable; hence the public is seldom overcharged.

Following a short discussion on public policy, Mr. W. S. Culver, of Cincinnati, Ohio, suggested that a committee on standardization of voltage be appointed

to operate with a similar committee of the Ohio Electric Light Association. The scope of this committee was enlarged to include meter work and a motion was passed creating the committee.

#### Election of Officers

Following are the new officers of the association: President, Mr. T. F. Grover, Terre Haute; vice-president, Mr. E. J. Condon, Angola; secretary, Mr. Thomas Donahue, Lafayette; treasurer, Mr. Fred L. Dennis, South Bend. Executive committee, Messrs. Thomas F. English, Muncie; C. C. Perry, Indianapolis; A. R. Holliday, Indianapolis; S. W. Greenland, Fort Wayne, and E. Holcomb, Francisville. Advisory committee, Messrs. J. C. McReynolds, Kokomo; F. A. Bryan, South Bend, and W. D. Ray, Hammond.

#### The President-Elect

The new president of the association, Mr. T. F. Grover, was born in Blairstown, N. J., in 1864. Receiving his early education in New Jersey and Pennsylvania, he went to New York as an apprentice for the



PRESIDENT-ELECT T. F. GROVER

Watson & Stillman Company and later worked for the Edison Manufacturing Company, then at 65 Fifth Avenue. In 1892 Mr. Grover became superintendent of the Milwaukee & Wauwatosa Electric Company at Milwaukee, Wis., where he remained until 1896, when he was made general manager of the lighting properties at Fond du Lac, Wis. Later he was made president of the lighting, railway and gas property which is now the Eastern Wisconsin Railway & Light Company. In 1907 he moved to his present home, Terre Haute, Ind., accepting a position as general manager of the Terre Haute Division of the Terre Haute, Indianapolis & Eastern Traction Company. This position he still holds and in addition is president of the Terre Haute & Western Railway Company, which operates lighting and power properties at Terre Haute, Brazil, Seelyville, Staunton, Harmony and Knightville, Ind., and Vermilion, Ill., and many other small communities and in outlying districts. Railways controlled by the company are the city lines in Terre Haute and interurban lines to Sullivan, Indianapolis, Clinton, Ind., and Paris, Ill. Mr. Grover was formerly president of the Northwestern Electrical Association, and in 1904 he was a delegate for this association to the International Electrical Congress at St. Louis. He is a member of the American Electrical Railway Association, the Central Electric Railway Association and the National Electric Light Association.



# Convention of Illuminating Engineering Society

**Abstracts of papers which were read at the sessions of the society held in Cleveland, Ohio, and of the interesting discussions that followed their presentation**

A FINAL registration of nearly 300 was reached at the Cleveland convention of the Illuminating Engineering Society, the opening sessions of which were reported in last week's issue.

The banquet of Wednesday evening proved to be one of the most enjoyable events of the convention. Mr. W. H. Gartley presided as toastmaster, and the occasion was made auspicious by the presence of the distinguished pioneer of electric lighting, Mr. Charles F. Brush, of Cleveland, and of Past-president L. B. Marks, President C. O. Bond and President-elect A. S. McAllister, all of whom made brief addresses. Mr. Brush, hale and hearty in his sixties, gave some interesting reminiscences of the early days of electric lighting, and described the pioneer street-lighting installation in the public square at Cleveland and the first interior electric illumination of a store, contracted for by Mr. John Wanamaker, of Philadelphia.

Following are abstracts of the papers presented at the remaining technical sessions, together with accounts of the discussions which they provoked:

## Artificial Daylight—Its Production and Use

Messrs. M. Luckiesh and F. E. Cady discussed the general problem of producing artificial daylight, explained how to compute the transmission coefficient of absorption screens, described the method of actually producing artificial daylight, mentioned commercial units and their uses, and cited other commercial methods of imitating daylight. As the subtractive method of producing artificial daylight is wasteful of light, it is preferable to use an illuminant which does not produce too much light that has to be absorbed. An ideal absorbing screen is one that has a transmission coefficient of 100 per cent at the extreme short wave-length chosen and which reduces the intensities of the rays of longer wave-lengths just enough to produce a resultant distribution of energy similar to that in the daylight to be matched. Curves plotted between wave-lengths and the corresponding transmission coefficients of absorbing screens were also included. A screen which will produce artificial skylight with a gas-filled lamp will give artificial sunlight with the lower-efficiency tungsten lamps. The transmission coefficients of screens producing noon sunlight range from 14 to 18 per cent for vacuum tungsten lamps and from 25 to 33 per cent for gas-filled lamps. For screens producing artificial skylight the coefficients are from 4 to 9 per cent and 13 to 19 per cent respectively. The transmitted lumens per watt with a vacuum lamp rated at 7.9 lumens per watt range from 1.1 to 1.4 for sunlight screens. The corresponding figures for gas-filled lamps rated at 22 lumens per watt are 5.5 to 7.3 lumens per watt and 2.9 to 4.2 lumens per watt.

In discussing the additive method of producing artificial light the authors cited the use of mercury-vapor with tungsten lamps and also mercury-vapor lamps with fluorescent reflectors. After computing the transmission coefficient of the ideal absorbing screen at different wave-lengths a glass should be selected which will nearly fulfil the requirements and should then be

corrected with permanent dyes. It was pointed out that if the spectro-photometric analysis of one thickness of screen is known it may be computed for any other thickness from the formula  $\log T = kd$ , where  $T$  is the transmission coefficient,  $k$  is a constant and  $d$  the thickness.

## Discussion

In opening the discussion on Messrs. Luckiesh and Cady's paper, Mr. R. H. Pierce, Philadelphia, Pa., emphasized the fact that skylight and daylight vary so widely that neither can be taken as a standard in any sense. Even the dyers themselves, he said, know that north skylight changes hourly as well as from day to day. Dr. H. P. Gage, Corning, N. Y., remarked that a color screen which had been devised by him ten years ago for the carbon-filament lamp was now found to prove useful in correcting the nitrogen-filled tungsten lamp. In the final analysis there remains the question, he declared, how close the spectrum curve obtainable with the artificial-daylight screen can be made to approach the theoretical curve. In making up such a color-correction screen, the use of separate pieces of glass usually enables a more accurate color analysis to be made. In order to compute the value of efficiency for an ideal absorbing medium, Dr. M. G. Lloyd, Chicago, suggested the scheme of comparing the ratios of the respective ordinates at the point in the curve where the illumination is weakest. Mr. G. H. Stickney, Harrison, N. J., placed in three classes, as follows, the installations requiring artificial daylight: (1) Textile mills, where a high degree of accuracy is demanded and efficiency is a secondary consideration; (2) other industries, where lesser accuracy is needed but greater efficiency is desirable; and (3) stores, where slight variations in tint will not be objectionable. For the ideal artificial-daylight screen, however, the colors should be reproducible at will as well as thoroughly constant. Besides their uses in textile mills and dye shops, artificial-daylight screens are already finding applications in breweries and for the matching of shoe leathers, etc. In some instances, added the speaker, manufacturers have avoided the use of aniline dyes in order to obviate the variations in appearance and tint which these dyes give under various illuminants. Mr. D. M. Moore, Newark, N. J., said that the problem of artificial daylight, although often declared solved, still remains to-day. He pointed out also that his carbon-dioxide tube lamp, devised a number of years ago, still remains a more efficient approach to artificial daylight than are the subtractive methods of color correction used with tungsten and nitrogen-filled lamps. He again recommended that the carbon-dioxide tube be adopted as the color standard and suggested that in undertaking the production of artificial daylight the investigators begin with some natural medium which more nearly approaches the color values desired than does the tungsten incandescent unit. In closing the discussion Mr. Luckiesh declared that the method proposed by Dr. Lloyd for measuring efficiency would obtain only roughly. In selecting a successful artificial-daylight screen, principal emphasis should be

laid upon its invariability. Mr. Luckiesh added that the tungsten lamp, operating at a specific production of 22 lumens per watt, suffers a reduction only to about one-fourth or one-seventh of its normal clear-globe efficiency when employed for the subtractive correction of color.

#### Development and Manufacture of Daylight Glass

The development and subsequent commercial method of manufacturing glass for converting light from artificial illuminants into daylight quality were described in Mr. Edward J. Brady's paper on "The Development of Daylight Glass." The paper contained curves showing the energy distribution of artificial and natural light at various wave-lengths, the amount and portion of a spectrum which must be subtracted from the light of some lamps to leave daylight distribution, and the effects of various coloring materials on the transmission coefficients of glass. The author pointed out that the best coloring materials to incorporate in "daylight" glass are those which will dissolve in the glass and will not deteriorate with age or temperature. For producing the artificial daylight glass which was described black oxide of copper, cobalt-oxide copper and black oxide of nickel were employed to alter the transmission characteristics of potash-lead glass. Attention was called to the care with which the glass had to be melted to prevent discoloration and insure a constant quality. Samples of the glass were spectrophotometered by comparing with the light from a special spectral distributor designed to produce the same distribution of energy as a black body heated to 5000 deg. absolute. This apparatus and a device for determining errors in the manufactured glass were described and illustrated. The tolerance instrument, as the latter was called, will measure the percentage of off-color due to improper proportions of the coloring oxides, and indicate any deviation in the total concentration of the colors, and a divergence from the correct thickness of glass.

#### Discussion

In opening the discussion on Mr. Brady's paper, Mr. E. B. Rowe, Cleveland, Ohio, declared that the research committee should find in the definition of artificial daylight an opportunity for investigation and should settle upon some accepted standard. In order to make a commercially successful screen, however, the factory output obtainable must be uniform. Dr. H. E. Ives, Philadelphia, Pa., also expressed the requirement that the color screens be uniform and unchangeable. It is, he explained, for example, possible to make an excellent color-correction screen with a combination of copper, cobalt and gold, but experience with the last-named precious metal soon showed that uniformity could not be depended upon in glasses containing its compounds, despite identical mixtures, treatments and temperatures during manufacture. Mr. J. B. Taylor, New York, suggested that two pieces of goods might be accurately matched for all possible colors by projecting a spectrum onto the matching table and laying the two pieces to be matched in its rays. Prof. G. A. Hoadley, Philadelphia, Pa., prophesied that in the future a large application of artificial-daylight screens will be in domestic illumination, as for the lighting of dining-rooms, libraries, etc. Mr. G. H. Stickney, Harrison, N. J., pointed out the fact that the apparent color of a fabric is affected quite as much by the character and diffusion of the illumination as by the color of the light. In dye-rooms small areas are often lighted to intensities as high as 30 ft.-candles, while in other parts of textile mills, where the products are inspected for homogeneity of color, lower intensities of "artificial daylight" suffice. Both classes of installation afford, however, important uses for artificial-daylight screens. Dr. H. P. Gage, Corning, N. Y., remarked

that the approximation obtained by Mr. Brady was very close, and he complimented the instruments devised by the author for testing glass and for showing the uniformity of the product.

President C. O. Bond, Philadelphia, Pa., quoted a remark by Dr. Louis Bell to the effect that moonlight, by reason of its color, is as effective for vision as ordinary artificial illumination of an intensity three times as great. President Bond suggested that a large installation of artificial-daylight screens be made, to be given an actual practical working test lasting twelve months or more. Mr. J. R. Cravath, Chicago, Ill., insisted that too much emphasis had been laid on the matter of color, and declared that consideration should also be given to the factors of direction and diffusion of the light. Mr. Ward Harrison, Cleveland, Ohio, reminded his audience that in artistic interiors color-correction glass will have to be inclosed behind globes of some kind which will conceal the objectionable dark-blue color of the screens when not lighted. Mr. G. Hammond, Cleveland, Ohio, declared his belief that when artificial-daylight glassware is perfected it will be a great help commercially to the installation of electric lighting. Mr. Norman Macbeth, New York, declared that to secure the installation of colored illuminants is only a matter of salesmanship. He urged that the Bureau of Standards fix a standard of "daylight" which could be adopted generally. Mr. Macbeth also spoke of the difficulty of matching fabrics under artificial illumination and said that designers of women's dresses often find it hard to select colors which will harmonize under artificial lighting as well as under daylight. One tailor in New York City, he declared, has brought out a line of blue dress suits and tuxedos which appear black under artificial light instead of showing the rusty brown so often taken on by ordinary black-broadcloth clothing.

#### Daylight and Sunlight in Buildings

In a paper entitled "Planning for Daylight and Sunlight in Buildings," Messrs. L. B. Marks and J. E. Woodwell discussed some of the problems encountered in designing buildings for the proper utilization of natural light and briefly reviewed some of the steps taken to illuminate the interiors by daylight in a scientific manner. Emphasis was laid on the hygienic value of daylight and sunlight in rooms. The factors that enter into the solution of the problem of providing for adequate and suitable daylighting facilities were discussed and formulas were given for the calculation of daylight illumination in buildings.

The amount of daylight available from a window, the authors stated, depends on the size, shape, depth and position of the window opening; the brightness of the sky; the sky angle—that is, the angle formed by a vertical plane passing through a window in the wall of a building and a line from the window through the top of the opposite building (in the case of an unobstructed horizon the sky angle is 90 deg.); the diffusion from the street surface and from adjacent buildings; and the character of the glassware in the windows. A new instrument for sunlight and shadow determinations was described and illustrated, and daylight illumination measurements in a test room and in several rooms of the County Court House, New York, were given. Means for obtaining good daylight values in the New York Court House were also described.

#### Discussion

Mr. S. G. Hibben, Pittsburgh, Pa., suggested the use of translucent bricks and building materials to admit daylight into dark interiors. Mr. G. H. Stickney, Harrison, N. J., charged that too few architects give enough attention to day-lighting, and said that a mistake is



made in depending upon artificial illumination when natural light is available. Mr. A. J. Sweet, Milwaukee, Wis., discussed the relative effects of high windows and skylights. Mr. W. A. Durgin, Chicago, Ill., suggested the use of a star-finder or a small telescope with an equatorial mounting, to take the place of the device in Mr. Marks' paper. Dr. H. E. Ives pointed out that rooms may be lighted to comply with all the literal requirements of brightness, etc., and yet be quite uncomfortable to remain in. Mr. J. R. Cravath said that while only the eye is concerned in problems of artificial illumination, provision for day-lighting involves questions of bacteriology. Medical authorities have insisted that as a health measure sunlight be provided for rooms part of the day, even though this illumination is not required under ordinary working conditions. Mr. J. B. Taylor showed that the problem of lighting a court room, where the judge, jury, accused and witnesses must have their comfort conserved, is quite the reverse of the problem of stage lighting where the actors are required to work under the discomfort of intense illumination. Mr. Norman Macbeth showed how in cities where real estate rentals are high adequate continuous artificial lighting can be had at a very small fraction of the rental cost. In the case of one office renting for \$3,600 a year, the cost of operating the full lighting equipment ten hours daily amounted to only 2 per cent of the rent outlay.

#### Illumination of Airshafts

Dr. Clayton H. Sharp presented a paper recording the results of a series of experiments relating to the illumination produced at different distances from the top along the sides of an airshaft open to the sky. Tests were made on wooden models 14 ft. in length and 19.5 in. by 19.5 in. or by 9.5 in section, the interior being covered with paint of different shades from dead black to matte white and glossy white. The test showed that the effect of using a glossy white surface instead of a matte white surface is to increase the illumination near the base of the shaft as compared with that higher up. The percentages of reflected light were found to be approximately equal to the coefficient of diffuse reflection expressed in percentage.

#### Discussion

Following Dr. Sharp's abstract of his paper, Dr. A. S. McAllister, New York, demonstrated on the blackboard a graphical solution of the problem of the intensity of illumination in an airshaft, showing that the illumination at a point on the side of the shaft varies inversely as the cube of the distance from the top, and is also affected proportionally by the reflection coefficient of the side walls. Mr. L. B. Marks suggested that this method of solution might be applied to his problem of courthouse lighting, although in this case the simple shaft becomes an annular opening, between outer and inner cylindrical walls, spanned by bridges and other obstructions.

#### Use of Projector Lantern in Sculpture

A method of utilizing photographic records and lantern projections in carving statuary of any size was described by Mr. J. Hammond Smith in a paper on "Photo-Sculpturing and the Use of Light in the Production and Illumination of Sculpture." The system described consists of photographing the subject on which a screen is projected from a lantern not in the same plane with the camera and projecting the photograph and original screens from the same relative positions on a block of clay, the position of which can be altered until the screen images coincide. The clay can then be worked to conform with the image cast thereon. In producing a statue, it is necessary to take several

photographs from different positions to determine the form of the image. By mounting the object on a rotatable stand one camera and one projector can be used.

#### Illumination for Inspection of Documents

In the paper entitled "The Relation of Light to the Inspection of Documents," Mr. Albert S. Osborn emphasized the need of proper illumination in court rooms for the examination of forged or fraudulent documents. He also discussed special uses of light used in the microscopic and photographic examinations of documents to determine the presence of erasures, substitutions, age and genuineness of writing, etc.

Mr. Osborn illustrated his address with a number of interesting lantern slides showing highly magnified reproductions of the penmanship, ink marks, erasures, etc., on questioned documents, raised checks, forged papers, traced signatures, etc.

In the course of the brief discussion which followed, Mr. Robert Ely, Philadelphia, Pa., suggested the use of colored light and artificial daylight as an aid to the examination of questioned documents. Mr. J. B. Taylor, New York, referred to the possibilities of stereoscopic and color photography as aids to the detective, and Mr. L. B. Marks, New York, suggested lighting the face of the witness on the stand so that his expressions would be brought into full view of the judge and jurors while giving his testimony.

#### Color Photography

A paper by Mr. M. C. Rypinski, entitled "Color Photography," contained an outline of the development of the art. It included brief descriptions of reproducing images in their natural colors—the direct and indirect methods—the first, by the direct effect of light on a sensitized surface, and the second by producing several independently colored pictures and superposing them. A number of references on color photography, multi-color printing and color cinematography were also given.

#### Requirements of Locomotive Headlamps

In his paper on "The Locomotive Headlamp" Mr. J. L. Minick pointed out that the chief function of a locomotive headlamp is to warn persons on the track ahead that a train is approaching. A lamp having a center-beam intensity of 500 cp can be seen 25 miles away by a person of average height, therefore it will give 25 minutes' warning of the approach of a train running at 60 miles an hour. To prevent blinding persons looking toward the lamp the intensity of the light should not be higher than 15 or 20 cp per sq. in. of projected area. A 3000-cp lamp with a 16-in. reflector will have an intrinsic brilliancy within the maximum value. Second in importance among the functions of a headlamp is its ability to illuminate whistle posts, land marks, etc., properly. These need not be illuminated with an intensity higher than 0.10 ft.-candle. This intensity will be produced by the side rays from a 500-cp lamp when the marker is about 50 ft. ahead of the locomotive. It was pointed out that no commercially available lamp will enable an engineer to see a dark object ahead in time to stop his train, as a dark dummy can be seen at night only 500 ft. away when illuminated by an incandescent headlamp of 10,000 cp, and a train containing twelve standard steel coaches running 60 miles an hour cannot be stopped inside of 1660 ft. with the most modern air-brake rigging or 1235 ft. with the electro-pneumatic system now being developed. The author also called attention to the fact that an intense headlamp will hinder flagmen and passing engineers seeing the train classification markers and may even

blot out or alter the color of semaphore signal lamps, etc. Some valuable references on tests of and regulations on headlamp intensity were included in Mr. Minick's paper.

#### Discussion

Mr. W. R. Mott, Cleveland, Ohio, declared that the inverse-square law holds approximately correct for headlamps and searchlamps. Mr. A. L. Powell, Newark, N. J., read a communication by Mr. L. C. Porter in which the author discussed the difficulty of defining the edges of the beam in the case of large sources of great spread. Locomotive numbers are best placed at angles of 30 deg., just behind the headlamp lens, so that they can be read from both the front and sides. With an incandescent headlamp source now marketed, a beam intensity of 900,000 cp can be obtained, enabling a dark object to be detected at 1200 ft., and a medium-colored object at 1600 ft. Chairman J. R. Cravath, Chicago, cited the need for more definite specifications for the measurement of headlamp beam candlepower.

Mr. G. H. Stickney, of Newark, N. J., emphasized the greater accuracy of curvature of glass reflectors, and said that the inverse-square law holds for distances beyond which the light becomes homogeneous. In closing the discussion, the author, Mr. Minick, remarked that all the beam measurements were made at a uniform distance of 25 ft., a convenient distance when tests are to be made inside buildings.

#### Illumination of Metal-Working Plants

In the paper entitled "Present Practice in the Use of Tungsten-Filament Lamps for Lighting Metal-Working Plants," Messrs. A. L. Powell and R. E. Harrington summarized the advantages of correct illumination, describing lamps and reflectors used in industrial plants and the methods of securing data therein. The requirements of illumination in various parts of metal-working plants were cited and considerable information was given on the equipment installed and the results obtained where adequate and suitable illumination is provided. The data were given for tank-houses, core-rooms, foundries, rolling mills, forge-shops, machine work, bench work, wire and sheet metal operations and assembling, erecting, testing and painting. Attention was called to the places in which local, general or group lighting should be employed.

#### Discussion

Mr. H. T. Spaulding, Cleveland, Ohio, said that the correct intensity of illumination is of great importance in industrial installations. Mr. Robert Ely, Philadelphia, Pa., remarked that it is often difficult to convince owners that the expense of a high general illumination for shops is advisable, in comparison with an arrangement of low-intensity general lighting and special illumination at each tool. He recommended the adoption of standard lamp locations for printing presses, machines, tools, etc. Mr. R. P. Burrows, Cleveland, Ohio, observed that such standardization of machine lighting would be very difficult, since each operator has his own views as to just where he wants his lamp placed.

Mr. R. E. Simpson, Hartford, Conn., said that other lighting should be provided in foundries than that coming from the molten metal itself. Insurance statistics show that 60 per cent. of all accidents occur at night by artificial light. Mr. C. A. Littlefield, New York, pointed out that factory illumination affords an opportunity for the closest co-operation between the lighting and motor-service departments belonging to the central station.

Mr. J. P. Mallett, New York, urged that lighting problems be referred whenever possible to professional consulting illuminating engineers.

#### The Lighting of Factories

The present trend in factory illumination at Chicago was brought out in a paper on "Factory Lighting," by Messrs. Oliver R. Hogue and Alfred O. Dicker. The paper included the form of contract which is made between factory consumers and the electric-service company. Three charges are made in this contract: (1) rental; (2) maintenance, and (3) electricity. Data were also given on the method of equipping twenty-five factories, the cost of installation, the maintenance expenses and the total cost to consumers. Shallow-bowl, white-enameled steel reflectors equipped with 100-watt, 150-watt or 250-watt lamps were installed almost entirely, the cost ranging from \$9.38 to \$2.76 per unit, the average being \$7.00 per unit. The maximum life of lamps installed was 4270 hours, the minimum 457 and the average 1811 hours. The total cost per square foot illuminated ranged from 1.44 cents to 0.156 cent, the average cost being about 0.361 cent.

#### Discussion

Mr. G. H. Stickney said that industrial or factory lighting is a field overlooked by many central stations. Mr. H. Calvert, Philadelphia, Pa., questioned whether it is advisable for the central station to assume the investment of installation expense, without offering the same accommodation to all its customers. Mr. W. J. Ayrston, Pittsburgh, Pa., described the system of inspection and renewals followed in the Westinghouse shops. Of the 12,000 lamps in use, 4.4 per cent are burned out every month. An inspector makes the rounds of the lamps, noting those in bad condition, and is followed by men who replace lamps and wash globes. Of a total operating cost of \$800 per month, this inspection and cleaning service represents 0.3 cent per kw-hr. An average lamp life of 2600 hours is obtained. Mr. Ward Harrison, Cleveland, Ohio, said that despite the small breakage of glass reflectors in factory installations, most owners prefer metal reflectors. Mr. Harrison declared standardization to be desirable, but insisted that the specifications be simple if they are to come into wide use.

#### More Efficient Gas Burner

In his paper on "Recent Developments in Incandescent Gas Lighting" Mr. Robert F. Pierce classified the opportunities for improving incandescent gas lighting units, and described a new burner which has shown a 50 per cent saving in the cost of gas lighting over what it was with the older units.

#### Discussion

Following a brief discussion on gas topics by Messrs. W. H. Gartley, F. R. Hutchinson, G. S. Barrows and Norman Macbeth, Mr. A. J. Sweet described a combination gas and electric lighting installation in a Milwaukee building where, despite the assurances of the engineer concerning the reliability of electricity, the client insisted on having gas available as an auxiliary. Gas lamps were therefore employed on the stairs and at exits, no electric lighting being used at the points where gas is installed, thus insuring the operability of the gas system in case of emergency. The gas fixtures are so distributed that in the event of shut-down of the electric lighting enough light will be provided throughout the store to prevent panic, thieving, etc.

Abstracts of papers presented during the closing sessions of the convention and outlines of the discussions relating thereto will appear in a later issue of the *Electrical World*.



# Prospects and Opportunities in Industry

Information and Suggestions Bearing on the Business Questions of World-Wide Importance  
Arising from the European War

## SOUTH AMERICAN SHIPPING FACILITIES

Steamship and Exporting Interests Say There Is Plenty  
of Service Without Government Aid

Reports reaching Washington from steamship and exporting experts serve to bring out in detail their objections to a bill now pending in Congress which provides for the formation of a corporation by the government to own and operate steamships carrying American products abroad, particularly to South and Central American countries. The bill has been favorably reported to the House, and it is understood to have the sanction of President Wilson.

This measure provides for the creation of a ten-million-dollar company, in which the government is to own 51 per cent, or, if necessary, all, of the stock; and it also provides for a sale of bonds to the extent of \$30,000,000, the proceeds of which the government is to use for the purchase of ships to be operated by the company.

Statistics gathered by steamship and exporting experts serve to show that the steamship lines running between New York and South and Central American ports, as well as Cuban and Porto Rican ports, are not doing anything like the business they are equipped to handle in the way of transporting freight. According to these figures, American exporters who wish to increase the volume of their trade to the countries mentioned are having no difficulty in finding ships in which to transport their goods and material, and the exporters who are holding back and who have not made the attempt to open up new lines of selling in the countries mentioned are under a misapprehension as to the actual facilities at hand if they believe more ships are needed at this time to carry their goods to the Southern countries.

So far as European—particularly English—ports are concerned, the Wilson Line steamships are regularly employed between New York and Hull, where there is transshipping for South and Central American ports, these vessels being grain and general cargo boats. The line reports that its vessels are leaving port far short of requirements as to cargo, and that if the situation does not improve the service will be materially reduced.

Steamship and exporting experts report that there is about \$100,000,000 capital employed in ships carrying passengers and cargo to South and Central American countries. They say that this transporting business is well established, well equipped, well financed and well anticipated.

## ELECTRICAL NEWS IN GERMAN PAPERS

Advances of 10 or 20 Per Cent in Prices of Electrical Machinery

German electrical papers are reaching here. The *Elektrotechnische Zeitschrift* announced in a statement of editors and publishers on the front page of the issue of Aug. 13 that for the present further issues would not be regularly published, but that larger issues would be brought out at irregular intervals.

Since then another number (Nos. 34-35) has been issued on Aug. 27. The number of advertising pages is reduced, but the text pages do not differ from ordinary issues. There are technical articles as usual, without any reference to the war.

On the last pages of the issue of Aug. 27 the war is

mentioned. There are brief obituaries on Prof. Karl Baedeker, of the University of Jena, and Dr. Friedrich Erb, of the Telefunken company, who were killed as officers of the German army at the French frontier.

A war committee (Kriegsausschuss) of the German industry has been formed. This will act in co-operation with the government and the banks. The objects are the systematic distribution of employees and workingmen in industry and agriculture and early information on emergency laws and emergency measures of the government (for instance, a lengthening of the time allowance for replies to the patent office, etc.).

The Allgemeine Elektrizitäts Gesellschaft, Bergmann company, the Siemens-Schuckert company, the Maffei-Schwartzkopff company, Paul Meyer, Brown, Boveri & Company and others have raised prices 10 per cent for dynamos, motors, fans, pumps, drills, starters, regulating rheostats, controllers, oil switches and traction material, and 20 per cent for transformers and automatic circuit-breakers. For dynamos above 100 kw and transformers above 500 kva the list prices have been canceled. Storage-battery quotations also have been withdrawn owing to the shortage of lead.

An article in the *Elektrotechnische Zeitschrift* of Aug. 27 shows that the countries at war in the middle of August have a population of 350,000,000. Of the business done in 1913 by Germany with this population 3¼ per cent comprised electrical equipment. Exclusive of Montenegro, the German manufacturers in 1913 did a total business of \$5,832,250 with Austria-Hungary, \$5,436,250 with Belgium, \$4,597,750 with France, \$8,605,250 with England, \$9,900,250 with Russia and \$73,000 with Servia. Of Germany's electrical exports, 34.62 per cent was with its present European opponents.

## ELECTRICAL IMPORTS OF JAPAN

Germany Led Great Britain and United States in Sales to  
Island Kingdom

In response to the request of the *Electrical World*, Mr. S. Kuru, consul for Japan in Chicago, has prepared an abstract of official statistics showing the amount of Japanese imports of electrical machinery and

IMPORTS OF ELECTRICAL SUPPLIES INTO JAPAN FROM GREAT  
BRITAIN, GERMANY AND UNITED STATES (1912)

	Great Britain	Germany	United States
Submarine telegraph or telephone cables	\$101,610	\$1,597	
Other armored cables	1,261,066	1,190,014	
All other insulated wire	49,956	52,413	\$129,508
Dynamos, transformers and other electrical machinery	339,523	538,046	714,920
Dynamos combined with prime mov- ers	321,750	61,703	\$7,584
Incandescent lamps	15,809	119,745	23,357
Galvanized wire	1,847	1,192,494	304,185
Totals	\$2,091,651	\$3,156,012	\$1,259,554

supplies from Great Britain, Germany and the United States. The figures given in the table show that the total trade amounted to \$6,500,000 annually, the United States getting less than 20 per cent of it.

## MANUFACTURERS' VIEWS ON THE OUTLOOK

Bases on Which Electrical Interests Look to the Future with Reasonable Confidence

Manufacturers have given the following statements on business conditions to the *Electrical World*:

### Confidence in Continued Prosperity

Mr. R. V. Bingay, Pittsburgh Transformer Company, Pittsburgh, Pa.: "We cannot see that the war has had any effect on our business up to date. As our export business is very small, we hardly think that any expression from us on this would be of any value. We do not believe that our business will be affected in this country, and we have not changed our organization in any way with a view to export business. We are not dependent on Europe for any of our raw materials. We are putting up a new factory which will about double our present floor space as we have every confidence in the continued prosperity of this country, particularly when we have a President who has shown such splendid qualities as President Wilson has in regard to the Mexican situation and since the great European war has started. We also feel equal confidence in President Wilson's entire cabinet."

### Expects Shipments from Germany

Mr. W. M. Nones, general manager the Norma Company of America, New York: "Our main works are in Germany, and for the time being we have not been able to receive any shipments, but this condition of affairs is passing away, and from advices in hand we can shortly expect further shipments to arrive. We have a factory in this country and sufficient stock on hand to carry it for a number of months. We are also quite able from our existing stocks on hand to take care of our customers and regular trade so that our condition has not been affected very seriously, nor, owing to the enlargement of our factory here which we are now making, will it be affected in the future. In regard to the effect on export business, there is no question that the immediate effect will be the large expansion of American trade with South American and other countries, and in so far as this concerns us we are in good condition and are able to take care of this new business if it develops."

### Domestic and Foreign Effects of War

American Vulcanized Fibre Company, Wilmington, Del.: "The raw materials from which vulcanized fiber is made—namely, cotton cellulose, coloring matter and zinc chloride—are all imported into this country in very large quantities. The European war has, of course, stopped the importation of these commodities, with the result that the cost of all such materials is steadily increasing. Unfortunately no substitution can be made without more or less seriously impairing the quality of the finished product. For instance, cotton cellulose in the form of rags costs now from \$10 to \$20 per ton more than a month ago. We have our own mill, which separates directly from the cotton hulls a very pure cellulose which we use largely for certain grades of vulcanized fiber, but we also use large amounts of cotton cellulose in the form of rags, the price of which in this country is regulated by the European supply. It is at present almost impossible to get aniline colors and manufacturers of fiber, in common with many others, will be forced to depend entirely upon mineral pigments, with the inevitable result that the price of these will be forced up. Certain colors will probably have to be discontinued after the supply of coloring matter now on hand runs out. The price of zinc chloride, and even the available supply, is likely to be seriously affected by the war, as is seen by the fact that large quantities were im-

ported from England and Germany in 1913. We ourselves are fortunate because we have an independent source of supply for zinc chloride which will not be affected by European conditions. We shall have during the next twelve months an excess of this chemical, which we can deliver as a chemically pure or commercial solution of any desired strength. We also have our own supply of pure red oxide pigment. The immediate effect of the war is to reduce very materially domestic sales of our finished product. In our opinion, the ultimate effect of the present war may be to stimulate the export business with countries other than Europe, but it is not to be expected, however, that this will make up for the loss of the European trade, for industries in those countries have not developed along lines that require vulcanized fiber in the large quantities that are used abroad, and we are, of course, in general adjusting our organization to meet the changed conditions."

### Adverse Effect from War

Mr. J. B. Meriam, engineer and sales manager Bruce-Macbeth Engine Company, Cleveland, Ohio: "We are not running full force; in fact about 60 per cent. We can but think that the war is having an adverse effect and causing a general depression. We have one or two cases where quite large orders were lost owing to the war conditions—that is, the failure of certain companies to secure chemicals from Germany—and therefore were not able to make the enlargements contemplated. We have observed a slight increase in inquiries from South American countries and have had some from Australia, but have taken no special steps toward organization for the development of export trade. It has been our opinion that a considerable period of time and some expense would be required to establish trade in these foreign fields, and all our energy has heretofore been applied at home."

## FACTS ABOUT EXPORT CONDITIONS

Suggestions and Data Relating to Opportunities in Foreign Fields for American Manufacturers

Secretary of Commerce Redfield has appointed seven commercial attachés who will be connected with various United States embassies and legations and who will devote their time solely to the advancement of American commerce. They are as follows: Messrs. C. W. A. Veditz, of Philadelphia, to be at Paris; Lincoln Hutchinson, University of California, at Rio de Janeiro; Julian H. Arnold, now consul-general at Hong Kong, to be at Peking; Irvin W. Thompson, of North Carolina, at Berlin; Albert Hale, of Indiana, at Buenos Aires; A. H. Baldwin, former chief of the Bureau of Foreign and Domestic Commerce, to be at London, and A. I. Harrington, of Ohio, to be at Lima, Peru.

United States Consul Chester W. Martin calls attention to present opportunities for American manufacturers in the British West Indies.

The Chamber of Commerce of Syracuse, N. Y., has issued a booklet entitled "Helps for a Beginner in Export," by Mr. John W. Brooks, chairman of the export committee.

The issue of "The Nation's Business," published by the Chamber of Commerce of the United States, dated Sept. 15, 1914, is devoted to foreign trade.

The National Association of Manufacturers announces that President Yuan Shih Kai of China has asked it to nominate a commercial adviser to the Chinese Republic. At a proposed meeting in October the Foreign Trade Commission of the association will present a tentative agreement which it has made with the Chinese Republic for closer trade relations.



## PUBLIC SERVICE COMMISSION NEWS

## New Jersey Commission

The board has approved an issue of \$70,000 stock by the Rockland Electric Company, the proceeds to be employed for the purchase of certain property and equipment of the Rockland Light & Power Company.

## New York Commissions

The Second District commission, on the opinion of Commissioner Irvine, has issued an order straightening out the capitalization of the Shore Line Electric Railway in Westchester County and reducing that capitalization to the real value of the property, following its sale to the New York, New Haven & Hartford road at a price which the commission's experts have characterized as several times the real value of the road.

The decision follows the decision of the Court of Appeals in the Westchester Street Railway case. The capitalization is fixed at the real value of the property at the present time as fixed by the engineers of the Second District commission, and Mr. E. G. Connette, at the time engineer for the First District commission. It is far less than the price originally paid for the property.

## Wisconsin Commission

The Wisconsin commission has issued a decision adjusting the rates for electric service to be charged by the municipal electric utility of Sun Prairie. The complaint alleged that the present rates are excessive and discriminatory, which facts were verified by the commission's investigation. The schedule ordered will effect a reduction in rates to residence consumers and will put all consumers and services on an equitable basis. To make an allowance for taxes an interest rate of 5 per cent was used in determining the cost of service. On this basis the following schedule was prescribed: Primary rate, 14 cents net per kw-hr. for energy used equivalent to or less than the first thirty hours' use per month of the active connected load; secondary rate, 11 cents net for the next sixty hours' use per month of the active connected load; excess rate, 8 cents net. All commercial consumers are divided into classes A, B and C in accordance with the commission's usual practice in rate cases.

To stimulate the demand for motor service, which heretofore has been of little consequence on account of the unsatisfactory rates, the following schedule was prescribed: Demand charge, 75 cents per month net per active hp of connected load; energy charge, 7 cents net per kw-hr. for amount equal to or less than 100 hours' use of the active load, 5 cents net for the next 100 hours' use and 4 cents net for excess. The active connected power load is to be determined on the basis of a scale ranging from 90 per cent of the first 10 hp connected to 50 per cent of the connected load in excess of 60 hp. Special rates were ordered for municipal street lighting, municipal pumping and short-time users.

## Illinois Commission

The Public Utilities Commission of Illinois on Sept. 24 adopted rules establishing standards for gas and electric service. These rules, which will become effective on Nov. 1, were prepared under the direction of Mr. Robert M. Feustel, chief engineer for the commission. All serious changes considered at the hearing at Springfield on July 16 have been made in the rules.

An order entered by the Illinois Public Utilities Commission annuls conference ruling No. 7, made by the commission some time ago. A new conference ruling, to be known as No. 14, is substituted. The ruling has to do with changes in rates, classification or service.

## Current News Notes

**DRAINAGE PUMPING BY ELECTRICITY.**—In the article entitled "Electricity Versus Steam in Drainage Pumping" which appeared in the *Electrical World* Aug. 8 it was stated that a Worthington pump was shown in Fig. 3, page 276. This is an error as the pumps illustrated were manufactured by the American Well Works, Aurora, Ill.

\* \* \*

**APPROACHING 100 PER CENT SATURATION AT HARTFORD CITY, IND.**—After a series of lively and successful new-business campaigns conducted by the sales force of the American Gas & Electric Company 98 per cent of the houses are now wired in Hartford City, Ind. Salesmen are still working on the owners of unwired houses, and it is confidently expected that the remaining 2 per cent will be receiving service within a few weeks.

\* \* \*

**COAL CONSUMPTION OF NEW YORK'S GENERATING STATIONS.**—The average consumption of fuel in all the central stations of New York City is at the rate of 3.3 lb. per kw-hr., inclusive of all standby and other losses. The average consumption of fuel by isolated plants is at the rate of not less than 10 lb. of coal per kw-hr., or three times the average rate of central-station operation, according to a committee of the Association of Edison Illuminating Companies. Compared with isolated plants, central-station generation of electricity is conserving in New York City alone about 1,750,000 tons of fuel a year by superior economy in production.

\* \* \*

## SOCIETY MEETINGS

**NEW YORK ELECTRICAL SOCIETY.**—For many years past the New York Electrical Society has participated actively in the New York Electrical Show and has enjoyed its hospitality. The society will hold its opening meeting of the present season at the Electrical Exposition, Grand Central Palace, Friday, Oct. 9. Captain S. S. Robison, of the Bureau of Steam Engineering, Navy Department, Washington, will lecture on "Electricity in Warfare."

\* \* \*

**OFFICERS OF ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS.**—At the recent convention of the Association of Iron and Steel Electrical Engineers held in Cleveland, Ohio, officers for the ensuing year were elected as follows: President, Mr. O. R. Jones, Youngstown Sheet & Tube Company, Youngstown, Ohio; first vice-president, Mr. F. H. Kittrege, Illinois Steel Company, Joliet, Ill.; second vice-president, Mr. F. D. Egan, Pittsburgh Crucible Steel Company, Midland, Pa.; treasurer, Mr. James Farrington, La Belle Iron Works, Steubenville, Ohio; secretary, Mr. W. T. Snyder, National Tube Company, McKeesport, Pa.

\* \* \*

**THE ELECTRIC VEHICLE AT BOSTON.**—A meeting of the Electric Motor Car Club of Boston was held at the Boston City Club on Sept. 23 to start the fall campaign in local electric-vehicle development. Vice-president E. S. Mansfield, Boston Edison Company, presided. It was announced that a salon would be held at the Copley-Plaza Hotel, Boston, on Nov. 2 to 6. The committee on charging apparatus reported that conferences are being conducted with the Massachusetts District Police with a view to securing a modification of the present stringent rules bearing upon the location of charging sets in garages shared by gasoline motor cars. The club now has 117 members. The annual meeting will be held at Boston on Oct. 14.

## Recent Improvements in the Luminous-Arc Lamp

Gains in efficiency through progress in electrode design and the development of the prismatic refractor—Advance in methods of light distribution attained by manufacturing engineers—Development of 5-amp system

WITHIN the past few months two improvements of importance have been effected in the luminous-arc lamp. Both have increased its efficiency as a practical source of illumination, and it is no exaggeration to state that when the results of recent progress are generally appreciated a new conception of the problems of street lighting by arc lamps will be realized by the central station, by municipal authorities and by the public. The first of these improvements consists of the development of new compositions in the magnetite electrode which have substantially decreased the amount of electrical energy required to develop a given mean spherical candle-power, and the second advance is the skilful adaptation of the prismatic re-

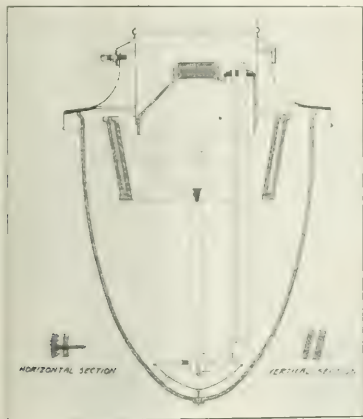


FIG. 1—LUMINOUS-ARC LAMP WITH REFRACTOR

fractor to the luminous arc with the object of securing an effectiveness of light distribution never before attained in this class of electrical service.

The new or so-called high-efficiency electrode differs chiefly from the ordinary magnetite electrode in the amount of titanium in its composition, the use of a larger proportion of this element in combination yielding the increased light-giving properties shown graphically in the accompanying curves.

The prismatic refractor (Fig. 1) consists of two truncated conical glass globes, open at the top and bottom, fitting inside one another and forming a single unit which is smooth on both inside and outside surfaces, this feature contributing to the maintenance of efficient light transmission and facilitating cleaning in service. The inner section is girdled by a succession of horizontal prisms which intercept the light rays from the arc and deflect them downward at an angle of 10 deg. below the horizontal, as shown in the vertical section, which is the most useful angle for the lighting of streets and large areas. The inner surface of the outer section is lined with a series of vertical prisms which

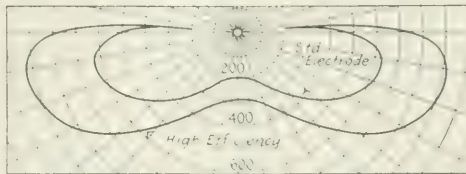


FIG. 2—LUMINOUS-ARC LAMP, MAGNETITE, DIRECT-CURRENT, SERIES CIRCUIT

(Clear globe, ash-lap and internal concentric reflector. Upper electrode, copper, 1 in. diameter. Lower electrode, 2 in. diameter, iron shell.)

	High-Efficiency Electrode	Standard Electrode
Volts at terminals	75-80	75-80
Ampères	4	4
Watts at terminals	310	310
Mean hemispherical cp	736	488
Watts per mean hemispherical cp	0.42	0.63
Mean spherical cp	385	258
Watts per mean spherical cp	0.81	0.21
Lumens per watt	15.60	10.40

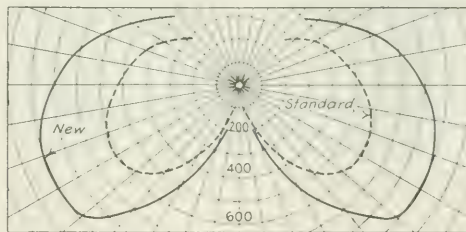


FIG. 3—ORNAMENTAL LUMINOUS-ARC LAMP, MAGNETITE, DIRECT-CURRENT, SERIES CIRCUIT

(Ornamental, light-diffusing globe. Upper electrode, copper, 1 1/2 in. diameter. Lower electrode, 3/4 in. diameter, iron shell.)

	New Electrode	Standard Electrode
Volts at terminals	80	80
Ampères	5	5
Watts at terminals	400	400
Mean hemispherical cp	510	510
Watts per mean hemispherical cp	0.52	0.78
Mean spherical cp	631	418
Watts per mean spherical cp	0.63	0.96
Lumens per watt	19.80	13.10



serve to diffuse the light, as shown in the horizontal section. The inner section is pressed down upon a lip at the bottom of the outer by a spring, the two globes being ground to fit. The outer section is  $10\frac{1}{4}$  in. in diameter by  $4\frac{1}{2}$  in. deep, and the inner is  $8\frac{5}{8}$  in. in diameter by  $4\frac{1}{4}$  in. deep. No diffusing globe is needed, as stated above, the electrodes, holders and refractor unit being inclosed in a clear glass globe of parabolic shape which protects the arc from drafts and keeps out the dirt. In the refractor-type lamp the upper electrode is adjusted on the principle of the old ring clutch used in carbon arc lamps and the electrode box is slightly larger than in the ordinary pendent form of magnetite arc lamp.

The difference in the light distribution between the old and the new magnetite electrodes is illustrated in Fig. 2, which compares two photometric curves of a 4-amp standard luminous-arc lamp consuming 310 watts

Cabot Street in the central business district of Beverly, Mass., and the character of the illumination leaves little to be desired from the standpoint of the most exacting community. These lamps are installed about  $14\frac{1}{2}$  ft. above the street, staggered, and are spaced about 100 ft. apart, the usual width of the street available being

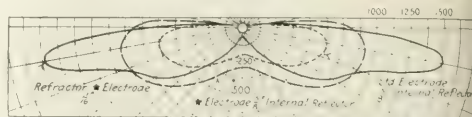


FIG. 5—LUMINOUS-ARC LAMP, MAGNETITE, DIRECT-CURRENT, SERIES CIRCUIT

(Clear globe and ashpan. Upper electrode, copper, 1 in. diameter. Lower electrode, standard and high-efficiency mixtures.)



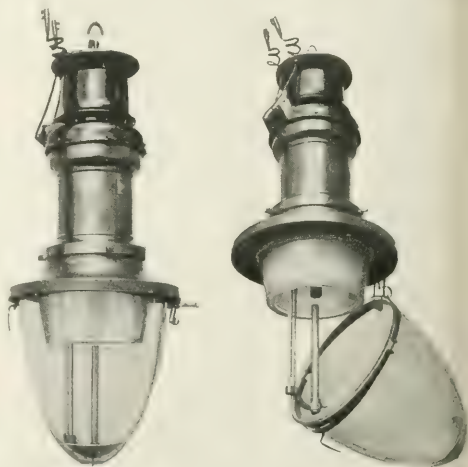
FIG. 4—ORNAMENTAL LUMINOUS-ARC LAMP, NAHANT STREET, LYNN, MASS.

at the terminals. With the present or so-called standard electrode the lamp yields 630 cp maximum at 10 deg. below the horizontal, and with the new electrode the maximum rises to 930 cp, a gain of 47.5 per cent in intensity in the most useful direction and without the slightest increase in expended energy. This lamp was equipped with a clear globe and internal concentric reflector. Fig. 3 is a comparison of standard and new electrodes in a "white way" or ornamental luminous-arc lamp of the new 5-amp type. Here the maximum flux is 620 cp at 30 deg. below the horizontal with the standard electrode and 900 cp with the new type. The lamp consumes 400 watts with a current of 5 amp. The data show that the relative wattages per mean hemispherical cp are 0.78 with the standard and 0.52 with the new electrode, the latter being just 50 per cent more efficient than the former. A light-diffusing globe was used. Forty-three 5-amp ornamental luminous-arc lamps with high-efficiency electrodes are in service on

	HIGH-EFFICIENCY ELECTRODES		Standard Electrodes, Internal Reflector
	Refractor	Internal Reflector	
Volts at terminals	75-80	75-80	75-80
Ampères	4	4	4
Watts at terminals	310	310	310
Mean hemispherical cp.....	741	736	488
Watts per mean hemispherical cp...	0.42	0.42	0.63
Mean spherical cp.....	425	385	256
Watts per mean spherical cp.....	0.73	0.81	1.21
Lumens per watt	17.20	15	10.40

60 ft. The electrodes are  $9/16$  in. in diameter and 15 in. long and the average life is 110 hours. With the present 18-in. high-efficiency electrode the life is increased to 130 hours.

Fig. 4 shows a 4-amp ornamental luminous-arc lamp in service on Nahant Street, Lynn, Mass., the "Wash-



FIGS. 6 AND 7—LUMINOUS-ARC LAMP WITH GLOBE CLOSED AND OPEN

ington" type of ribbed diffusing globe being used. With the high-efficiency electrode and globe mounted  $14\frac{1}{2}$  ft above the street, the installation, which has a most pleasing appearance, is admirably adapted to the illumination of a residential district containing thick foliage. A light-density glass is used on the side toward

the street and a heavy-density glass on the rear. This tones down the flux sufficiently to make the lamp entirely unobjectionable to persons sitting on adjacent piazzas. The arc is centered in the globe, so that uniform distribution of light over the sphere is obtained. In the Nahant Street district the lamps are spaced from

ward from the lamp between the angles of 30 deg. on each side of the vertical. Little necessity exists for directing light downward in this zone, and while the photometric curves taken with the internal reflector show a decided decrease in the flux immediately below the lamp, the refractor lamp exhibits a superior quality

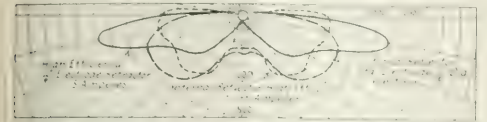


FIG. 8—LUMINOUS-ARC LAMP, MAGNETITE, DIRECT CURRENT, SERIES CIRCUIT

Clear globe and ashpan. Upper electrode, copper, 1 in. diameter. Lower electrode,  $\frac{1}{8}$  in. diameter.)

	High-Efficiency Electrode	Standard Electrode
Volts at terminals	75-80	75-80
Ampères	5	6.60
Watts at terminals	388	510
Mean hemispherical cp.	1131	1266
Watts per mean hemispherical cp.	0.34	0.403
Mean spherical cp.	687	668
Watts per mean spherical cp.	0.61	0.762
Lumens per watt	20.6	16.50



FIG. 9—LUMINOUS-ARC LAMP, MAGNETITE, DIRECT CURRENT, SERIES CIRCUIT

Clear globe and ashpan. Upper electrode, copper, 1 in. diameter. Lower electrode,  $\frac{1}{8}$  in. diameter.)

	High-Efficiency Electrode	Standard Electrode
Volts at terminals	75-80	75-80
Ampères	6.60	6.60
Watts at terminals	510	510
Mean hemispherical cp.	1626	1266
Watts per mean hemispherical cp.	0.314	0.403
Mean spherical cp.	948	668
Watts per mean spherical cp.	0.54	0.762
Lumens per watt	23.40	16.50

250 ft. to 300 ft. apart, and the resulting silhouette illumination is thoroughly satisfactory. These lamps are in service on Nahant Street and others are being installed at Swampscott, Mass., with the arc 18 ft. above the roadway in continuation of the Lynn shore drive lighting. The city of Springfield, Mass., has recently installed 1500 5-amp luminous-arc lamps of the pendent type with high-efficiency electrodes.

In Fig. 5 three comparisons are given for the 4-amp luminous-arc lamp, consuming 310 watts. The difference between the lamp when equipped with a high-efficiency electrode and with the refractor and the ordinary lamp with the standard electrode and internal reflector is remarkable. Figs. 6 and 7 show the luminous-arc lamp complete with electrode and refractor, the globe in the latter case being lowered for cleaning and trimming. A life of 150 hours is obtained with the 11/16-in. by 9 1/2-in. high-efficiency electrode in the 5-amp, 310-watt lamp, compared with 350 hours for the same-sized standard magnetite electrode, the latter figure being based upon the service rendered by 6000 amps of this size in a typical installation. The increase in the cost of trimming, however, is a small matter in relation to the improved illumination secured by the high-efficiency equipment.

The effect of these improvements is further shown in Figs. 8 and 9. In the former comparisons are made between the 5-amp luminous-arc lamp with and without the refractor, the new electrode being used in each case, and as a matter of interest the photometric curve of a 6.6-amp lamp with internal reflector and standard electrode is shown. The meaning of these gains in efficiency is thus apparent from the significant standpoint of comparisons between smaller and larger units. The 6.6-amp lamp develops a maximum of 1500 cp at 5 deg. below the horizontal, while the 5-amp unit, with refractor, develops 2200 cp at the 10-deg. angle, its maximum being in a more useful direction than the maximum of the former.

A marked characteristic of the refractor distribution is the comparatively small luminous flux driven down-

ward from the lamp between the angles of 30 deg. on each side of the vertical.

The 5-amp lamp, equipped with the high-efficiency electrode and the prismatic refractor, therefore, bids fair to become one of the most valuable resources of the street-lighting art. Even the 4-amp lamp equipped with refractor and new electrode delivers 1500 cp at 10 deg., compared with the 6.6-amp lamp's 1300 cp at this particular angle, although the total flux is larger in the case of the latter unit and consequently governs its selection in certain instances.

Fig. 9 shows the illumination obtained by equipping a 6.6-amp luminous-arc lamp with the improved electrode and refractor, as compared with the ordinary electrode and internal reflector used in this type of lamp.

In passing it may be noted that the progress that is outlined above gives evidence that the arc lamp is by no means becoming a thing of the past in modern street lighting. With the lamps now available—and the specific consumption is figured on the important values of mean hemispherical and mean spherical candle-power—the gas-filled incandescent lamp need give the central-station man no concern if he prefers to utilize the arc, even in the lighting of high-class residential districts.

In an installation of 4-amp lamps equipped with prismatic refractors and the high-efficiency electrode on the main highway between Lynn and Nahant, Mass., the spacing between units is 590 ft. The roadway is 60 ft. wide and occupies a narrow peninsula with the sea on either side. Lamps are mounted on temporary supports on one side of the highway only, and the arc is about 25 ft. above the roadway. There are no disturbing lights along the section thus equipped, and on a cloudy night it is easy to tell time with a watch at a point half-way between the lamps and about 500 ft. from each on a diagonal line. Addresses on envelopes can be fairly deciphered, and a rough calculation was made without much trouble on a 5-in. slide rule. With one lamp out of circuit, the second hand of a watch could be read by the light received from the next lamp, 590 ft. distant.



## Operating Costs for Commercial Electric Vehicles

**Independent investigation undertaken by the Electrical World to determine cost of operation of electric vehicles in the principal installations of the country—Authoritative data a real necessity to progress in the industry**

FOR the past fifteen years there has been an incessant demand for reliable and serviceable information on the cost of operating electric vehicles. So great has this need been that many persons have made futile attempts to produce the desired figures. The statistics put out, however, have been worse than useless, in that they created distrust by their inaccuracy, which was instantly apparent upon critical inspection. None of the glittering array of figures and tables or the many ingenious graphic presentations made have been serviceable in answering satisfactorily the questions of the common-sense business man in his quest for authentic information, based not on possibilities and isolated tests but upon actual practice and experience.

### Insufficient Data

Most of the data presented have been developed by persons inexperienced in every-day practical electric-vehicle operation and actual cost of the service rendered. Elaborate magazine articles have been written with the *bona fide* intention of offering enlightenment on the subject; but in almost every case these have been woefully deficient in information necessary to the prospective commercial user or to the owner of an existing installation desiring comparative figures. The deductions presented have for the most part been based upon very limited data or observation, or have been confined to one or a few specific applications, so that they would not be applicable except under conditions duplicating those covered in each particular case. In some instances the material offered has been woven around a limited statement of actual outlay for some particular period of months, without reference to the fact that the accounting should cover a long period of service. It is only information of this kind that is worth relying on because there must be equalization or a proper prorated disposition of the active and latent charges occurring in any particular period.

Great stress has often been laid upon unessential details of accounting or performance, without developing any crucial resulting figures which may be utilized in business. Thus, for example, the figures for waste and oil per mile, per ton mile or per package will be extended to the fourth decimal place without much consideration of the changes which take place in these figures when applied to one machine operated singly or as a unit in an installation of a great number of machines of varying sizes. The figures seem to be given with the implication that the user or prospective user can by some mental process apply them to his own case, no matter what his operating conditions.

### Reliable but Unserviceable Information

Many creditable exhibitions of operating costs as experienced by some of the principal electric light and power companies have been worked out with accuracy by the talented statisticians usually attached to such organizations. Unfortunately, no matter how correct these figures, the cost of electric-vehicle service by public-service companies is of little use in the commercial field, because these vehicles are not generally used in the

collection, transportation or delivery of merchandise. They are principally used as part of the working equipment of a number of men in lamp and meter installations, construction work or emergency service. The vehicles are used as convenient workmen's utilities rather than conveyors of freight, and few merchants are satisfied to take such operation cost as indicative of what would be obtained with vehicles in commercial employment.

### Subsidized Research

Prompted by an earnest desire to render material aid and recognizing the necessity and value of information upon this subject, one of the large illuminating companies has very liberally subsidized the engineering department of one of the technical institutes to make investigations in this general direction. The work has been prosecuted faithfully within the limits which obviously restrict any scholastic institution in undertaking a commercial investigation. Such an institution cannot penetrate much beyond the scope of observing students who are necessarily amateurs and not practically or personally familiar with the details involved in any complete comprehension of the subject.

Aside from making observations of the schedules of vehicle operation in limited or specific instances, the information procured, particularly in relation to cost of operation, must necessarily come to the institution second-hand, being supplied upon printed forms requesting the user to fill in the general features of his operation as well as calculate and supply the actual figures of cost and performance. No doubt the lighting and power companies are in many instances competent and willing to undertake the task of supplying these data, but anyone who has endeavored to procure this information from the user—and particularly the vehicle manufacturer who is almost constantly soliciting it for development purposes—will recognize how futile it is to expect the average mercantile institution to make the analysis necessary to furnish the figures. As a matter of fact, if the information were so readily available the cost of operation would be well known and there would be no necessity for undertaking the project in question.

The results achieved and published so far indicate how difficult it is to secure workable and conclusive information on vehicle operation. Several bulletins illustrating this research have been issued to date, but the detailed figures on cost and performance vary so widely as to destroy rather than to create any confidence in them. This contention is borne out by all the principal statements and conclusions in the bulletins, which carry with them qualifications limiting their application to the few specific cases observed.

### Manufacturers' Efforts

Nearly every manufacturer of commercial vehicles has endeavored by some means or other to meet the requirements of prospective customers. Manufacturers have always urged the users of their machines to keep records which would be mutually advantageous, in the first place dwelling on the low operating cost and economic value of this class of vehicle, and as a sec-

ondary result securing the users' enthusiastic recommendation to other intending purchasers as the outcome of experience. The underlying purpose has been to develop established figures which the manufacturer could use broadcast in his advertising campaigns and general propaganda.

Generally speaking, the best that manufacturers have been able to produce so far have been sets of tables which show a reasonable anticipation of the cost of operating each of the various-sized vehicles, as units, in ordinary service on level roads. Naturally the manufacturers cannot afford to make representations which relate to the utmost possibilities under ideal conditions. All users are not skilful, and experience has shown that those most careless and incompetent in employing their machines are loudest in condemnation when their anticipations or the representations made to them are not realized. The conservative manufacturer, therefore, hedges his figures with so many qualifying statements or cautionary restrictions that their value is destroyed. This is very detrimental in the case of an owner of a small number of horse vehicles who would employ machines if he could realize the true margin of expense reduction certain to result from electric-vehicle use—a fact which is not made evident to him by the tables as described.

#### Defects of Existing Tables

To the prospective users of large numbers of vehicles manufacturers' tables of figures can have only approximate value, because each large group requires extra reserve equipment. Moreover, the questions of garaging, supervision and general operation assume importance in collective installations, and the cost of these items is not apparent from the tables. In fact, until costs which are deduced without a minute consideration of all of the accounting which must enter into an annual statement covering an entire installation can be regarded only as limited approximations. Where large fleets of vehicles have been involved manufacturers in the past have undertaken an analysis of all the conditions surrounding the transportation requirements in advance of submitting their proposals. In this way they were able to make a correct showing of the economic value of the new equipment as against the cost of operation with the older one to be superseded. Some of the larger installations have been thus made. The plan, however, is expensive and manufacturers are loath to undertake such a study unless they have some assurance from their customer that they shall have the exclusive benefit resulting from such investigations. In other words, they ask protection against the competition of other manufacturers who might obtain the advantage of such investigations without having borne any of the expense involved. There are many cases where manufacturers have been victimized by prospective customers who purchased machines elsewhere as the result of the enlightenment given them by such investigations.

Unfortunately, the representations made by any particular manufacturer, no matter how extended his experience may be, are not always regarded with impartiality. It is generally recognized that a manufacturer has something to sell and is primarily interested in the accomplishment of his own purposes, and therefore the economic showing which may be developed is questioned. In many cases manufacturers have had to reduce the margin of saving which they believed would exist between the old and the new equipment in order to create confidence, believing at the same time that when the true saving shall be realized the resulting enthusiasm will stimulate further commercial developments.

#### The Necessity for Comprehensive Investigation

The problem to be solved is an intricate one, and if the cost of operating electric vehicles is to be manifested in a way to serve the many useful purposes to which they can be applied it is also one of considerable magnitude. It involves an accurate knowledge of all the underlying considerations and a complete and harmonious co-operation of all the parties in interest. Each must contribute his share of information necessary to the compilation and establishment of reliable figures based on experience with electric vehicles in all the varied lines of commercial service to which such machines have been successfully applied. The demand exists for such information. Its advantage to both maker and user is unquestionable, and while each must necessarily be a contributor to the final result, a broad and satisfactory investigation can be made only by an independent and impartial authority.

The *Electrical World*, having in mind the general advancement of the industry and the interests of its readers, has undertaken at great expense to collect, compile and publish accurate and trustworthy information on this subject. A further analysis will be given in next week's issue, to be followed by a series of articles dealing with the operating costs of each of the principal sizes of commercial vehicles, in widely diversified service.

### ZERO LINE REGULATION AT BIG CREEK

Operating Conditions of Pacific Light & Power Corporation's 150,000-Volt Transmission System, Delivering Energy to Los Angeles, 240 Miles from Generating Station

The 150,000-volt transmission system of the Pacific Light & Power Corporation, generating energy in the hydroelectric plant at Big Creek, Cal., and delivering electricity to Los Angeles, 240 miles away, is not only interesting because it operates at the highest voltage in the world, utilizes a 4000-ft. head, and transmits energy over a long distance, but also because the receiving-end voltage is maintained constant under all loads and equal to that at the generating end. The method of obtaining these results was described in Mr. Edward Woodbury's paper entitled "Some Operating Conditions of the Big Creek Development of the Pacific Light & Power Corporation," which was presented at the Pacific Coast meeting of the A. I. E. E.

The inherent regulation of the line alone without terminal equipment is from 10 per cent above the generating-end voltage at no load to 20 per cent below at full load. The reactance of the transformers at the generating station, which practically doubles the boosting at light load, and the self-exciting characteristics of the generators when supplying charging current only, would produce abnormally high voltages at the receiving end at light loads were it not for the special equipment employed. This equipment consists of synchronous condensers at the receiving end in conjunction with automatic voltage regulators, one for each condenser as well as for the generators at each generating station.

Two methods of voltage regulation are used, one employing standard alternating-current automatic voltage regulators and the other a new type of regulator having no direct-current magnet. In one generating station the excitation system consists of three direct-current units, one of which is the exciter proper, the other two being connected in series opposition and used to excite the field of the main exciter. The two units making up the secondary exciter are designed to generate 125 volts and 275 volts respectively. With a standard potential regulator on the 275-volt unit, arranged with auxiliaries to prevent a reversal of the field in the 125-volt unit of this



set, the voltage applied to the main exciter field may be changed from that required to give maximum generator excitation to zero excitation.

The alternators at the other generating station are excited directly by a 200-kw, 250-volt exciter, the main field of which is controlled by a new type of alternating-current automatic voltage regulator, which has no direct-

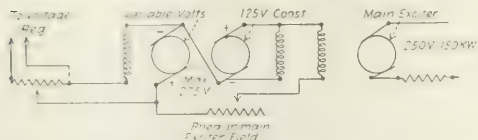


FIG. 1—EXCITER CONNECTION, PLANT NO. 1, BIG CREEK

current magnet and which therefore can be adjusted to reduce the exciter voltage to zero. The exciters on this system have three shunt windings on the field, as shown in Fig. 2. One auxiliary field is provided to give the reversed excitation necessary to hold the voltage down when charging the line, the current being supplied to this field, through a variable resistance, by means of a storage battery. The other auxiliary field, which is solely for the purpose of maintaining the correct polarity, takes its current, which is small, from the same storage battery.

A reduction of the excitation to zero by means of the potential regulator has not been necessary at the generating stations, but operation of the synchronous condensers at the receiving station over the range required would not be feasible without provision for a complete reduction of the exciter voltage.

With 150,000 volts at the receiving end of the line, the charging current is about 40 per cent overload for one generator. With normal voltage of 6600 volts at the generator, the charging current overloads one generator 65 to 70 per cent. Hence in normal operation a line is usually energized by using two generators, under which condition a small field excitation in the normal direction is required. Abnormal conditions sometimes make it necessary to charge the line from a single generator until the receiving-station condensers can be started.

The self-exciting characteristics of the system with leading current are such that a single 6600-volt generator in one of the stations when connected to an unloaded line without its condenser and run at normal speed with the field switch open would excite itself to 7000 volts, corresponding to 176,000 volts on the transmission line at the generating station. Under these conditions the generators would have to supply 34,000 kva, or 850 actual kw.

At the other station, where the generators were designed by a different manufacturer and had slightly different characteristics, the results were greater and the

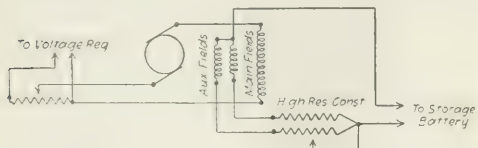


FIG. 2—EXCITER CONNECTION, PLANT NO. 2, BIG CREEK

self-excitation under similar conditions would reach 9000 volts at the generator, or 230,000 volts on the line at the generating end. For this condition the generator would have to deliver 5000 kw and about 50,000 kva. Means, therefore, had to be furnished for using current in a reverse direction to the generator fields to counteract the excitation due to the leading current.

As might be expected with a system of this magnitude, special consideration had to be given to minimizing the effects of short-circuits. Accordingly, the reactance of the generators of the two manufacturers has been made 70 per cent and 85 per cent respectively; of generator station transformers, 5 per cent and 8.5 per cent; of receiving station transformers, 5 per cent and 8.5 per cent. The result is that the instantaneous short-circuit current is only 330 per cent of full load on the generators and the sustained short-circuit current 110 per cent with normal excitation of full load. Under these conditions the waterwheel governors shut off water on short-circuit before any serious change in speed can take place.

On account of the use of aluminum cable for the transmission line, it is very desirable to suppress an arc on the line before the wire can be seriously injured. For this purpose a field-killing relay has been considered which can be installed in the neutral of the generating-station transformers to extinguish the arc and automatically restore the voltage immediately.

Of the short-circuits which have occurred, none has

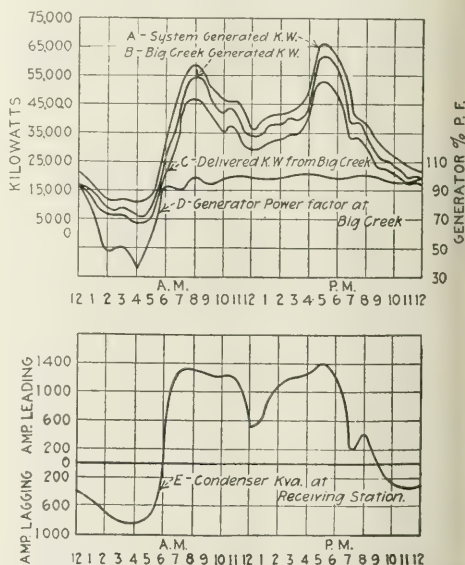


FIG. 3—TYPICAL DAILY OPERATING CURVES OF SYSTEM

been sufficiently serious to burn down the cable. Some of the outer strands have been scorched, but not sufficiently so to diminish strength. The scorched sections are, of course, removed at the earliest opportunity. In every case of short-circuit which has occurred so far trouble was cleared by reducing the voltage at generators as soon as the ground ammeters indicated a current in their circuit, after which service was immediately resumed.

In addition to the foregoing facts, the following may be of interest: A reversed field current of 50 amp is required to bring a 17,500-kva generator "down on line" to zero potential at no load. Owing to the line conductors being supported in a horizontal plane, the currents in the conductors are unbalanced 12 per cent at no load and 2 per cent at full load. A pressure of 4200 volts is induced in a 100-mile dead section of the duplicate transmission line which runs parallel to the energized circuit at 82 ft. from it. A complete description of the system was published in the Jan. 3 and 10 issues of the *Electrical World* for 1914.

# Use of Electricity in the Iron and Steel Industry

Wide and varied applications of motors, lamps and electric control in all branches of steel manufacture described and discussed by the Association of Iron and Steel Electrical Engineers

THE extent to which electricity is employed in the iron and steel industry is seldom appreciated by men outside of that profession. So rapid and so satisfactory has been the employment of electric motors that it is predicted that these will soon supplant the steam engine for driving purposes. The papers read at the eighth annual convention of the Association of Iron and Steel Electrical Engineers, held in the Hotel Statler, Cleveland, Sept. 14 to 19, illustrate the variety and magnitude of the applications of electricity in the steel industry.

## Affiliation with A. I. E. E.

Affiliation with the American Institute of Electrical Engineers was discussed, Mr. Farley Osgood, vice-president of the A. I. E. E., pointing out its advantages to the membership of both bodies. Mr. C. A. Menk suggested that the whole matter be referred to a committee, whose duty would be to secure all the information possible as to the advantages and disadvantages of such a step and make a report later on. Mr. J. P. Mallet, Society for Electrical Development, advised the association to retain its identity but endeavor to establish relations with the larger body that will be valuable to both organizations.

## Magnitude of Electrical Equipment in the Industry

Data showing the magnitude of electrical applications in the iron and steel industry were given in Mr. R. Tschentscher's paper on "Statistical Data of Electrical Applications in the Iron and Steel Industry in the United States." Of eighty-five companies engaged in this business and operating approximately 200 plants which were asked for information, sixty-five companies, operating 175 plants, reported. Fifty-nine of these had a total of 170 plants which generated their own electrical energy, while the remainder purchased electricity. In the private plants were a total of 840 generators having a combined rating of 394,466 kw. The number of motors employed was 45,512 and their combined rating 1,261,148 hp. Other connected loads amounted to 33,863 kw for illumination, 7047 for metallurgical processes and 4810 for miscellaneous purposes. The total energy generated during 1913 in the private plants amounted to 1,633,764,000 kw-hr., making the production per company 27,700,000 kw-hr. and per plant 1,610,000 kw-hr. About 7,800,000 kw-hr. of energy was purchased in the same period by the companies reporting. The lowest plant production was about 100,000 kw-hr. and the largest 330,000,000 kw-hr., or about 30 per cent of the total. Three companies owning nineteen plants generated 683,000,000 kw-hr., representing 2 per cent of the total energy generated.

These figures compare favorably with 4,800,000 kw-hr. per railway plant and 2,202,000 kw-hr. per combined railway and lighting stations as given in the 1912 United States Census. From the data given the author estimated that the average load-factor in this industry is between 15 per cent and 20 per cent. He prophesied that within the next ten years all forms of drive other than electric will be eliminated. Besides pointing out the economy and increased output made possible by

electrical drive, he said that it tends to promote the safety of the working force.

## Discussion

President E. Friedlaender, in calling for discussion, said that the number of motors utilized in the iron and steel industry had trebled since 1907 and expressed the belief that the use of steam engines will not be continued long into the future. Mr. K. A. Pauly, of the General Electric Company, compared the load-factors of motors with the load-factor of generating plants and stated that where as many as 2000 motors are used the station factor would be in the neighborhood of 33.3 per cent. With a smaller number of motors the value would be higher. Mr. G. W. Richardson, of the American Bridge Company, said that in a plant containing 700 motors the ratio of motor load-factor to station load-factor would be seven or eight to one.

## Switching Apparatus for Steel-Mill Equipment

Switching apparatus and switchboards required for the operation of electrical equipment in steel mills were described in a paper on "Switchboard and Switching for Steel Mills," by Mr. Saul Lavine. Among devices described were carbon-tipped circuit-breakers, oil-inclosed circuit-breakers, and knife and disconnecting switches. The author also suggested how switchboards should be arranged and constructed. A short description of one of the most recently constructed steel-mill generating-station switchboards completed the paper.

## Discussion

Mr. K. H. Cederlund said that the double-bus system cannot be too strongly advocated. The plan of switching advocated in Mr. Lavine's paper, he believed, is a means of making lines safer.

## Electrical Auxiliaries for Steel-Mill Operation

Applications of auxiliary electrical apparatus to iron and steel mill equipment were described and reasons for using particular apparatus for certain kinds of work were discussed in a paper on "Application of Auxiliary Apparatus in Iron and Steel Mills," by Mr. Stewart C. Coey. Automatic devices were described for five types of service—frequent starting, stopping or reversing; cyclic operations which must be duplicated in several parts of a machine; main-roll drive; constant speed in one direction, and variable-speed drives.

## Characteristics of Magnetic-Control Switches

In his paper on "Magnetic Control Characteristics" Mr. H. F. Stratton pointed out that approximately 0.11 second elapses between the excitation and closing of the main contacts of a shunt-operated magnetic switch and that about 0.06 second passes after breaking the circuit before the switch starts to open. In general, he declared, about 0.25 second is consumed in opening and closing an automatic switch of this type, therefore installing more automatic switches than necessary will curtail production. It was also shown that a switch designed for intermittent operation will close in less than half the time required by a switch designed to



carry current continuously. Graphical and algebraic methods of determining the number of accelerating switches to use with motors were also described. The author pointed out that the number thus determined should be modified to allow for the effect of counter electromotive force and inductance on the prompt closing of the switches. It is not always practicable to place relays in the shunt-field circuits of compound motors as the current therein may be reversed by transformer action when electricity is supplied to the armature at the moment of starting. In the case of a shunt motor driving a load having considerable flywheel effect the motor current may be reversed upon a sudden drop in voltage, therefore a relay could not be held closed by a coil in series with the motor. To prevent accelerating switches from breaking the motor circuit entirely and damaging the contacts when the voltage drops, the author suggested shunting the contactor which is last to close with a resistance which will allow 0.75 full-load current to flow when full working voltage is impressed across it. When the motor current drops to 10 per cent full-load value this contactor will usually open, causing the current to drop to about 0.0036 full-load value, thereby decreasing the torque and speed of the motor and causing the current to build up to 10 per cent full-load value again.

#### Magnetic Control for Auxiliaries

In a paper on alternating-current and direct-current control for auxiliary motors Mr. W. O. Lum considered the details of the design of contactors under the three parts—magnet, contacts and blow-out—separately and together.

#### Discussion

A short written discussion of Mr. Coey's paper sent in by Mr. M. A. Whiting, General Electric Company, was read by President Friedlaender. In this the author gave special attention to winding switch coils. Mr. S. Henderson, American Steel & Wire Company, said that a new line of accelerating magnetic switches with series-operating coils had been placed on the market since Mr. Coey's paper was prepared. A number of slides were shown illustrating accelerating control by means of these switches. The speaker also discussed the speed control of cranes and said he believed that the speed of lowering could be controlled by shunting the motor field. Regarding Mr. Stratton's paper, he expressed the belief that heavy relays possess so much inertia that they will not operate properly. He recommended designing switch-operating coils for continuous current flow and a large fluctuation in voltage. A coil when cold should be capable of opening a switch at 130 volts and should be capable of closing the switch at 140 volts. Moreover, it should not burn out at 250 volts.

Mr. W. F. James, Westinghouse Electric & Manufacturing Company, sent a written discussion which was read by Mr. Long. It was along the lines that had been brought out in the papers and discussions, with conclusions that varied somewhat from those which had already been presented. The author also discussed the operating speed of switches and the effect of eddy currents upon them.

Mr. Paul Caldwell, General Electric Company, in commenting on the papers by Mr. Coey and Mr. Stratton, said that the results of dynamic braking are not so good as with "plugging," as the first method has a tendency to heat the motor.

Mr. Frank Smith, Otis Elevator Company, described the operation of furnace elevators and the manner in which variable speed required for emptying the buckets is secured. Mr. H. S. Richardson, Electric Controller & Manufacturing Company, pointed out the superi-

ority of double-magnet coils to protective resistance units. He also said that while the human element has considerable effect on the speed of "plugging," a quicker stop can be made thereby than with dynamic braking.

Mr. T. W. Tynes, Lackawanna Steel Company, spoke of the tendency of switches to "freeze in," especially when table work is reversed before all of the switches are closed. Mr. C. A. Menk, Carnegie Steel Company, expressed the belief that magnetic control will in time reduce the expense of repairs on motors and equipment operated by them.

Mr. Ernest Wiley, Westinghouse Electric & Manufacturing Company, in comparing steam and motor drive, said that old motors are practically as efficient as the more modern ones. Mr. Arthur Eastwood, president of the Electric Controller & Manufacturing Company, spoke on series and shunt-wound contactors and expressed preference for the former. He emphasized the necessity of careful inspection in order to avoid trouble and frequent repairs.

#### Meters and Their Application in Steel Mills

A paper presented by Mr. R. C. Lamphier described the different types of watt-hour and ampere-hour meters, both for direct current and alternating current. The author considered the testing of the instruments in detail. It was stated that meters properly installed were of great aid in steel mills in making the employees more careful not to waste energy.

#### Discussion

President Friedlaender suggested that meters be protected from dirt and dust and that all connections and terminals be on the outside of the case. Mr. T. E. Tynes said that for years energy has been wrongly apportioned to the various departments of steel mills on a tonnage basis and suggested that meters be used to determine how the apportionment should be made. Mr. Ludwig Hommel, Pittsburgh, said that great economy can be effected by analyzing the energy consumed in each operation with meters. He recommended using the shunt-type wattmeters as they can be installed wherever desired by connecting them with the busbars by small wires.

#### Practical Problems in Operating Electrical Apparatus

Insulation and insulation troubles, commutation and commutator troubles, methods of varying the speed of induction motors and the advantages of twenty-five-cycle and sixty-cycle service were discussed at length in a fifty-four-page paper entitled "Some Electrical Problems Practically Considered," by Mr. B. G. Lamme. He pointed out that fibrous insulations impregnated with gums will withstand higher temperatures than when untreated. Asbestos and mica may be subjected to temperatures of about 400 deg. and 700 deg. C. respectively, but are more suitable as spacers than insulators. Insulating materials should be impervious to oil, grease, water, etc., and should be braced mechanically to prevent cracking or buckling caused by magnetic stresses. For driving off water which has soaked into insulation the author recommends heating in a vacuum. Following the discussion of insulation he presented the theory of commutation. The causes of commutator blackening and pitting, brush chatter, etc., were discussed and remedies suggested. Methods of controlling the speed of induction motors through their primary and secondary winding were also described. Among the auxiliary devices employed for absorbing the energy developed in the secondary circuits of induction motors were mentioned the alternating-current commutator motor, rotary converter and commutation-type frequency changer. It was pointed out that these devices can also be employed to correct the power-factor of an induction motor. When considering the advantages of sixty-cycle

and twenty-five-cycle energy for motor drive the author said that the higher frequency presents more advantages than the lower except for low-speed machines. In general, however, a sixty-cycle machine is more expensive than a twenty-five-cycle machine having the same speed and corresponding characteristics.

#### Discussion

In the absence of the author, Mr. Wilfred Sykes, Westinghouse Electric & Manufacturing Company, said that Mr. Lamme had been experimenting with a washing material to be used in cleaning insulated coils. The speaker proceeded to point out that delays in rolling-mill work are caused in the passes on the rolls and not by the motor control. The advantages of the slip control are that it is as rapid in operation as any magnetic control, has little dash-pot action, is simple and easy for operators to understand, and the expense of installation is comparatively low. If a plant is so large that the peaks do not cause trouble, then there is little use for regulators of any type.

Mr. Karl A. Pauly, General Electric Company, expressed belief that motor-generators have many advantages over rotary-converters for heavy steel-mill work. Mr. Friedlaender suggested undercutting mica if it does not wear sufficiently to keep the brushes from chattering. He also stated that mica V-rings are being sealed by some manufacturers to keep oil from the commutator, but this construction has a tendency to increase the temperature.

In a written discussion, Mr. S. Lankton, Carnegie Steel Company, called attention to the importance of setting plates properly in rolling machines to prevent overloads on the motors. He discussed the uses of electric brakes and other accelerating and decelerating apparatus.

#### Induction Motor Control for Rolling Mills

A paper dealing with the control of large induction motors driving main rolls and briefly describing the requirements of such controllers was presented by Messrs. Wilfred Sykes and G. E. Stoltz. The paper contains numerous curves showing controller operation.

#### Discussion

Mr. Fred B. Crosby, General Electric Company, presented a written discussion in which he said that greater speed reduction can be obtained by connecting resistance in the secondary circuit of an induction motor than by any other method. Liquid rheostats are not always suitable for this purpose, however, as evaporation of the electrolyte increases the density of the solution, causing a corresponding change in motor speed. Permanent resistance has been found preferable for slip regulation.

Mr. R. Tschentscher, Illinois Steel Company, also presented a written discussion, giving a history of the control of mill machinery where the installations were made some years ago.

#### Silent-Drive Chain

The construction and advantages of one type of silent-drive chain were brought out in Mr. F. L. Morse's paper on "Silent-Chain Power Transmission." The author referred to an installation at Ithaca, N. Y., where a 5000-kw generator is being equipped with a silent-drive chain.

#### Discussion

Mr. S. Henderson, American Steel & Wire Company, spoke of the changes required in a sprocket when the chain is changed and called attention to relative wear of chains and sprockets. Mr. James Farrington said that an oil-tight gear case should increase the life of a chain. Mr. Frank A. Wiley, Wisconsin Steel Company,

expressed the belief that chain drive will reduce motor repair expenses because of its flexibility. In reply to questions asked by some of the members, Mr. Morse said that chains are now being made especially for work that requires both forward and reverse motion. Some chains are now running as fast as 4500 ft. per minute.

#### Transformer Construction for Steel Mills

In a paper entitled "Power Transformer Construction for Steel Mills," Mr. G. A. Waters presented particularly the details of insulation and cooling for transformers.

#### Discussion

A written discussion prepared by Mr. R. D. Nye, Central Steel Company, was read by President Friedlaender, in which the author discussed cooling transformers in series by spraying water over them. Mr. H. H. Rudd also presented a written discussion in which he called attention to the stresses in transformers caused by the magnetic repulsion of the coils, adding that the insulation should be designed to withstand this strain. Mr. W. M. Dann gave figures showing the stresses in transformer coils and said that such stresses can be reduced by placing the primary and secondary coils as far apart as possible.

Mr. R. A. Treat, Crocker-Wheeler Company, characterized core-type transformers as having high efficiency and being easy to repair. Mr. Farley Osgood, Public Service Electric Company of New Jersey, spoke of a transformer break-down caused by dirt and dust preventing the proper circulation of oil. He advised cleaning the transformers as well as the oil periodically, especially in plants where there is a great deal of dust.

Mr. G. A. Waters, in closing the discussion, said that hot coils may be caused by the carbonization of the insulating oil. In making periodic inspections of transformers the speaker recommended removing the oil and lowering a lamp in the case so that all the coils can be seen. Excessive stresses may be prevented by extending the plates to hold the coils in place.

#### Improving the Power-Factor of a System

In his paper on "A Synchronous Condenser Installation for Power-Factor Correction and Voltage Regulation," Mr. W. O. Oschmann described how an over-head distribution system was altered and synchronous apparatus installed, increasing the power-factor at the generator from 56 per cent to 90 per cent and raising the voltage at the extreme delivery end from 400 volts to 441 volts (about the correct operating pressure). As the original distribution circuit, which consisted of four conductors per phase, was arranged horizontally in an order producing excessive inductive drop, the conductors were rearranged in the order A B C C B A, etc. This change reduced the distance between phases one-half and caused a smaller inductive drop. As the magnetizing current of any motor is about the same for light and heavy loads (and this current is from 25 per cent to 35 per cent of full-load current), the motors were interchanged where possible so that each would be operated at about full load. An unloaded over-excited synchronous motor was then installed at the extreme end of the line and a loaded motor of the same type connected nearer the generating station. Apparatus for controlling the field excitation of these machines was installed at the station, where it could be operated by the attendant. The rotary condensers increased the power-factor at the generator 15 per cent and the voltage at the extreme delivery end 31 per cent. It was declared that by increasing the available output of the plant the synchronous motors have more than paid for themselves in five years.



### Discussion

President E. Friedlaender pointed out that power-factor correction is especially difficult where sixty-cycle motors are used and less so where twenty-five-cycle machines are employed. Mr. Nicholas Stahl, Westinghouse Electric & Manufacturing Company, contributed a written discussion in which he said that a multiplicity of small power-factor correcting machines is undesirable. The usual plan, he said, is to install one large condenser near the delivery end of the line instead of two smaller ones at separate points. In some cases it may be advisable to use rotary converters instead of synchronous motors. In Europe it has been the practice of a number of engineers to employ phase advancers. The stationary type of condenser is being employed in some American plants, but there are objections to its use. Mr. Stahl also read a discussion prepared by Mr. F. D. Newbury suggesting when synchronous condensers should be used.

Mr. T. E. Tynes stated that in the plant of which he has charge 90 per cent power-factor is maintained by the use of motor-generator sets with windings changed for greater capacity. A written discussion prepared by Mr. H. M. Gasman, Tennessee Coal & Iron Company, was read by Secretary W. T. Snyder. In this paper step-up and step-down transformers were recommended for line regulation.

### Manufacture, Installation and Care of Underground Cables

In his paper on "Underground Cables and Accessories," Mr. J. C. Bowman pointed out that underground cable should be protected from moisture and should not be subjected to abuse. As to the relative advantages of dielectrics used, saturated paper is hygroscopic; varnished cloth is less impervious to moisture, mechanically stronger than paper and withstands voltage surges better; rubber compound is the best water-resisting material of the three and in addition is more flexible. Methods of jointing, sealing the terminals and providing for junctions were described. To obtain the longest life from cables only the most reliable accessories should be employed.

### Underground Transmission in Steel Plant

In Mr. F. D. Egan's paper on "Underground Transmission in a Steel Plant" was described the electrical equipment of the Pittsburgh Crucible Steel Company's plant at Midland, Pa., where the entire distribution system is installed underground. The paper contained an estimate of the cost of installing both overhead and underground circuits and showed plans of the layout and wiring connections. The author also described the method of laying the ducts, pulling the cable, making splices and testing the finished installation. It was declared that the underground system cost less than an overhead system would have. In addition the present system insures safety and continuity of operation.

The author added that conduits should be made sufficiently large to provide for future development, as the greater portion of the expense of installing underground work is for excavating. In discussing work at his own plant, he said that the conduits were laid in horizontal lines, and where water pipes or other obstructions were encountered the conduits were dropped and run on a lower level to the next manhole, where they were brought up again to the desired level. The practice of wrapping cables at the manholes was not followed in this installation, he said, as it makes repair work difficult.

### Discussion

In commenting on the two preceding papers, President Friedlaender said that they contained information that cannot be found in textbooks. He thought, however, that information on the temperature which each

type of cable can withstand and on the effect of moisture and heat on rubber insulation would add to the value of the papers. He also invited discussion on the heating of inner ducts (where a large number are grouped without walls between them), on the ventilation of cable ducts and manholes, on the separation of cables in conduit to prevent fire, and on the practicability and cost of producing steel-taped cable.

Mr. A. F. Hovey, Standard Underground Cable Company, pointed out that the ventilation of ducts has become of much importance in New York City, and suggested that one or more ducts be left empty to give ventilation. He does not believe that steel-taped cable is suitable for use about steel and iron mills, and discussed the subject of bonding cables and keeping the lead sheath together. The speaker declared that cables which are racked on the side of a manhole are liable to injury from being used as ladders and advised employing some kind of fireproof protection for them. Mr. S. C. Coey, Youngstown Sheet & Tube Company, used a series of lantern-slide diagrams to illustrate a method of preventing overheating in conduits. His tests were made with lead-sheathed 1,000,000-circ. mil copper cables laid in ducts, with cables bonded and unbonded, and with 600 amp and 900 amp flowing into the lead-covered, paper-insulated cables at different times. The tests showed that the temperature observed at manholes could not be depended on to show temperatures in intervening portions of the ducts. It was pointed out that the temperature is lowest in the ducts nearest the earth and highest in the center of the bank.

Mr. R. Tschentscher declared that he had been using rubber-covered cable without lead sheaths for seven or eight years and had encountered no trouble yet. On the other hand, he had had his trials with lead-covered cable, and especially with grounded sheaths. Mr. James Farrington, La Belle Iron Works, said he had used rubber-covered cable in conduits made as nearly water-proof as possible, but to prevent sweating of the cables it was necessary to install drip boxes. Mr. C. W. Parkhurst, Cambria Steel Company, described a method of running cables to mines through bore-holes.

Mr. Ray S. Huey, Universal Portland Cement Company, remarked that he had experienced trouble with rubber-covered cables because of water in the conduits and high temperatures. Mr. D. F. Knapp, Eastern Steel Company, said that the presence of water in conduits must always be taken into consideration, as a very small pressure will force it along the wires inside the insulation.

Mr. Egan suggested that cambric insulation rather than rubber be employed near furnaces to withstand the heat. Steel conduits, he declared, deteriorate rapidly around iron and steel mills because of the chemical action caused by slag and other materials which may come in contact with them.

Mr. J. C. Bowman, in discussing what effect temperature has on the current-carrying capacity of a cable, advised employing ducts with large radiating surfaces. He also recommended providing for future extensions in laying conduits.

### Turbines, Condensers and Auxiliaries

In his paper on "Condensers and Their Auxiliaries," Mr. R. N. Ehrhart showed the trend in the construction of condensers, referring especially to those using centrifugal air-exhaust pumps. Comparing reciprocating air pumps with Leblanc centrifugal pumps, the author declared that the first are most efficient at varying loads and moderate vacuums, while the centrifugal pump is best adapted to constant loads and exceedingly high vacuums. The paper also contained a description of unit-type jet condensers rated as high as 15,000 kw

and containing centrifugal air and water pumps mounted on a single shaft driven by a turbine. Data were given showing that with a Leblanc air pump a 15,000-sq. ft. surface condenser would maintain a vacuum of 29.25 in. when condensing 111,000 lb. of steam per hour with water at 38 deg. flowing through the tubes at the rate of 13,000 gal. per minute. The advantages of radial-flow surface condensers were brought out, and the construction of a single-runner multi-stage turbine was described. Tests on a condensing 400-hp turbine of this type showed a steam consumption of 17.7 lb. per brake-hp at 3600 r.p.m.

#### Discussion

Mr. S. L. Blake, Pittsburgh & Conneaut Dock Company, suggested the use of a trap to carry away water from exhaust pipes, but Mr. C. A. Menk thought that small hot-water pumps would do the work better, as traps corrode. Mr. T. E. Tynes pointed out that water can be collected satisfactorily with a trap and called attention to float-operated vacuum brakes for condensers. In closing the discussion Mr. McNeil advised lining the interior of surface-condenser casings with cement when acid is present in the water.

#### Electrical Apprenticeship Course for Steel Mills

In his paper on "The Apprenticeship System as Applied to Steel Mills," Mr. B. W. Gilson outlined what he considered the ideal system of education for mechanical and electrical apprentices in steel mills. He suggested that six hours a week be devoted to classroom instruction on alternate days. During apprenticeship the students should have their wages increased so that on completion of the course they will be drawing an amount equal to that paid to an employee of equal worth. It was recommended that the course cover a period of three years.

#### Discussion

President Friedlaender advocated training men so that they will know what to do in an emergency. He said that to be competent men should have a grammar-school and high-school education and if possible college training. Educated and uneducated men should be kept apart in an apprentice course, he said, because the rapid progress of the former will tend to discourage the latter.

Mr. R. Tschentscher presented a written discussion in which he contended that men should be trained especially for the duties which they are to perform. He outlined the apprentice course given by the Illinois Steel Company, which encourages its men to do good work by giving bonuses. Mr. Farley Osgood urged the committee on training apprentices to consider the subject thoroughly and make suggestions that may be of use to other engineering organizations.

#### Organized Safety

The relative values of accident-preventive methods and suggestions for carrying on "safety-first" work were given in a paper on "Organized Safety," by Mr. Lew R. Palmer. He pointed out that accident prevention should be undertaken through three general channels—organization, safeguarding and education. These may again be subdivided into the following classes with relative values as shown. Under organization are: Attitude of officers, 20 per cent; safety committees, 20 per cent; inspection, 5 per cent. Education may be classified as follows: Instruction of men, 15 per cent; prizes, 9 per cent; signs, 3 per cent; lectures, 3 per cent. Safeguarding is subdivided into: Safety devices, 17 per cent; cleanliness, 5 per cent; lighting, 3 per cent. The author recommended conducting accident prevention on a competitive basis under the supervision of plant, department and sub-department committees. Where sev-

eral plants are under the same management, it is advisable to have a central safety committee which can study causes of accidents and preventive methods from a broader viewpoint.

#### Discussion

President Friedlaender discussed the use of danger signs on all transmission lines, and referred to rules for the installation and care of electric apparatus that are being formulated by the State of Pennsylvania, and also those sent out by the safety department of the United States government. Mr. L. R. Rankin, Carnegie Steel Company, described some personal experiences in safety work and said that plant foremen should encourage the men in preventing accidents by thanking them for every suggestion which will tend to promote safety. Mr. Tynes said that a row of flags representing each department of his company had been arranged on an arch at the mill, and whenever an accident occurs a black cloth is draped over the flag representing that department. Workmen and foremen are thus prompted to keep down the number of accidents in their respective departments.

#### Flame-Arc Lamps Compared with Other Illuminants

In his paper entitled "The Flaming-Arc Lamp in the Iron and Steel Industry," Mr. Allen T. Baldwin compared flame-arc lamps with other electric illuminants as to efficiency, life, reliability, steadiness and color of light. He declared that a variation of 5 volts to 15 volts is not detrimental to the light emitted by a flame-arc lamp, although it is so for tungsten lamps. To prevent formation of slag he recommended operating a flame-arc lamp at a current above the rated value. The author said that two lamps can be operated in series on a circuit without either "robbing" the other of energy if the current is shunted through an automatic cut-out when either arc goes out. Attention was called to the care with which carbon is now selected for lamps of this type. The average deviation from their rated intensities of illumination during normal operation is 5.1 per cent for flame-arc lamps and 2.5 per cent for tungsten units. Data from 158 iron and steel manufacturers were given showing that 93 per cent of these plants are retaining or increasing their flame-arc equipment. The author declared that from 60 to 120 hours' operation per trim have been reported by some organizations. Data were given comparing flame-arc, tungsten and gas-filled lamps as to unit energy consumption and maintenance charges. For producing equivalent illuminations these lamps require energy in the proportions of 1 to 2.5 to 1.75. The maintenance expense per year for one 540-watt flame-arc lamp is about \$10.13, while the corresponding expense for both tungsten and nitrogen-filled lamps giving equivalent illuminations is about \$18.60.

#### Discussion

Mr. G. H. Stickney, General Electric Company, declared that tungsten lamps are less affected by voltage variations than ever before. One of the chief advantages of tungsten lamps is that their rating for any purpose can be determined more accurately than if flame-arc lamps are used. Mr. C. E. Bedell, Wheeling Steel & Iron Works, declared that flame-arc lamps are undesirable for mill work, as they require too many adjustments. Mr. J. H. Reniers, Pittsburgh Screw & Bolt Company, suggested using quartz-tube mercury-vapor lamps as they are well adapted to mill work and in addition can be operated at a low cost. A written discussion by Mr. Frank H. Kittrege, Illinois Steel Company, read by Treasurer James Farrington, pointed out the lamps which are best adapted to give adequate illumination for detail work when suspended from high ceilings. A discussion of "Question Box" topics brought the convention proceedings to a close.



# Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods and Current Practice Among Successful Utilities

## Getting the Small Customer at South Bend, Ind.

Co-operating with the Excess Indicator Company, the Indiana & Michigan Electric Company, South Bend, Ind., has inaugurated a house-wiring and electric-lighting campaign among the smaller residential prospective customers in its city. South Bend, as the home of the factories making Oliver plows, Studebaker and Birdsall vehicles and Singer sewing machines, has a larger foreign element in its population than most American cities of its size. The total number of inhabitants is about 55,000, and about 33 per cent of that number are foreign laborers, who come mostly from Poland, Austria-Hungary and the Balkan States. The average wage of these people is probably not more than \$1.50 or \$1.75 a day, so that the cost of both wiring and electric service must be low to come within their means.

To interest these home owners and house renters in things electrical the central-station company is there-



TYPICAL HOUSES CANVASSED IN FACTORY DISTRICT

fore advertising a flat rate for energy and a reduced-price wiring schedule. The net rate for lighting is 1 cent a watt a month based on 66 per cent of the connected load. One hundred watts is the minimum allowable connected load per contract, and for the present the maximum connected load allowable under the terms of the flat-rate contract is 400 watts. The schedule of wiring prices is given in the accompanying table.

In dealing with such a foreign population an American solicitor who speaks only English sometimes has

SCHEDULE OF WIRING PRICES

Three outlets with drop cords, lamps and shades.....	\$9.00
Four outlets with drop cords, lamps and shades.....	10.00
Five outlets with drop cords, lamps and shades.....	11.50
Six outlets with drop cords, lamps and shades.....	13.00
Seven outlets with drop cords, lamps and shades.....	14.50
Additional outlets, each.....	1.50

trouble, and to avoid such difficulties the company has one Polish sales agent whose duty it is to solicit contracts from his countrymen, attend to the translations of advertisements for Polish papers, and help the other four salesmen with their troubles. The departure in employing the Polish solicitor Mr. William Darkwood,

new-business manager, thinks to be an excellent idea, for even though this man may prove not to be so good a salesman as some of his American confrères, he has a distinct advantage when meeting his countrymen, in speaking their language and appreciating their viewpoint. The most successful salesmen in any line, it is pointed out, are those who are able to appreciate the viewpoint of the prospective buyer and can present their arguments to appeal directly to him.

Of the success of the present campaign the men engaged in the work are confident, for last year a house-wiring campaign among residences of the better class resulted in wiring about 1000 houses. No flat-rate controllers were used in the former campaign, however, the main feature of that canvass lying in the very low wiring prices offered by the contractors, who were co-operating closely with the company as they are in the present campaign.

## Electrical Convenience at Chicago Baseball Park

At Comiskey Park, the home of the Chicago American League Baseball Club, a Hughes electric range and a refrigerator were installed in the early summer months so that Mr. Comiskey, his secretary and Miss McIlvaine, his private stenographer, could have lunch served at the ball park instead of journeying to a downtown hotel or restaurant. Four and sometimes five persons are served with lunch at the office every weekday and it is said that the arrangement is quite satisfactory.

The total connected load of the stove is 4.5 kw when all five heating units are operating at "high heat." In daily practice, however, only three units are used at any one time, and the period over which the range is in operation seldom exceeds forty-five minutes. With the stove connected to the general meter for the ball-park service, it is impossible to determine accurately the cost of operation, but 2 kw-hr. may be taken as a conservative estimate of the energy consumption. With the ball park receiving energy at a wholesale rate the stove is an inexpensive convenience.

## Economical Group Drive in St. Louis Factory

When the Wrought Iron Range Company, St. Louis, Mo., recently moved into its new building the problem of equipping the factory with motor drive was placed before the new-business department of the Union Electric Light & Power Company. A survey of the machines to be driven and the power requirements of each showed that the item of first cost for motors made the application of individual drive impracticable. Data in the accompanying table show how the machines in the various departments of this modern stove factory have been arranged so that each motor will at all times be operating at high load-factor and consequently high efficiency.

Heavy machines in the shearing department which on first sight appear formidable are being driven by 10-hp motors, large flywheels helping to take up the momentary peaks when the dies of the machines meet

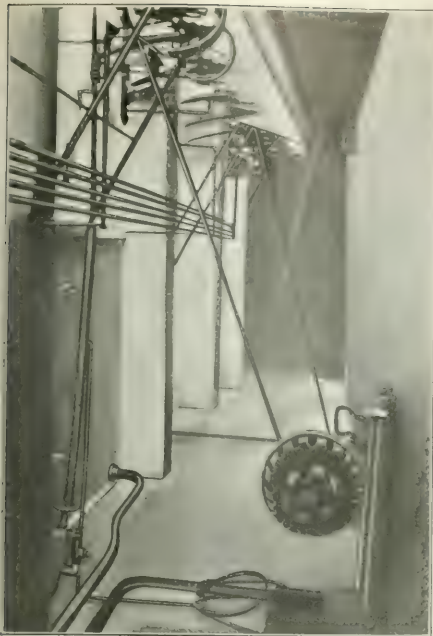


FIG. 1—50-HP MOTOR IN BASEMENT



FIG. 2—VIEW OF FIRST FLOOR, SHOWING SUSPENDED MOTOR

the work. By careful grouping of machines in other departments where loads are light motors ranging from 1 hp to 10 hp have been installed and are performing admirably. The largest motors of the entire installation are those employed in the grinding and polishing room and the buffing room. A view of one of these 50-hp motors, together with the line shafting in the basement beneath a polishing group, is shown in Fig. 1.

Wherever practicable motors driving machine groups have been placed on platforms of heavy timbers swung

## MOTOR APPLICATIONS TO GROUP DRIVE

Machinist shop	3.0
One 18-in. carpenter's lathe.	One medium hack saw.
One flexible shaft grinder.	One wall drill.
One 12-in. lathe.	One water grinder for shear blades.
One 26-in. shaper.	One double-head tool emery
One medium drill press.	
Shearing department	10.0
One 60-in. square shear.	One blanking press.
One 48-in. square shear.	One multiple punch.
One 110-in. square shear.	One punch.
One 40-in. square shear.	One double-head emery.
One bailing machine.	One wall drill.
Press department	5.0
Two 17-in. square shears.	One small punch.
Four punch presses.	One blanking press.
Forming department	3.0
One 72-in. brace.	One double-head grinder.
One punch.	One wall drill.
One 14-in. by 8-in. grindstone.	
Tin shop	5.0
One pipe machine.	One 24-in. by 6-in. grindstone.
One drill press.	One double-head emery.
One punch.	
One 46-in. roll for copper.	
Copper shop	5.0
One 20-in. lathe.	One roll.
One 40-in. lathe.	One punch.
One grindstone.	One hammer.
One double-head emery.	
Carpenter shop	3.0
Two saws.	One planer.
One grindstone.	One drill.
Stock mounting department	3.0
One emery.	One grindstone.
Shelf department	3.0
Three punches.	One drill.
One lathe.	
Tumbling department	10.0
Five polishing mills from 15 in. diameter to 24 in. by 18 in.	
Polishing group	50.0
Eleven lathes, double-head.	
Exhaust fan	25.0
Buffing group	50.0
Seven lathes, double-head.	
Exhaust fan	25.0
Electroplating department	15.0
Motor-generator sets	20.0
Pattern shop	1.0
One air compressor	15.0
Oven department	
One swing saw	1.0
One sand-blast machine	1.5
Total motor rating	203.5
Lighting	15.0
Total connected load	218.5

from the ceiling. A general view of a portion of the first floor of the factory showing one of these suspended motors is given in Fig. 2. In selecting the motors an attempt was made to secure machines operating at the same speed so that if future arrangements necessitate the changing of any department to increase its power requirements the condition may be met by an exchange of motors without altering the sizes of pulleys.

All motors operate at 230 volts, service being received through a pole-type transformer outside the factory where the pressure is stepped down from 2300 volts. Wiring to each motor is inclosed in iron-pipe conduit traversing the ceiling to each motor.



## Illumination and Wiring

### Standard Construction for Fire Alarm and Police Circuits

According to Mr. C. S. Downs, city electrician of Altoona, Pa., if it is necessary to place police and fire signaling wires upon electric-light poles, the electric-light wires should be strung upon standard ten-pin cross-arms instead of the average six-pin cross-arms, and should be placed on the top of the pole. Distribution from the electric-light wires should then be made from the ends of the arms directly to the tops of the buildings, instead of being strung at various angles from the poles, thus jeopardizing wires that may be beneath them. Mr. Downs suggested that the signaling wires be placed not less than 4 ft. below the electric-light wires, and where possible the spacing should be at least 6 ft. In his estimation, the telephone and telegraph wires should be placed below the city wires, because experience has shown that the chief trouble with fire-alarm and police signaling circuits has been because the lighter telephone and telegraph wires drop across electric-light wires and come in contact with the city wires. The mid position on the pole also avoids the necessity of having linemen climb over high-tension wires in order to work upon the signaling wires. In many cities the police and fire-alarm signaling circuits are carried on extensions to the top of the pole, while in other cities the fire and police circuits have the lowest position on the pole.

### Temporary Lighting of Roque Courts

To provide roque tournament enthusiasts with an opportunity to play and practise in the evening hours, the temporary lighting installation shown herewith was erected in Washington Park, Chicago, Ill. Inexpensive as is the entire equipment, it has given good service and is still used by local players. Eight posts in all are used to light two courts, each upright standard consisting of a 4-in. by 4-in. piece of timber, raising the lighting unit about 9 ft. above the ground. A 110-volt circuit carried on porcelain knobs from post to post sup-



ROQUE COURT IN WASHINGTON PARK, CHICAGO

plies energy for the 100-watt tungsten lamps inclosed in 12-in. Alba diffusing globes. The switch controlling this circuit has been placed in the locker room used by the players so that they can turn it on or off at will. The installation furnishes a good example of the way in which it has become possible to pursue not only outdoor work but also outdoor play after dark.

### Electric Corner Sign

One of the chief objections which owners of office buildings make to installations of projecting electric displays is that the signs mar the architectural beauty of the buildings. As indicating how such arguments can be met, provided that corner space is available, the accompanying illustration of a curved sign in St. Louis



NIGHT PICTURE OF CURVED SIGN

is of interest. Aside from the slightly appearance which this type of construction lends to electric signs, it enables the sign companies to erect large display signs and yet comply with the terms of the strict electric-sign ordinance in St. Louis. This city has placed a very narrow limit on signs extending over sidewalks, and it is, therefore, almost impossible to install a heavy sign of the straight-line variety over the walks. On account of this fact sign users as a rule are obliged to rent space on roofs of buildings or buy curved signs.

## RECENT TELEPHONE PATENTS

### Visual Call Systems

Under this heading falls an arrangement for private systems patented by Mr. J. Meyerhoff, of Chicago. At the central switchboard is a bank of lamps divided into three groups. The left-hand vertical row designates the calling stations, the horizontal row following each of these represents the stations to be called, and the right-hand vertical row is an answering signal for the various lines. The stations are called by individual push switches. When any switch is depressed it is locked magnetically. The left-hand lamp shows the operator who is calling, and the lamp glowing in the corresponding horizontal row shows the wanted station. When connection is established the right-hand lamp shows the response.

Mr. J. Hergesheimer, of Glenside, Pa., has devised another type of visual call. His is a multiple-call system arranged to arrest the attention of the desired party in whatever part of the premises he may be. The

names are arranged upon dials with pointers. The calling device includes a solenoid, a plug board and a circuit-closing plug. The plug board has a vertical row of holes, one name being opposite each hole. When a desired name is selected and the plug inserted the circuit of the solenoid is closed and its core is slowly drawn in until the plug strikes a stop connected to it. Simultaneously the core has dragged a brush over a series of contact points spaced to correspond to the plug holes, and the resultant current impulses have through stepping magnets driven the pointers of the various dials around to the desired name.

#### Arm to Support Receiver

Mr. S. Dussak, of Seanor, Pa., has obtained a patent for a receiver-supporting arm. This consists of the usual linkage with a holding clamp on one end and a mounting plate upon the other. The receiver may be returned to its normal position to depress the hook when not in use.

## Letters to the Editors

### The California Rules on Inductive Interference

*To the Editors of the Electrical World:*

SIRS:—In the summary of the rules issued by the California Railroad Commission in its general order No. 39, given in your issue of Sept. 5, there are certain requirements which, in the writer's opinion, should not be made mandatory, and which, to say the least, are open to discussion by the engineering profession before any fixed rules can be promulgated.

Under the head of "Minimum Horizontal Separation," it is required that the distance between a power line and a telephone or similar line shall not be less than the height of the taller line. As the writer has pointed out previously, such a requirement practically prohibits the construction of power lines on trolley or railroad rights-of-way, as the ordinary right-of-way is not sufficiently wide to permit, under this rule, a communication line on one side of the track and a power line on the other.

The installation of power lines on railway or railroad rights-of-way is, in the opinion of many engineers, an entirely proper proceeding, and, provided that unreasonable inductive troubles can be avoided, it would seem that the previous occupancy of such land by the communication line should not prevent the installation of a power line on the opposite side of the tracks. As a matter of fact, the requirement that the separation should not be less than the height of the taller supports provides only an imaginary safety, as this requirement might prevent the structures of one line falling upon the other line, but would not prevent contact from falling wires. Further, in cases where the tracks are at a higher elevation than the ground at either side, the requirement in question is of no apparent benefit other than to provide a certain actual separation between the lines.

The further requirement under the above heading that the power line throughout the entire parallel section shall be constructed in accordance with the crossing specifications of the National Electric Light Association is, in the writer's opinion, unreasonable. The specifications in question were prepared for crossings, and only for crossings, and there are a number of first-class types of construction which are not made to conform to the crossing specifications for long lengths, and cannot be without involving a prohibitive expenditure. It would seem that the alternative of cabling the communication line is at least worthy of mention.

The possible requirement of transpositions as frequent as one-sixth of a mile may be justified by the actual facts, though the writer ventures to suggest that such facts have not received any undue publicity.

In conclusion, it would seem somewhat undesirable to issue rigid mandatory specifications in advance of the consideration of the subject by the national joint overhead committee.

New York, N. Y.

R. D. COOMBS.

### Regulation of Wireless

*To the Editors of the Electrical World:*

SIRS:—The nice questions of neutrality involved in the status of wireless communication at the present time point to the necessity of more definite legislation on the subject. Nobody wants to interfere with the legitimate use of wireless for pacific purposes, but it is little short of scandalous that there should even be the slightest question about the unrighteousness of an individual or company, for private gain, imperiling the neutrality of the country at a time when every necessity exists for maintaining in the most conscientious way a completely neutral position. Whatever one's sympathies may be in the present struggle, he must recognize the utter impropriety of wireless communication with vessels of a belligerent prowling off the coast and desiring communication merely for the purpose of facilitating its warlike operations in one way or another. The most flagrant recent case was that of improper communication with a British warship, and while the sympathies of many Americans have been turned against the Germans on account of their cynical and deliberate violation of the neutrality of Belgium and their policy of ferocious terrorism after invading it, yet it must be remembered that Germany is technically a friendly nation and we owe it to the German people not to provide their enemies with any facilities in belligerency that we should feel compelled to deny to their own cruisers, however little we may enjoy having them operate along our seaboard.

That, thus involving a clear issue of national policy, there should have been even the possible semblance of appealing to the courts to defy the policy of level-handed neutrality sought to be enforced by the Executive is little short of outrageous, and although the ruling of the Attorney-General has probably put an effective end to further opposition, it is clear that there ought to be such definite legislation, giving such complete authority over wireless, and, in fact, over all channels whereby neutrality may be violated, as shall make it a perfectly easy and straightforward matter in the future to proclaim neutrality and enforce it without any opportunity for legal quibbles.

It is apparent that the authority of the Executive is actually sufficient to meet most exigencies, yet there should be for the proper defence of the country legislation so definite in its specifications of crimes against neutrality as to leave no loophole for escape. This country has been far too lenient in this matter and in the questions of espionage. Struggles like the present one show the importance of stricter rulings all around. In default of thoroughgoing legislation it is certainly the duty of every patriotic American to see that he does nothing which may cause friction with foreign governments or in any way imperil the position of his country as a power to which belligerents can turn with the certainty of getting fair play. We all have to suffer in one way or another from the titanic struggle now going on, and it is a part of decent citizenship to face the issue squarely and uncompromisingly.

Boston, Mass.

BARRETT LEE.



# Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

## Engine-Room Floors Should Be Kept Dry

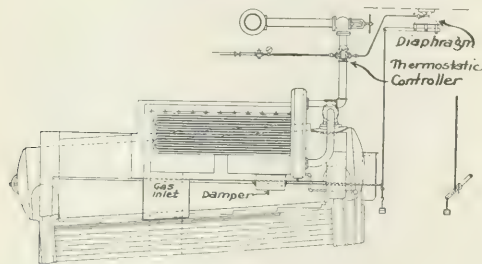
Around engines, turbines, pumps and cylinder apparatus from which drippings may reach the floor it is necessary to provide some sort of floor drain to prevent water from collecting on the floor in unsightly puddles.

Attendants will take much better care of apparatus when the surroundings are clean and can be kept so than when the floors are wet and disagreeable.

As a matter of safety, the floor around any piece of apparatus should be maintained in a dry condition, particularly if such apparatus is of an electrical nature.

## Temperature Regulator to Maintain Constant Superheat Temperature

By controlling the amount of hot gases which flow past a steam superheater with a temperature regulator installed in the boiler header the temperature of the steam may be maintained constant at all loads. In the Heine boiler this has been accomplished by inclosing the superheaters in firebrick chambers through which only a portion of the furnace gases are allowed to pass on their way to the smokestack. In the outlet to the chamber is a damper the position of which is determined by a temperature regulator. The regulator consists of two principal parts—a diaphragm lever actuated by compressed air and a thermostatic controller which admits air to the diaphragm in accordance with the temperature of the steam. The diaphragm is suspended from a convenient beam where it will be in line with the damper rod. The thermostat, which is placed in the outlet of the superheater, consists of two tubes, one of which changes considerably in length when heated. The change in the relative length of these tubes causes



ARRANGEMENT OF AUTOMATIC TEMPERATURE REGULATOR WITH SUPERHEATER

a ball valve to open a corresponding amount, admitting compressed air to the diaphragm. This apparatus is said to be very sensitive to changes in the temperature of the steam. It is declared that the diaphragm lever will act almost instantly if the furnace gases are chilled by opening a door or if steam is drawn from the superheater so fast that the gases can not heat it. One of the chief advantages of the temperature regulator is that

the degree of superheat may be changed at any time within limited amounts without having to install a new superheater.

## Alarm Bell Indicating Discharges Through Electrolytic Lightning Arresters

An alarm system for indicating when discharges take place through electrolytic lightning arresters is shown in the accompanying diagram. It consists of

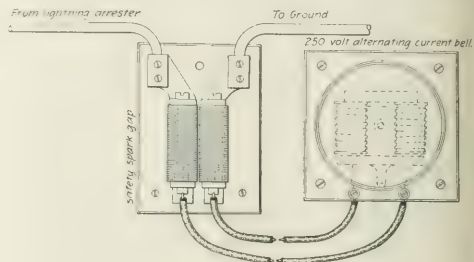


DIAGRAM OF ALARM BELL FOR LIGHTNING ARRESTER

an alternating-current bell shunted across a narrow gap in the circuit leading from the arresters to ground. A 250-volt alternating-current bell and an ordinary safety spark-gap capable of carrying the discharge current are employed. The gap discharge surfaces are placed very close together and wires run from the terminals of the device to the bell, which may be installed in the operating room where it can be heard by the station attendant. Apparatus connected as described is being used satisfactorily on 25,000-volt circuits by the Montreal (Quebec) Light, Heat & Power Company.

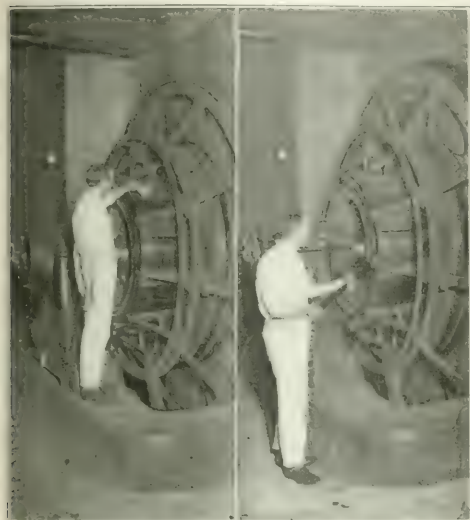
## Effect of Superheated Steam on Cast-Iron Fittings

Gray cast-iron fittings show a tendency to crack and increase in size when employed on superheated or high-pressure steam systems. The cracks, although hair-like at first, frequently widen, allowing enough steam to escape to make their presence noticeable. Fittings containing cracks may be weakened to such an extent that they will burst under working pressure. The permanent stretch in cast-iron fittings may also become a source of annoyance as it has been observed to be as much as 2.5 per cent of the linear dimensions.

A high grade of cast iron may be employed satisfactorily for fittings having an internal diameter of less than 4 in., but for larger sizes mild cast steel is the best material. To prevent cracks, which usually develop in the flanges in or near the fillets, the fittings should be provided with long tapering fillets. Semi-steel, or "gun iron," will also give satisfaction if its composition approaches that of mild steel. What has been said of pipe fittings also applies to valve bodies and all other fittings exposed to the action of superheated steam.

### Dangerous Habit Prevailing in Generating Stations

Engineers and wipers in many generating stations throughout the country have the dangerous habit of standing on the iron bases of generators, rotary converters, etc., while dusting or wiping the brush holders or commutator with a rag held in the bare hand. To educate plant employees regarding the safe way of performing such operations, the Rochester (N. Y.) Railway & Light Company has displayed photographs similar to those shown herewith in prominent places around its generating stations. Fig. 1 shows a man engaged in dusting the brush holders of a rotary converter in the wrong manner, while Fig. 2 represents him standing on the concrete floor wiping the commu-



FIGS. 1 AND 2—THE UNSAFE AND THE SAFE WAY TO WIPE A COMMUTATOR

tator with a swab on the end of a long dry stick. When it is necessary to stand on the iron base of any electrical apparatus to make repairs or adjustments during operation, rubber gloves should be used and a rubber mat should be employed to stand on.

### Drying Out Electrical Apparatus Which Has Been Submerged

Submerging of electrical apparatus owing to floods and other causes is not unusual in power-plant practice, and Mr. B. G. Lamme, of the Westinghouse Electric & Manufacturing Company, in a paper before the Association of Iron and Steel Electrical Engineers, gave some interesting information bearing on this subject. In some cases experience has shown that a flooded machine can be dried out with apparently no harmful after-effects, while in other cases it has been found almost hopeless to try to save the apparatus. This depends to some extent upon the kind and character of the insulation and the means for getting rid of the water without injuring the insulation itself. If water has percolated into the coil and becomes sealed or trapped inside, then high internal temperatures obtained by any means may simply vaporize the water without getting rid of it. If the insulation is porous, the water may be driven off readily. If the

drying heat is applied from the outside, then, before the center is heated sufficiently to vaporize the water, the outside insulating films may seal together under the higher outside temperature, so that the internal vapors cannot escape except by disrupting the film. If, on the other hand, heat is applied from the inside, by means of current for instance, and the heating is too rapid, vapor may be formed more rapidly than it can percolate through the insulation, and it may injure the insulation in escaping. Also, in the case of electrical heating, non-uniformity of temperature must be taken into account. For instance, the armature winding of a high-voltage alternator might be operated on a short-circuit for the purpose of drying out. The drying-out current may be so high that the center of the armature core is considerably above 100 deg. C. or the boiling point of water, while the end windings may be 30 per cent or 40 per cent cooler. In such case the water in the hot part of the coils is simply vaporized and driven to the end windings and there condensed. This is not an unusual condition in drying out high-voltage windings which contain moisture.

One instance may be cited where, several years ago, the power house of the Westinghouse Electric & Manufacturing Company was flooded for several days and several large 2200-volt turbo-generators were partly submerged. One of these machines was dried out on short-circuit for about a week at a temperature of possibly 120 deg. C. inside the coil. At the end of this time no leak to ground showed and the machine was put in service. A few weeks afterward a short-circuit occurred inside one of the coils, in the end winding. When dismantled this coil was found to be sopping wet in the end portion, although the buried part of the coil was fairly dry. The baking process had simply distilled the water from the center to the end parts. An examination of others of the submerged coils showed the same condition. It is possible that untaping of the end winding sufficiently to have allowed the escape of vapor would have caused this machine to dry out properly, but apparently this would not have been the case unless the end windings in themselves could have been brought up to a temperature considerably above 100 deg. C., and this might have meant 150 deg. C. in the buried portion. Such a temperature would probably have been injurious except to mica insulations, which did not happen to be on these machines. Furthermore, it is not always easy to get rid of moisture, even at 100 deg. C., with fibrous insulations. One very effective manner of doing so is by means of a vacuum. Experience has shown that if apparatus to be dried out is heated to the boiling point, in a vacuum, the moisture usually is removed very completely.

### Effect of Power-Factor on Steam Consumption

One turbine generator driven by steam is supplied with energy at 80 per cent power-factor. Would an increase of 15 per cent in the power-factor produced by floating an over-excited synchronous motor on the line reduce the steam consumption of the turbine?

A. R.

Increasing the power-factor at which energy is supplied will reduce the steam consumption of the turbine but slightly, as the only effect on the electrical system is to improve the regulation and reduce the resistance loss in the generator. If the synchronous motor is installed at the delivery end of the line, the resistance loss in the feeder will also be reduced for a given load. The amount by which the total steam consumption will be reduced will depend on the difference between the resistance loss eliminated and the power required to drive the synchronous motor.



# Digest of Current Electrical Literature

## Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

### Generators, Motors and Transformers

*Phase Advancers.*—REINHOLD RÜDENBERG.—The first part of a paper on phase advancers and their use in improving the power-factor of induction motors. The subjects discussed by the author are the use of phase advancers, their general principle of operation, construction and connections, regulation, reaction on motor and network, different constructions of phase advancers, and their calculation.—*Elek. Kraftbet. u. Bahnen*, Aug. 4, 1914.

*Diagrams of the Polyphase Commutator Motor.*—H. MEYER-DELIUS.—A continuation of his illustrated article on the theory of the polyphase commutator motor. The shunt-motor theory is explained, and the geometrical relations are developed showing this motor to be impracticable. The compound motor is then developed along lines similar to the series and shunt motors. The method of obtaining the characteristics graphically is demonstrated and the influence of the variable design constants of the motor is explained. The alternating-current, constant-speed motor diagram is developed and its similarity to the normal polyphase induction motor diagram is noted. The article concludes with an explanation of the various methods of speed control for this class of motor.—*Gen. Elec. Rev.*, August, 1914.

### Lamps and Lighting

*Electric Lamps for Use About Oil and Gas Wells.*—H. H. CLARK.—After pointing out the danger from electric lamps at oil and gas wells, the author describes tests made by the Bureau of Mines. Tungsten lamps were found to be far more dangerous than carbon lamps. The best incandescent lamp to use for lighting gaseous places is the 8-cp, 220-volt carbon-filament lamp, and the safety of this lamp can be largely increased by using bulbs that are constructed without a tip. The electric wiring used in connection with the lighting of gaseous places should, within the limits of the region made dangerous by the presence of gas, be carried in iron-pipe conduit, and the fittings, such as switches, sockets and junction boxes, should be made to correspond. If it is necessary to install the switches where gas is liable to be present, the switch boxes should be made gas-tight. Additional safeguards around lamp bulbs, such as heavy glass outer globes and metallic guards outside the outer globes, provide a factor of safety that is highly desirable.—*Bureau of Mines Technical Paper 79, "Petroleum Technology 19"* (1914).

*Arc Lamp Under High Atmospheric Pressure.*—A note stating that Professor Lummer in Breslau has succeeded in operating arc lamps under high atmospheric pressure, whereby the temperature of the crater is much increased. At 20 atmospheres absolute pressure the brightness of the lamp increases to eighteen times the value at atmospheric pressure. From this fact the temperature is calculated to be 7500 Centigrade deg. absolute, while the temperature of the arc under atmospheric pressure is 4200 deg. absolute and the temperature of the sun is estimated at 6000 deg. absolute. If a commercial lamp could be developed on this basis, it would represent a great advance over all improvements in lamps made recently.—*Elek. Zeit.*, Aug. 6, 1914.

*Search-Lamp.*—W. WEDDING.—An illustrated article on the Beck search-lamp, which already has been described in detail in the *Electrical World*. The results of some tests are given.—*Elek. Zeit.*, Aug. 6, 1914.

### Generation, Transmission and Distribution

*Protection Against Dangerous Rises of Voltage.*—R. KUHLMANN.—A long memoir prepared for the commission of the Swiss Electrical Society on the protection against dangerous rises of voltage. The object of the author is to discuss the subject broadly from the standpoint both of theory and practice. He refers to a former paper of his in which he had already called attention to the protective value of condensers. The present paper also endeavors to emphasize the great importance of the protection of a network which can be obtained by a high static capacity per unit of length. The author does not recommend protection by condensers only, but proposes to combine condensers with a cable before each machine. These cables must have a higher capacity than the network conductors. Choke coils should be used as far as possible in the busbars only. They should be used shunted by resistors, and when used in connection with the release coils of direct-acting oil switches they should be shunted by fuses. The general conclusions as to the principles of operation and the effectiveness of the various types of protective devices are summed up by the author at the end of his paper in form of thirty-two theses.—*Bull. Schweiz. Elek. Ver.*, 1914, No. 4; in abstract in *Elek. Kraft. u. Bahnen*, Aug. 4, 1914.

*Synchronous Boosters in Transmission Lines.*—LEE HAGOOD.—An analysis of the application of synchronous boosters to transmission lines. When a synchronous booster is driven by a synchronous condenser an ideal method is secured for deriving flexible voltage for a distribution point on a transmission system. Such voltage is independent of the system's voltage and yet does not involve the local synchronous machines in operating at undesirable power-factors, since the insertion of the booster effects a means of securing only such power-factors in the transmission line itself as are desired to meet the operating conditions.—*Gen. Elec. Rev.*, August, 1914.

*Electric Power in Metallurgical Works.*—HUBERT HERMANN.—An illustrated article on the use of electric motors for driving various machines in steel plants and other metallurgical works.—*Elek. u. Masch. (Vienna)*, Aug. 2, 1914.

### Traction

*Single-Phase Traction in France.*—An illustrated article on the single-phase traction roads in the Haute-Vienne district in France. There are four roads running radially from Limoges with an aggregate track length of 345 km (276 miles). The single-phase system at 10,000 volts and twenty-five cycles is used. There are considerable grades and curves along the roads. Energy is supplied from a water-power station at Eymoutiers. The single-phase system was selected because if the total network of 350 km had been operated with direct current at 1500 volts, eight substations and a trolley-wire section of  $2 \times 8$  square mm would have

been necessary. The cost of the electrical equipment, including three-phase feeder lines, would have been higher by 35 per cent for the direct-current system than for the single-phase system. Within the cities the voltage on the trolley wires is 600. The change on the motor cars from 10,000 volts to 600 volts is automatic.—*Elek. Zeit.*, July 30, 1914.

**Hungarian Interurban Railway.**—ROBERT MILCH.—An illustrated article on the electrification of the Arad-Hegyalja Railroad in Hungary, which has a length of 71 km (43 miles) with many grades and curves. Originally gasoline-electric motor cars were used, but these proved unsuccessful, partly on account of the difficult local conditions of the road and partly because at that time the gasoline-electric equipments were still in the first stages of development. It was therefore decided to electrify the road, the direct-current system at 1650 volts being used. Energy is bought from the Arad power plant as three-phase currents at 15,000 volts, which are transformed to direct current in a substation at Györök. Each motor car is equipped with four 50-hp interpole motors. Two motors are always connected in series, the voltage at the terminals of each motor being 825. The system has proved very successful.—*Elek. Kraft. u. Bahnen*, July 14, 1914.

**German Interurban Railway.**—LÖWIT.—A long illustrated article on the Rhein-Haardt Railway from Mannheim-Ludwigshafen to the bathing resort of Dürkheim. The direct-current system is used at 1200 volts, but in towns the voltage of 550 is used. Each car has two interpole motors. Energy is brought from the power plant in Mannheim in form of three-phase currents and transformed to direct current in a converter station with a storage battery.—*Elek. Kraft. u. Bahnen*, July 24, 1914.

**French Single-Phase System.**—In southern France in the Belfort district a light railway system of 70 km (42 miles) length has been installed on the single-phase system. Energy is being bought from a steam power plant.—*Elek. Kraft. u. Bahnen*, July 14, 1914.

#### Installations, Systems and Appliances

**German Central Stations.**—GEORG DETTMAR.—An article giving further statistical data on the status of German central stations on April 1, 1913. In the original statistics no information was available concerning the equipment of quite a number of stations. These missing figures have now been supplemented from esti-

TABLE I—NUMBER OF STATIONS

Year	OWNED BY PRIVATE PARTIES		OWNED BY MUNICIPALITIES OR BY THE STATE		Unchanged
	Number	Percentage	Number	Percentage	
1907	501	33	1025	67	4
1909	1328	67	632	32	18
1911	1745	69	729	29	56
1913	2833	70	1012	25	195

mates based on average values for cities of different sizes. According to these corrected figures, the number of incandescent lamps was 29,000,000, the aggregate rating of stationary motors connected to central stations 1,900,000 kw, the rating of the central stations 2,350,000 kw, the number of kilowatt-hours sold in 1913 4,336,000,000. Table I shows how in the course of the last years the sentiment has grown in favor of privately owned stations against municipal stations or stations owned by the state. Table II shows how the number of towns supplied with electricity in Germany

has increased from year to year, two or more towns being often supplied from one station. Table III shows the number of stations which generate their own electricity and those which buy their power in bulk from other stations. For lighting, forty-two different volt-

TABLE II—GROWTH OF TERRITORY

Year	Number of Towns Supplied with Electricity	Increase	Percentage
1906	2,160		
1907	3,330	1170	54
1909	4,000	1306	39
1911	10,100	5814	125
1913	17,500	7050	68

ages are in use in German central stations. The most usual ones are 110 volts (in 737 stations), 120 volts (in 247 stations) and 220 volts (in 1443 stations). For power purposes fifty-six different voltages are in use. The most usual ones are 110 volts (in 301 stations), 220 volts (in 1372 stations), 380 volts (in 181 stations) and 440 volts (in 347 stations). In transmission sys-

TABLE III—FURTHER DATA

	1909	1912	1913
Total number of stations	1478	2200	1940
Stations which buy all their energy from other power plants	47	194	1225
Stations which generate their energy in whole or in part	1931	2302	2817

tems seventy-nine different voltages of transmission are in use, varying from 1000 volts to 110,000 volts. The most usual transmission voltages are 3000 volts (in 156 systems), 5000 volts (in 159 systems) and 10,000 volts (in 134 systems).—*Elek. Zeit.*, Aug. 6, 1914.

**Electrification of Manufacturing Plants.**—F. P. JONES, JR., AND F. B. SULLIVAN.—A detailed description of the sources of power and the means of energy distribution which has been adopted by the J. G. Brill Company in the electrification of its plant manufacturing cars. The electrical installation is very flexible to meet the varying conditions of daily load and capable of systematic growth in keeping with the increased demands in production. The author gives ratings and other electrical dimensions of the various units composing the system, diagrams of the relative location of the parts of the equipment, wiring diagrams of the connections between the pieces of apparatus, and photographs of interesting parts of the installation.—*Gen. Elec. Rev.*, September, 1914.

**Synchronous Motors for Power-Factor Correction.**—G. H. EARDLEY-WILMOT.—The author considers certain problems that arise in the use of synchronous motors for correcting power-factor—for example, the design of such motors so that they are capable of doing certain mechanical work as well as effecting phase correction. The advantages of rotary converters, as compared with synchronous motors, for railway work are shown, and curves are given illustrating the variation of power-factor with load in the case of a synchronous and rotary converter. In conclusion, the author describes briefly the Brown-Boveri regulator, designed for automatically controlling the field of a synchronous motor so that it varies in accordance with the power-factor of the system to which it is connected. Since the regulator has to operate in accordance with the angle of phase displacement, it is clear that the windings must be arranged in such a manner that the more the current lags



behind the emf the greater is the torque exerted by the armature of the regulator, thus varying the resistance in the exciter field, which alters the field, and hence the power-factor, of the synchronous motor. This is done by providing a split-field winding having both current and pressure coils. The poles are so connected that when the current and pressure are in phase the field system acts as if it were wound with a single-phase winding and no torque is exerted by the armature, the field resistance being such that the field of the synchronous motor is kept constant at the required value to produce unity power-factor. If the current of the system starts to lag behind the emf, the field system is split into two separate phases, torque is exerted by the armature of the regulator, and the exciter field

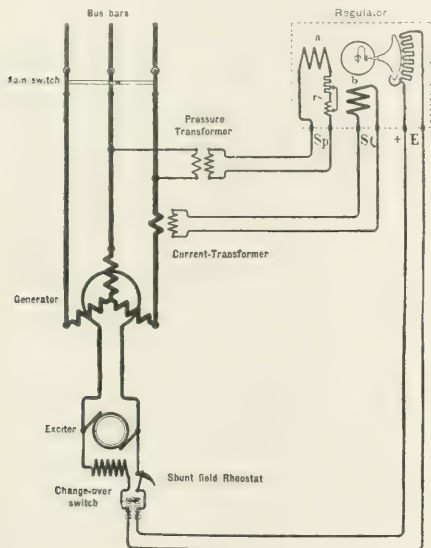


DIAGRAM OF AUTOMATIC-REGULATOR CONNECTIONS

resistance is cut in so that the field of the synchronous motor is strengthened, thus producing a leading power-factor which compensates for the lagging current of the system. Thus, as the power-factor of the system tends to decrease, the field of the synchronous motor is strengthened to such an extent that a leading power-factor is produced sufficiently low to correct the power-factor of the system to the predetermined value under all normal conditions.—*London Electrician*, Sept. 4, 1914.

#### Electrophysics and Magnetism

*New Paths of Physical Knowledge.*—MAX PLANCK. —His inaugural address as rector of Berlin University, giving a review of the apparently chaotic present conditions in theoretical physics. In the disputes which have been going on during recent years it is just the great physical principles which have held the field—such as the principle of the conservation of energy, the principle of the conservation of momentum, the principle of least action, and the chief laws of thermodynamics. On the other hand, the theorems which have succumbed in the fight are those on which theoretical developments were based tacitly, either because they seemed so self-evident that it was not, as a rule, considered necessary to mention them or because they were forgotten. Three of such theorems which have hitherto been used without any hesitation as self-evident

foundations of any theory, but which, in the light of new facts, have proved untenable or extremely doubtful, are the invariability of chemical atoms, the mutual independence of space and time, and the continuity of all dynamical effects. These three theorems are discussed in some detail.—*Philos. Mag.*, July, 1914.

#### Electrochemistry and Batteries

*Industrial Chemistry.*—L. H. BAEKELAND.—His lecture on "Some Aspects of Industrial Chemistry," with which the Chandler lectureship at Columbia University was inaugurated. The scope of the lecture is very broad. Of electrochemical problems, the fixation of atmospheric nitrogen and caustic soda and chlorine processes are discussed at some length.—*Met. and Chem. Eng'g*, September, 1914.

#### Units, Measurements and Instruments

*Comparing Inductance and Capacity.*—JOHN P. DALTON.—A description of a new method of comparison of an inductance with a capacity which has proved workable, convenient and satisfactory, and which determines a continuous balance for all frequencies.—*Philos. Mag.*, July, 1914.

#### Telegraphy, Telephony and Signals

*Telephone Progress in London.*—C. W. MUIRHEAD.—A statistical article on the development of the telephone system in London. The principal features are as follows: On March 31, 1914, there were 240,870 stations, a year ago 226,234 stations, so that there is an increase of 14,636. The increase compares with an increase of 14,731 for the preceding year over the 1912 figures. With adequate plant and consequent resumption of normal canvassing the rate of increase of 15,000 per annum could be very appreciably increased. Careful development study shows that the number of stations connected with the London telephone system in 1922 should nearly reach 500,000—that is to say, in eight years the system should double itself.—From the *Post Office Electrical Engineers' Journal*, in *London Electrician*, July 31, 1914.

## Book Review

LA TÉLÉGRAPHIE SANS FIL; LA TÉLÉPHONE SANS FIL; APPLICATIONS DIVERSES. By G. E. Petit and Léon Bouthillon. Paris: Librairie Ch. Delagrave. 244 pages, 184 illus. Paper cover. Price, 7.5 francs.

An elementary treatise on the theory and practice of radiotelegraphy and radiotelephony. It contains a good description of the apparatus employed in modern radiotelegraphy, particularly at French stations, such as the Eiffel Tower and Saintes-Maries de la Mer. The book is divided into three sections and chapters dealing respectively with the following subjects: Electric oscillations, detectors, propagation of electromagnetic waves, direct and indirect excitation, the problem of radiotelegraphy, technique, regulations, the present and future of radiotelegraphic applications, the problem of radiotelephony, the problem of radio-transmission of energy, unilateral-conduction detectors, the problem of the directing of waves, radiotelegraphic stations, reception of messages for transmission, state telegrams, service telegrams, counting of words, transmission of telegrams, delivery, special telegrams, service records, claims, ship stations, weather telegrams, accounting. A full presentation is given of the radiotelegraphic convention of London. The book will be of interest to students of radio-communication generally, and particularly to such as are desirous of becoming acquainted with French practice.

# New Apparatus and Appliances

## An Illustrated Descriptive Record of Recently Developed Manufactured Products of Interest to Electrical Readers

### Cover for Weatherproof and Sign Receptacles

The cover illustrated herewith is designed to protect sign receptacles and other outdoor fittings. The cover is said to be very compact, yet ample room is left for wiring. The connections to the terminal screws can be

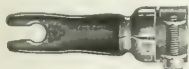


FIGS. 1 AND 2—COVER ATTACHED TO RECEPTACLE AND COVER ONLY

made before placing the receptacle in the fitting. The cover is held in place by four brass screws, and the screw holes are spaced for 1 13/16-in. centers. This cover is finished in black enamel. In Fig. 1 is shown a cover attached to a receptacle, and the cover only is shown in Fig. 2. This cover is being made by the V. V. Fittings Company, Philadelphia, Pa.

### Conduit Clamp

The conduit clamp shown herewith is designed for use with shallow wall cases. The clamp is small enough to enter the ordinary loom knockout and when lying flat on the bottom of the box takes up little room. The



CONDUIT CLAMP FOR WALL CASES

clamp can be easily fastened to the bottom of the box by pushing the jawed end under the head of one of the screws used in attaching the box to the wall. This clamp is being manufactured by the H. T. Paiste Company, Philadelphia, Pa., for which the Hart & Hege-man Manufacturing Company, Hartford, Conn., is sole selling agent.

### Electrolier Sockets

Various types of electrolier sockets with interchangeable shells are being manufactured by the Weber Electric Company, Schenectady, N. Y., for which Henry D.



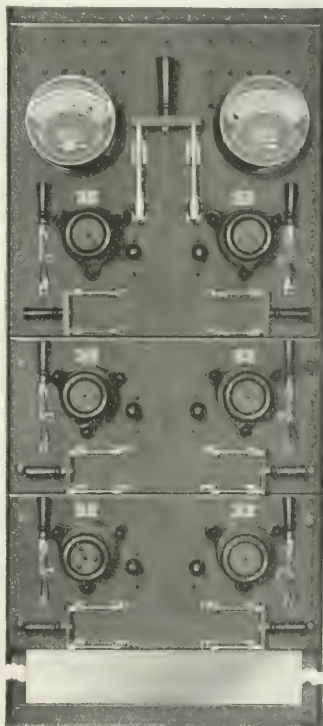
FIG. 1, 2, 3 AND 4—SOCKETS AND CAPS

Sears, 131 State Street, Boston, Mass., is general sales agent. The two parts of the shell are held together by eight projections coming in contact with a sharp metal ring inside the cap. Rotation of these two parts is pre-

vented by four projections on the shell coming in contact with openings in the ring placed inside the cap. There are no outside projections on these sockets. In Fig. 1 is shown a key socket of this type and in Fig. 2 a pull socket. In Fig. 3 is shown a 1/8-in. cap and in Fig. 4 a 1/4-in. cap.

### Battery-Charging Switchboard for Garage Service

A compact battery-charging switchboard for garage purposes is being placed on the market by the Allen-Bradley Company, Milwaukee, Wis. In the accompany-



BATTERY-CHARGING SWITCHBOARD

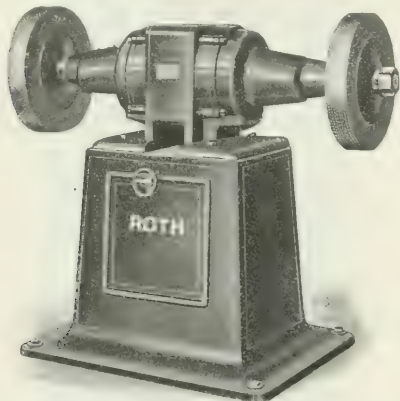
ing illustration is shown a battery-charging panel with six charging stations to which four more stations can be added without unduly increasing the height of the board. This panel is built up according to the unit system. The switchboard complete consists of one instrument panel and four rheostat panels. The instrument panel includes the main-line switch, a voltmeter and an ammeter, two battery-charging rheostats, the main distributing-fuse panel, the angle-iron frame and supports and the necessary switches, conductors, etc.



A unit rheostat panel includes two battery-charging rheostats and the necessary switches, fuses, etc., besides the proper screws for fastening the slate panel to the wrought-iron frame or support of the instrument panel. These switchboards are built in two sizes, one being rated at 60 amp and the other at 100 amp. The dimensions of the 60-amp board are 2 ft. by 7 ft. and those of the 100-amp board 3 ft. by 7 ft. The height of the operator's reach, however, is never above 5.5 ft. The battery-charging rheostats are of the graphite compression-resistance type.

### Electric Polishing and Grinding Machines

Various kinds of motor-driven grinding machines are being made by Roth Brothers & Company, Adams and Loomis Street, Chicago, Ill. The magnetic frames of the machines are of cast iron and steel and are provided with many ribs, which assist in keeping the motor cool. The poles can be easily removed to take out the field coils. Two small glass-covered peepholes are provided and also two hand-holes for getting at the brushes and commutator. The distance from the front



GRINDER OPERATED BY 7.5-HP ALTERNATING-CURRENT MOTOR

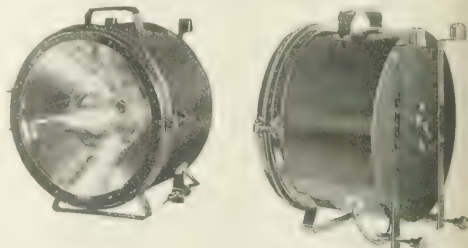
of the machine to the center of the shaft is very small, thus enabling the operator to work on long pieces with the flat face of the wheel. Excessive wear is, therefore, prevented, because it is not necessary to grind and polish with the corners of the wheel. In the accompanying illustration is shown one of these machines mounted on a cast-iron stand. A 7.5-hp alternating-current motor is used to operate this machine. These grinders and polishers are also designed for bench work, in which case no stand is provided.

### Interurban-Railway Headlamp

A headlamp designed for service on interurban electric railways has just been brought out by the Esterline Company, Indianapolis, Ind. Light from tungsten lamps with ratings up to 150 cp is reflected from a 12-in. parabolic mirror. The glass used in this reflector is colored so as to extract the blue and violet rays from the light, thereby, it is claimed, rendering it less blinding without seriously detracting from the illuminating qualities. The reflector is mounted in a heavy sheet-steel case which is finished inside and out in black baked enamel. The door is made of pressed

steel and is designed to fit tightly over a sealing ring, making the lamp dustproof and waterproof.

Focusing screws are provided so that the lamp can be adjusted without opening the door. The weight of the apparatus complete is 16 lb. The manufacturers assert that the motorman can distinguish with this lamp light-colored objects on the track at a distance of

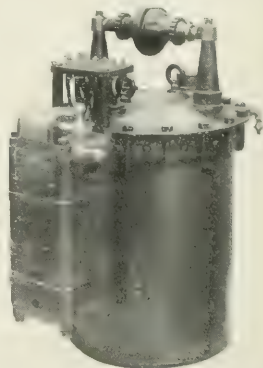


FIGS. 1 AND 2—HEADLAMP FOR ELECTRIC-RAILWAY SERVICE

1500 ft. and dark-colored objects at 900 ft. to 1000 ft. Fig. 1 shows a front view of this lamp and Fig. 2 a side and back view.

### Oil-Testing Set

With high-voltage oil-insulated apparatus it is necessary to maintain the dielectric strength of the oil at a maximum value in order to insure successful operation. An oil-testing set recently developed consists of a transformer with an induction regulator for voltage control and an oil spark-gap. The transformer is rated at 3 kva with a pressure of 30,000 volts, but may be operated at 10 per cent above this figure. The high-voltage winding is equipped with a voltmeter coil for indicating directly the test voltage. The induction regulator permits a variation of the test voltage from zero to maximum. The regulator as well as the transformer is arranged for series-parallel connection, making the set suitable for use on 100-volt or 200-volt circuits. A dial is attached to the top of the rotor shaft of the



SET FOR TESTING OIL UTILIZED WITH HIGH-VOLTAGE APPARATUS

regulator and is accurately graduated to give readings of the test voltage directly in kilovolts. The set may also be equipped with a small portable voltmeter for reading the test voltage.

The oil is tested between flat metal disks, which are placed inside the receptacle. One electrode is stationary, and the other has a micrometer adjustment with

an adjustable zero index. This permits taking up wear in the gap. By merely turning the receptacle about its horizontal axis, the oil which has been tested may be emptied, being caught by a depression and flowing away through a pipe. This oil-testing outfit is being manufactured by the General Electric Company, Schenectady, N. Y.

### Large Diesel Engine

In the accompanying illustration is shown one of two Diesel engines with ratings of 1250 hp at sea level built for Phelps, Dodge & Company for use in the central generating station of the Burro Mountain Copper



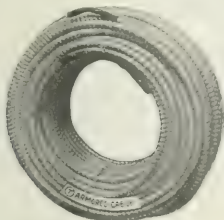
1250-HP DIESEL ENGINE

Company, Tyrone, N. M. These engines are of the two-stroke-cycle, five-cylinder type. At the right in the illustration is shown the scavenging air cylinder connected directly to the main crank-shaft.

The plant is at an elevation of 6700 ft., where the normal ratings of these engines will be 1000 hp each. One engine is now ready for operation, while the installation of the other is rapidly being completed. These units are the first large Diesel engines, it is declared, to be installed in this country. They were built by the Usines Carels Frères, Ghent, Belgium. Engines of the Carels type are now being built in this country by the Nordberg Manufacturing Company, Milwaukee, Wis.

### Armored Cable

A new and complete line of armored cable, flexible-steel conduit and armored cord is being made by the



COIL OF ARMORED CABLE

Trumbull Electric Manufacturing Company, Plainville, Conn. The cable is of the twin-conductor or three-conductor type. A coil of this "circle T" armored cable, as it is called, is shown in the accompanying illustration.

### Lamp-Cord Adjuster

The cord adjuster for drop lamps shown herewith can be inserted in place without removing the socket from the cord. It consists of a block of maple with a spring which grips the cord without friction. The device is enameled with a triple coat of rubber enamel. In inserting the cord in the holder the cord is placed straight across the throat of the device at one end, the

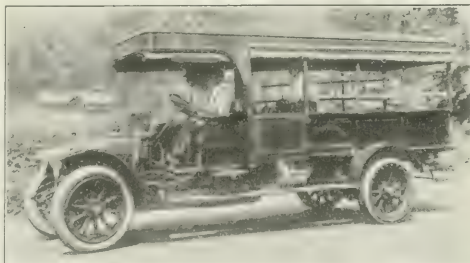


CORD ADJUSTER FOR DROP LAMPS

spring is depressed, and the cord is pulled lengthwise, when it slides in place at this end. To complete the operation a loop is formed across the throat of the holder at the other end, and the procedure described above is repeated. This cord adjuster is being made by the Gam Manufacturing Company, Lancaster, Pa.

### Truck Equipped with Wireless Outfit for Municipal Work

A motor truck which is used as a vehicle for transporting repair crews and supplies and contains a pumping and lighting outfit and a wireless set has been placed in service by the electrical commission of Baltimore, Md., for the maintenance of the municipal con-



MOTOR TRUCK WITH PUMPING, LIGHTING AND WIRELESS APPARATUS

duit system. The truck is equipped with hinged doors on each side and in the rear. Just behind the driver's seat is a centrifugal pump which is designed to pump water from manholes at the rate of 12,000 gal. per hour. A 4-hp marine engine is used to operate the pump. The

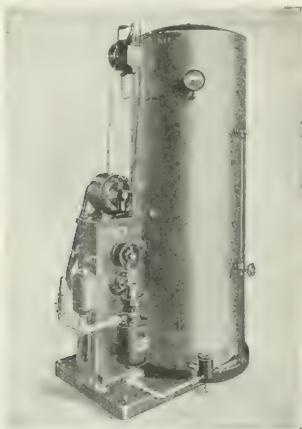


engine also drives a small generator which furnishes energy for ignition purposes and for illuminating the manholes.

A feature of this outfit is the wireless-telegraph equipment. The antenna is suspended immediately under the roof of the car and is of No. 14 stranded wire, 425 ft. long. A series of tests proved that excellent results can be obtained by means of a simple code of signals. This truck was built by the White Motor Company, Cleveland, Ohio.

### Electric House Pump

An electric pump for residence use is being made by the Fort Wayne Engineering & Manufacturing Company, Fort Wayne, Ind. As shown in the illustration, the pump, pressure tank and all accessories are mounted on a bedplate, thus forming a self-contained unit which requires merely a connection to the service pipes and



MOTOR-DRIVEN HOUSE PUMP

lighting circuit to be ready for operation. The pump is driven by a small Westinghouse motor which is mounted above the floor away from dirt and water, and is belted to a countershaft geared to the pump. The gears are inclosed within the cast-iron stand on which the pump and motor are mounted. Included with the outfit are an automatic priming device, which insures a supply of compressed air inside the tank, and an automatic pressure controller which keeps the pressure within the tank adjusted from 30 lb. minimum to 50 lb. maximum. These pumps are built in sizes rated at from 150 gal. per hour to 300 gal. per hour, with tanks of from 66 gal. to 220 gal. capacity.

### Removable Cover for Electric Conductors

A flexible electric conductor consisting of a figure-eight wire of steel with its lower lobe covered by a strip of copper has been brought out by the Electro Manufacturing Company, Brooklyn, N. Y. This conductor is designed particularly for trolleys, combining, as it does, a body of relatively high tensile strength and a cover of great conductivity. In case any portion of the copper ribbon forming the contact face is worn away, it can easily be replaced. The ends of the strips are either lapped over each other or a gap is maintained so as to allow for expansion and contraction.

### Thermo-Relay

The thermo-relay is a device for controlling electric circuits by means of the heating effect produced. Since it takes time to heat anything, the thermo-relay is similar to other time-limit relays except that the former takes into account what has gone before. For instance, if a motor has been running for some time and

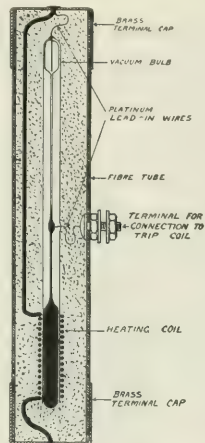


FIG. 1—SECTION THROUGH THERMO-RELAY

has already become hot, the thermo-relay will also be hot and its overload time-limit delay will be reduced accordingly. Similarly, it takes account of the temperature of the surrounding air, so that less overload is permitted in hot weather than in cold. This device is especially valuable with motors operating under fluctuating loads or with polyphase motors which have been inadvertently connected to only one phase of the system.

In the diagram in Fig. 1 is shown one form of the relay. It consists essentially of a contact-making thermometer having its bulb surrounded by a heating element in series with the line wire and the whole covered with heat-insulating material. The thermo-relay operates the trip coil of an automatic switch through an auxiliary circuit like any relay. The temperature-time characteristic may be varied to any desired extent by simply varying the degree of heat insulation. If the heating element is left bare and has a large surface ex-

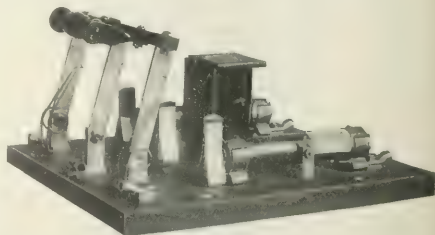


FIG. 2—THERMO-RELAY AND CIRCUIT-BREAKER

posed to radiation, it will reach a constant temperature quickly, and vice versa. In Fig. 2 is shown a thermo-relay and circuit-breaker.

The thermo-relay is being manufactured by the Baruch Electric Controller Corporation, 424 Thirteenth Street, Oakland, Cal.





# Industrial and Financial News

## Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

**Searchlamps for Europe.**—According to information received from Norway by the Foreign Trade Bureau of the Philadelphia Commercial Museums, the Norwegian government intends to install a number of searchlamps of the latest type on its warships and its coast defences. Holland is also reported to be contemplating the installation of searchlamps along her frontiers and seacoast.

**Electrical Equipment for Automobiles.**—The Crescent Motor Car Company, Cincinnati, Ohio, manufacturer of the "Ohio" car, has adopted the Westinghouse electric starting, lighting and ignition system for its cars. This equipment consists of a starting motor with gear reduction, Bendix screw shift and housings, a combination ignition and lighting generator, switches, voltmeters, fuses and fuse boxes.

**Electric Cooking Installation for High School.**—The School Board of Murray, Utah, recently let a contract for the complete electrical equipment of the domestic-science department of the new Hillcrest High School. This apparatus will consist of twenty-five Simplex 4.5-in. three-heat disk stoves equipped with a 1-pint saucepan and a 2-pint double boiler. The contract for this equipment was awarded to the Inter-Mountain Electric Company.

**Rutile for Titanium-Carbide Electrodes.**—A large part of the rutile produced in 1913, according to the United States Geological Survey, was used in the manufacture of titanium-carbide electrodes for arc lamps. A part of the ilmenite found in the deposits, which is separated by means of a magnetic separator, has also been employed in the manufacture of electrodes. The entire output of rutile in America for 1913 came from deposits near Roseland, Va.

**Central-Station Energy for Lead and Zinc Mines.**—During the past four years most of the isolated plants used in the operation of lead and zinc mines in the vicinity of Platteville, Wis., and Galena, Ill., have been abandoned and electric energy is now in most cases being purchased from the Consumers' Power Company at Galena. In December, 1910, the company's motor load was 2711 hp, and it has increased until now it is 5413 hp. The rating of the company's Galena plant is 4750 kw.

**Electrical Supply Jobbers Consolidate.**—In order to serve better and more economically the trade and territory tributary to Indianapolis and Evansville, Ind., the Varney Electrical Supply Company, Indianapolis, and the Service Electric Company, Evansville, have been consolidated and will hereafter be operated at both places as the Varney Electrical Supply Company. The branch at Evansville will be under the management of Mr. Harry A. Robertson, former president of the Service Electric Company.

**Order from London for Incandescent-Lamp Bulbs.**—The Libby's Glass Company, Sandusky, Ohio, has received an order from London, England, for 5,000,000 incandescent-lamp bulbs to be delivered in weekly shipments without the filaments. This order is believed to be a direct result of the effect of the present European war on the Belgian glass industry. It is the first of a number of such orders which the above company expects to receive on account of the paralysis of foreign industries brought about by the war.

**Ball-Bearing Company Enlarging Plant.**—As was stated in the *Electrical World* of Aug. 29, 1914, the Hess-Bright Manufacturing Company, Philadelphia, Pa., is building an addition to its plant to make up for the decreased supply coming from its factory in Berlin, Germany. A one-story building of saw-toothed construction, occupying a space 200 ft. by 300 ft., is being added to the Philadelphia establishment. The company is well stocked and will be able to take

care of all orders, it is declared, for some time to come. This company markets ball bearings in North America only.

**Shipment of Generators for Ford Power Plant Commences.**—The first car containing generator parts for the mammoth direct-current plant of the Ford Motor Company now being built in Detroit, Mich., left Ampere, N. J., last week. It will require about fifteen cars to transport all the material, which comprises four big units, each of a normal rating of 3750 kw and weighing 105 tons. The field frames are 21 ft. high and 26 ft. long at the supporting feet. The armatures are approximately 16 ft. in diameter and weigh about 87,000 lb. As these dimensions exceed the limits set by railroads for clearances on tracks, bridges and tunnels, the assembly of the armature parts and windings will be done in Detroit. These four generators were designed and built by the Crocker-Wheeler Company, Ampere, N. J.

**Electric Heating Company Makes Foreign Sales.**—Considerable optimism over the outlook for the electrical export trade is evident at the Chicago office of the Hot Point Electric Heating Company. Mr. H. A. Lewis, who is the sales manager for the Chicago and Eastern territory, stated recently that the company is looking at things in a different attitude now from that it took when the European war began. Orders have been received from the company's London office and also from countries in South America, indicating that the heating-appliance business is apparently still active in foreign centers. Mr. Lewis also stated that the company is doing everything possible to counteract the retrenchment movement which on purely psychological grounds seems to be affecting so largely portions of the business world.

**Foreign Company Readjusting Itself.**—The Siemens & Halske A. G. is reported to be gradually rearranging its affairs to conform with the extraordinary conditions brought about by the present European war. This company is one of the largest concerns in the world and over 80,000 employees are kept on its payrolls in normal times. Although the largest factories of this company are in Germany, it has manufacturing establishments in many other countries as well. Among these is a large plant near Barcelona, Spain, which, being in a neutral country, will be able to take care of much of the demand for the company's products from countries not in the war zone. It is said that 40 per cent of the male employees in Germany are serving in the army. The company is finding an outlet for its goods from Germany via Rotterdam, Holland. Products imported into this country by the Siemens & Halske company include various kinds of instruments, carbons and special electrical apparatus. Its main office in this country is at 90 West Street, New York.

**Elevators for Newspaper Offices.**—Quick, reliable service is one of the most essential requirements of a newspaper establishment. With this need in mind apparatus has been designed by the General Elevator Company, 29 Broadway, New York, to facilitate the removal of papers from the press room to the mailing room on a higher floor. The equipment built by this company for the New York *Sun* includes an elevator which by pressing a button can be sent up from the press room to the mailing room. At the latter place a foot pedal is provided for returning the car, since in removing the papers the attendant's hands are engaged and time would be lost if it was necessary to set the papers aside merely to touch a button. The General Elevator Company has also designed a balanced-car elevator for the Philadelphia *Enquirer*. In the establishment of this newspaper it is necessary to raise the papers to two different floors. For this purpose the balancing support can be lowered or raised, and one mailing depart-

ment can be served for a time and then the other. Mr. W. N. Dickinson, of the company, states that business in the United States is fair, while that with foreign countries is poor. Banking difficulties and financial stringencies, he declares, greatly hinder foreign trade, particularly that with South America.

**Incandescent-Lamp Industry in Canada.**—Canada has always imported a large number of incandescent lamps from continental Europe, but on account of the war the supply has been considerably curtailed. As a result the demand for lamps from Canadian manufacturers has increased. When the war began the plant of the Canadian Tungsten Lamp Company, Hamilton, Ontario, was shut down for the summer. Under ordinary conditions operations would not have been resumed until Sept. 15, but in view of the probability of an increased demand on account of the war the plant was reopened Aug. 15. Since that time the company has been in operation several nights a week to keep up with orders. Although the present output of the plant is 75 per cent greater than that under normal conditions, it is not sufficient to meet the increased demand. Recently three large orders, which normally would have kept the plant busy for three weeks, were refused because of the difficulty in filling orders already on hand. The plant of the Canadian Sunbeam Company, Toronto, Ontario, was reopened on July 28 after the usual thirty-day shut-down in the summer. This plant has been operated at full capacity since that time and plans are being made to double last year's output.

**Electrical Exhibits at Worcester Contractors' Convention.**—An excellent exhibit of wiring equipment and various electrical appliances was maintained at the Hotel Bancroft, Worcester, Mass., during the recent convention of the Electrical Contractors' Association of Massachusetts. Landers, Frary & Clark, New Britain, Conn., showed a new combination electric curling iron and hair drier and a number of other heating devices, including a percolator equipped with a fusible plug in series with the heating element, so that in the event of failing to cut off energy with the water out of the apparatus the circuit will be opened automatically and the heating element saved. This percolator was rated at 450 watts. The Holtzer-Cabot Electric Company, Brookline, Mass., exhibited a large assortment of telephone, fire-alarm and signaling apparatus, a new departure being a removable glass cover for an interior alarm box which greatly facilitates testing. The American Model & Instrument Company, Worcester, Mass., displayed a new combination fire alarm and factory official call system, a feature being the breaking of the circuit at each impulse at a platinum contact. The Worcester Electric Manufacturing Company showed a number of switches and meterboards, including a new combination push switch, fuse and panelboard adapted to high-class interior construction. Other exhibitors were the Pettingell-Andrews Company, Boston; the Stuart-Howland Company, Boston; the Bancroft Electric Company, Worcester, Mass.; the Westinghouse Electric & Manufacturing Company; E. R. Bryant, Boston; Albert Mann, Boston; the Condit Electric Manufacturing Company, Boston; S. B. Condit, Jr., Boston; the M. W. Dunton Company, Providence, R. I.; the Bryant Electric Company, Bridgeport, Conn.; the Crouse-Hinds Company, Syracuse, N. Y.; the Trumbull Electric Manufacturing Company, Plainville, Conn.; and the Culver-Stearns Manufacturing Company, Worcester, Mass.

## Corporate and Financial

**Bond Redemption.**—The Ithaca (N. Y.) Electric Light & Power Company has called for redemption Oct. 1, at 102 and interest, its first-mortgage 5 per cent sinking-fund gold bonds.

**Atlantic Gas & Electric Bankrupt.**—The Atlantic Gas & Electric Company, which was incorporated in April, 1912, under the laws of Connecticut, to acquire gas and electric properties, has filed a voluntary petition of bankruptcy in the United States District Court. Mr. Calvert Brewer, of the United States Mortgage & Trust Company, New York, has been appointed receiver by Justice Mayer.

**Public Utility Bonds Good Investment.**—Messrs. N. W. Halsey & Company, New York, have sent a letter to investors in which they "urge at this time the consideration of public utility bonds, because it has been repeatedly demonstrated that in periods of business disturbance the earnings of public service companies are less affected than are those of any other class of corporations. When people economize they curtail nearly all other expenditures before they reduce the amount they expend for such service as gas or electricity for lighting, gas for fuel and heating, intra-urban transportation as supplied by street railways, and other similar necessities."

**American Public Utilities Company Dividends.**—The board of directors of the American Public Utilities Company, Grand Rapids, Mich., declared the regular quarterly dividend of 1½ per cent on the preferred stock. The board, however, did not declare the usual quarterly dividend of three-quarters of 1 per cent on the common stock. The company had undertaken a large amount of constructive work at the beginning of the war, particularly in Indianapolis. The board was not certain that this work could be carried forward without using funds available for dividends. However, at the meeting of the board on Sept. 28 it was decided that not only could the work be completed but the preferred dividend could be paid as well. In view of the present financial depression it was thought wise not to declare the usual quarterly dividend on the common stock.

**Better Financial Indications.**—In a memorandum sent to brokers and investment dealers in connection with the financial situation caused by the war the New York banking firm of Messrs. H. L. Doherty & Company was of the opinion that financial conditions show indications of improvement. Not only has the changing character of the news from Europe contributed to the improvement in the situation, but preparations have been largely completed by bankers on both sides of the Atlantic to adjust commercial and financial affairs to the changed order. It was also stated that the prompt appreciation on the part of those in positions of leadership in finance and industry of the complexity of the problems to be solved has resulted in every possible provision to insure against any further disturbance of credits. It was further stated with respect to the dividend policy of the Cities Service Company that the conservative course of the board of directors has met with hearty approval in practically all quarters.

**Operations of the American Public Utilities Company.**—At the annual stockholders' meeting held in Grand Rapids, Mich., on Aug. 24 the directors of the American Public Utilities Company made an interesting report. It is admitted that the general depression which has affected all business throughout the country has been felt, yet cause for congratulation was found in the constructive results accomplished. While the growth of the underlying companies' business for the year has been retarded, the physical properties have been improved and a more efficient organization has been effected. The gross earnings of the company for the year ended June 30 last increased 8.14 per cent over the preceding twelve months, the operating expenses increasing 13.59 per cent and the net earnings from operation of subsidiary companies 1.59 per cent. The net income of the company for the year was \$974,696. After paying fixed charges of \$599,309, there was paid \$234,840 in dividends on preferred stock, a balance of \$140,547 remaining. The condensed balance sheet shows total assets of \$8,518,262, of which \$6,968,091 consists of stock and bonds owned. The item of cash and accounts receivable stands at \$808,904.

### NEW YORK METAL MARKET PRICES

	Sept. 22	Sept. 23
Open Lake	12.25 to 12.47 1/2	12.25 to 12.37 1/2
Open Lake	11.75 to 12.00	11.75 to 11.90
Copper wire base	13.25 to 13.37 1/2	13.25 to 13.30
Sheet zinc, f.o.b. smelter	10.00 to 10.00	10.00 to 10.00
Aluminum, 98 to 99 per cent	18.50 to 18.50	18.50 to 18.50

### COPPER EXPORTS

Total tons to Sept. 29, 1914, 16,308

†Nominal.

**NOTE.**—The New York Metal Exchange and the London Metal Exchange have been closed until further notice. No reliable quotations on old metals can be obtained for the present. There is no buying in this market.



**New Application for Receiver.**—An order has been issued by Chancellor Walker of New Jersey to show reasons on Oct. 6 why a receiver should not be appointed for the International Power Company.

**Time Limit Extended for Exchange of Baltimore Stock.**—The time limit for exchanging the preferred stock of the Consolidated Gas, Electric Light & Power Company of Baltimore, Md., for common stock of the company, share for share, in order to take advantage of the dividend on the common stock, payable Oct. 1, has expired. The offer of exchange, however, holds good until Dec. 19, and holders of the preferred stock who accept it will receive three months' dividend, amounting to  $1\frac{1}{2}$  per cent, on their stock and the regular quarterly dividend of  $1\frac{1}{4}$  per cent on the common, a total of  $3\frac{3}{4}$  per cent, instead of 3 per cent, should they elect to keep the preferred stock. It is stated that approximately \$1,000,000 preferred stock has been deposited for exchange from holders of this country, no returns having as yet been received from abroad, where a considerable amount of the stock is held. When the original offer to exchange was made, more than a year ago, the holders of \$1,221,498 availed themselves of the privilege, and the conversion of this amount reduced the outstanding preferred stock to \$5,138,654.

**United Gas & Electric Corporation Defers Dividend.**—At a meeting of the board of directors of the United Gas & Electric Corporation, New York, Sept. 17, a statement of earnings of the corporation for the twelve months ended June 30 was submitted, showing the earnings applicable for fixed charges and dividends to be \$1,206,075 and the interest on convertible 5 per cent notes \$313,200, leaving a balance available for dividends of \$892,875. The dividend on first preferred cumulative 6 per cent stock amounts to \$557,088. At the offices of the company the following statement was made: "The corporation has amply earned the current dividend on its first preferred 6 per cent stock, and on Oct. 1 will have in hand more cash than is required to pay the same. In view, however, of the unprecedented disturbance in financial conditions and the impossibility of foreseeing developments, the directors decided that the best interests of the corporation and its stockholders made the conservation of its cash resources advisable, and they therefore voted to defer action on the dividend. It is evident from the earnings statement that under other than present conditions there would have been no hesitation on the part of the directors in declaring the customary dividend."

**Philadelphia Company Declares Dividends.**—The Philadelphia (Pa.) Company has declared the regular semi-annual dividend of 3 per cent on the preferred stock and the regular quarterly dividend of  $1\frac{1}{4}$  per cent on the common stock, payable, the former in cash and the latter in scrip of the company, on Nov. 2 to stock of record Oct. 1. The scrip will be redeemable at the option of the company on or before May 1, 1916, and will bear interest until date of redemption at the rate of 7 per cent, payable semi-annually. Mr. M. B. Starring, president of the United Railways Investment Company, has sent a letter to stockholders containing the following announcement from the Philadelphia Company: "The earnings of the Philadelphia Company have, considering the disturbed conditions of general business, been satisfactory. The earnings of electric-light companies show a gratifying increase. The street-railway earnings are slightly less than last year. The earnings of the natural-gas companies, in view of the general industrial depression, have also been satisfactory. Because of these earnings the board of directors has declared the usual quarterly dividend of  $1\frac{1}{4}$  per cent upon the common stock, but owing to the unprecedented financial condition growing out of the European war the board deems it wise and for the best interest of the company to conserve in every way its cash resources, and has therefore made said quarterly dividend payable in scrip redeemable on or before eighteen months from Nov. 2, 1914, and bearing interest until date of redemption at the rate of 7 per cent per annum. The semi-annual dividend upon the 6 per cent cumulative preferred stock was declared, payable in cash. Until Dec. 31, 1914, the United Railways Investment Company offers stockholders the opportunity to purchase its portion of such scrip at par and interest.

## GAINS BY MIDDLE WEST UTILITIES

### Returns from Two-thirds of Electric Utility Industry of Central States Show a 15 Per Cent Growth in Income from Sale of Energy

The electric utility companies of the Central States are continuing to show a large growth rate. The accompanying figures are based on returns received by the *Electrical World* from over two-thirds of the central-station industry of the Central States—Illinois excepted. As yet but six companies in Illinois have regularly sent in monthly figures. These six companies represent about 10 per cent of the industry in Illinois. Their total income from the sale of energy in July, 1914, was \$235,480, as against \$216,392 in July, 1913. This was a growth of 8.7 per cent. The same companies in July, 1914, had an output of 11,306,267 kw-hr.,

TABLE I—COMPARATIVE FIGURES COVERING THE OPERATIONS OF 70 PER CENT OF THE CENTRAL-STATION INDUSTRY OF THE EAST NORTH CENTRAL STATES OF OHIO, MICHIGAN, INDIANA AND WISCONSIN (ILLINOIS EXCLUDED) FOR THE MONTHS OF MAY, JUNE AND JULY, 1913 AND 1914

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
May	\$1,895,130	\$1,713,766	10.6	93,815,971	86,001,868	9.1
June	1,776,809	1,592,880	11.5	90,248,607	81,626,045	10.6
July	1,821,029	1,699,163	7.3	94,192,229	85,167,825	10.6

and in July, 1913, the output was 9,151,403 kw-hr., or a growth of 23.6 per cent. The smallest company has a monthly income of between \$8,000 and \$9,000, and the largest company has an income of almost \$100,000.

Table I gives comparative figures for the remainder of the East North Central States for the three months of May, June and July. The companies there represented range in size from those having a monthly income of \$2,600 to those having a monthly income of almost \$500,000. Two companies showed small decreases for the month in income.

Table II gives comparative returns for May, June and July for the West North Central States, from which region the *Electrical World* is getting almost complete returns. The

TABLE II—COMPARATIVE FIGURES FOR MAY, JUNE AND JULY, 1913 AND 1914, SHOWING THE OPERATIONS OF 90 PER CENT OF THE CENTRAL-STATION INDUSTRY OF THE WEST NORTH CENTRAL STATES

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
May	\$778,029	\$683,432	23.0	76,302,296	55,015,511	38.7
June	754,935	610,224	23.6	71,864,644	53,909,090	33.3
July	749,597	676,788	10.9	75,463,726	66,525,278	13.4

great decrease in growth rate in July is accounted for by the fact that one very large company made very substantial gains in July, 1913, but in July, 1914, the business was practically the same as for previous months. One company showed a decrease in this group for July. The decrease amounted roughly to \$3,600. A small company in Kansas increased its monthly income from \$2,515 in July, 1913, to \$5,601 in July, 1914—over 100 per cent.

In the East South Central States, for which figures are given in Table III, two companies showed an income decrease, the total being approximately \$1,300, and one company showed a decrease in output of 10,000 kw-hr. One of the companies to show a decrease in income had made a reduction in domestic rates. The other companies, however,

did very well—in fact, much better than for June, as is shown by the table. The West South Central States kept up their remarkable growth. The country is growing and developing rapidly and the companies are keeping well abreast of the movement. Two of the smaller companies

TABLE III—JUNE AND JULY OPERATIONS OF THE CENTRAL-STATION COMPANIES IN THE EAST SOUTH CENTRAL STATES

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
Max. in per cent of industry	\$246,876	\$235,469	5.0	10,893,631	10,191,363	7.0
Avg. in per cent of industry	279,389	245,076	13.7	15,991,328	13,095,744	19.2

sending in returns showed a backward tendency, but one of no great consequence.

Table V shows the entire returns received by the *Electrical World* for the months of May, June and July for the Central States with the exception of Illinois. While the

TABLE IV—JUNE AND JULY OPERATIONS OF CENTRAL-STATION COMPANIES IN THE WEST SOUTH CENTRAL STATES

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
Max. in per cent of industry	\$574,410	\$499,097	13.0	19,843,957	14,246,882	39.3
Avg. in per cent of industry	591,552	518,169	14.2	20,952,906	15,784,865	32.8

figures are not strictly comparable, they should, however, serve as a basis for a certain amount of comparison. Almost the same volume of business is represented in each of the three months. There is a tendency for the income growth rate to increase and for the output growth rate to decrease.

TABLE V—RETURNS FOR MAY, JUNE AND JULY OPERATIONS FROM CENTRAL-STATION COMPANIES IN THE CENTRAL STATES (EXCLUDING ILLINOIS)

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
Max. in per cent of industry	\$3,200,553	\$2,841,685	12.7	202,611,026	162,363,929	24.8
Avg. in per cent of industry	3,914,836	3,459,497	13.2	217,920,183	182,406,207	19.4
Min. in per cent of industry	3,802,126	3,307,719	15.0	217,928,950	188,569,581	15.6

As a convenient way for showing the status of the companies in this section of the country, the companies, including holding companies, have been divided into six groups with respect to their monthly income from sale of energy. The first group includes companies whose monthly income is over \$100,000, the second those companies whose monthly income is between \$50,000 and \$100,000, the third

between \$25,000 and \$50,000, the fourth between \$10,000 and \$25,000, the fifth between \$5,000 and \$10,000, and the sixth those companies having a monthly income of less than \$5,000.

In the first group twelve companies are represented. Their total income for energy sales in July, 1913, was \$2,142,556, and in July, 1914, had grown to \$2,461,533, an increase of 15.7 per cent. The output of the same companies in July, 1913, was 129,165,683 kw-hr., and in July, 1914, was 151,401,405 kw-hr., an increase of 17.2 per cent. In the second group there are also twelve companies. Their total income for July, 1914, was \$904,944, as against \$801,378 in 1913, a growth of 13 per cent. The output grew 17.2 per cent from 46,895,693 kw-hr. to 50,954,697 kw-hr. In the third group there are ten companies, of which the total monthly income for July, 1914, was \$362,065, and for 1913 was \$338,915, an increase of 6.7 per cent. The output increased from 16,579,433 kw-hr. to 19,037,148 kw-hr., or 14.6 per cent. Twenty-one companies make up the fourth group. The total monthly income increased from \$284,179 to \$315,552, or 10.3 per cent, and their output grew from 8,990,038 kw-hr. to 11,328,311 kw-hr., or 26 per cent. In the fifth group thirteen companies are represented, with a total income in July, 1913, of \$84,123, and in 1914 of \$99,208, being a growth of 17.9 per cent. Their output increased from 2,939,808 kw-hr. to 3,900,480 kw-hr., or at the rate of 32.8 per cent. Only five companies having a monthly income of less than \$5,000 reported to the *Electrical World*. Their total income increased from \$16,967 to \$19,431, or 14.7 per cent, and their output increased from 779,300 kw-hr. to 884,357 kw-hr., or 13.5 per cent. It is thus seen that the companies having the best growth rate are those having a monthly income between \$5,000 and \$10,000, and those having the poorest growth rate are the ones whose monthly income is between \$25,000 and \$50,000.

## Business Notes

The American Conduit Manufacturing Company, Pittsburgh, Pa., has appointed E. H. Sutton in charge of territory in and adjacent to Philadelphia. H. Winder, formerly in charge of Eastern territory, has been transferred to Chicago.

The Electrical Supply Company, New Orleans, La., has moved into larger quarters at 326 Camp Street. Edward Jumonville is president of this company, T. T. Hirsch vice-president, T. Hirsch secretary, J. Jumonville treasurer, and L. Levy director.

The Holophane Works of the General Electric Company, Cleveland, Ohio, have established a selling district in the West, including Utah, Idaho, Wyoming, Montana, Colorado and New Mexico, and Spokane and El Paso. This district will be known as the intermountain territory, and J. O. Presbry will be in charge, with headquarters in Salt Lake City.

Charles E. Young and Henry W. Young have opened an office at 419 First National Bank Building, Chicago, to give technical advertising service. They aim to give personal service along technical lines in class-journal and other advertising. Mr. Charles E. Young was until recently advertising manager of the Ohio Brass Company, and Mr. Henry W. Young was for several years editor of *Popular Electricity*.

## New Industrial Companies

The Chicago Electric Sign Company, of Chicago, Ill., has been chartered with a capital stock of \$5,000 to manufacture and deal in electrical and other signs, chandeliers, supplies, etc. The incorporators are Clark C. Worthy, L. E. Smith and E. W. Worthy.

The National Electric & Auto Supply Company, of Peoria, Ill., has been incorporated by Ralph V. Miller, Theodore E. Bass and H. H. Moody. The company is capitalized at \$75,000 and proposes to manufacture and deal in electric, telephone, motor-boat, automobile and air-craft supplies, accessories and novelties.



**The Rex Revolving Light Company**, of Vine Grove, Ky., has been incorporated. The capital stock is \$15,000, divided into \$100 shares. The incorporators are W. D. Carter, Ulie Richardson and J. R. Davis.

**The Continental Electric Welding Company**, of New York, N. Y., has been incorporated with a capital stock of \$20,000 by H. L. J. Siemund, W. C. Steiger and H. Tessensohn, 29 Broadway, New York, N. Y.

**The Ray Manufacturing Company**, of Louisville, Ky., has been incorporated with a capital stock of \$20,000 to deal in power-station supplies. The incorporators are Frederick L. Ray, Edward F. Peter and C. Robert Peter.

## Trade Publications

**Shade Holders.**—A folder describing a screw shade holder has been issued by the Bryant Electric Company, Bridgeport, Conn.

**Tube Cleaners.**—The Roto Company, Hartford, Conn., has issued several bulletins describing its cleaners for boiler and condenser tubes.

**Steel Pulleys.**—The Fairbanks Company, Broome and Lafayette Streets, New York, has issued a booklet describing its split-steel pulleys.

**Cord Adjuster.**—A cord adjuster for drop lamps is described in a leaflet published by the Gam Manufacturing Company, Lancaster, Pa.

**Receptacle Covers.**—Covers for weatherproof and sign receptacles are the subject of a leaflet issued by the V. V. Fittings Company, Philadelphia, Pa.

**Generating Plant.**—A small generating plant is described and illustrated in several catalogs issued by the Fay & Bowen Engine Company, Geneva, N. Y.

**Small Generating Outfit.**—A generating outfit for small-plant operation is the subject of a catalog published by the Warner Lamp Company, Davenport, Ia.

**Stand-Lamp Fixture.**—An adjustable stand for reading lamps is the subject of a leaflet issued by the R. M. Millar Electric Works, 9 South Clinton Street, Chicago, Ill.

**Electric Buckets.**—Electrically operated clam-shell buckets are described and illustrated in Pamphlet No. 599 issued by the Hayward Company, 50 Church Street, New York.

**Wiring Devices.**—Pass & Seymour, Inc., Solvay, N. Y., have issued a pocket-sized catalog which is a photographic reproduction of its Catalog No. 22 concerning handy wiring devices.

**Electric Ironing Machines.**—In Folder R-2 of the Chicago Dryer Company, 624-630 South Wabash Avenue, Chicago, Sept. 1, are pointed out the advantages of the company's motor-driven ironer.

**Water Heaters and Switches.**—Electric water heaters and snap switches are described and illustrated in a catalog issued by the Geyser Electric Water Heater Company, 42 Hudson Street, New York.

**Air Drills and Pneumatic Hammers.**—Circular "V," recently issued by the Independent Pneumatic Tool Company, Chicago, describes, illustrates and gives specifications on the company's air drills and pneumatic hammers.

**Washing Machines and Vacuum Cleaners.**—The Western Electric Company, New York, has issued a mailing folder entitled "Profitable Electrical Merchandise," enumerating various dealers' helps for selling washing machines and vacuum cleaners.

**Electrically Operated Laundry Machines.**—Many types of driers, washers and ironers are illustrated and described in detail in a forty-eight-page catalog issued Sept. 1 by the Chicago Dryer Company, 624-630 South Wabash Avenue, Chicago. This large bulletin is known as Catalog 15. Booklet C1 of the same company contains similar information.

**Electric Apparatus.**—Electric drive for rubber calendars is the subject of Leaflet No. 3693, electrically heated glue pots and glue cookers of Folder No. 4293, electric drive for flour mills of Folder No. 4287, and motor-generator sets of Leaflet No. 3742, all of which have been issued by the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.

## Personal Mention

**Mr. K. Shiraki**, hydroelectric engineer associated with the Kinugawa Hydroelectric Company, which supplies power to the Tokyo (Japan) Municipal Railway, is visiting the United States to investigate steam-turbine plants.

**Mr. H. D. Winn** has resigned his position in the engineering and sales department of the Alabama Power Company, Montgomery, Ala., and has accepted a position as sales manager of the Birmingham Metal Products Company in Virginia.

**Mr. J. Gordon Lovelace** has resigned as manager of the Socorro Electric Light Company, Socorro, N. M., to take a similar position at Tyrone, N. M. Mr. Lovelace had been manager of the Socorro plant since its inauguration five years ago.

**Mr. L. S. Boggs** has resigned as general manager of the Macon Railway & Light Company, Macon, Ga. Mr. Boggs was formerly superintendent of electrical construction with the New York, New Haven & Hartford Railroad. He has long been connected with electric-railway work.

**Mr. H. P. Bradford** has been appointed local superintendent in Yalladega, Ala., for the Alabama Power Company. Mr. Bradford, although a native of America, has been in Europe for the past twenty years, connected with various transportation propositions and has been in this country only about two months. He was recently at Lille, France.

**Mr. W. D. Kerr**, who has acted as director of the Bureau of Public Service Economics since its organization, has resigned. Mr. Kerr resumed his law practice on Oct. 1 in Chicago. He will devote special attention to matters affecting the relations between public utilities and the public. He is also to lecture on transportation law in the Northwestern University School of Commerce. The activities of the bureau will not be interrupted, although some interval may elapse before the appointment of a new director.

**Mr. Walter Farrington Wells**, whom the Edison Association has chosen as its next president, is vice-president and general manager of the Edison Electric Illuminating Company of Brooklyn. Mr. Wells was born in Rahway, N. J.



W. F. WELLS

Jan. 10, 1870, and received his technical education at Rutgers College. He served the Brooklyn Edison Company as draftsman, foreman and assistant electrician up to June, 1894, when he was appointed electrical superintendent. Three years afterward he left the company to become assistant general manager of what was then the Manhattan Electric Light Company. This position he held until 1900, when the company was taken over by the New York Edison Company and Mr. Wells was made a district superintendent. When the Edison company made its first installation of rotary converters, etc., for 6600-volt transmission, Mr. Wells was placed in charge of the work, and he also co-operated in the preparation of the plans and superintended the installation of the electrical equipment of Waterside Station No. 1. When the station was completed Mr. Wells was appointed superintendent in general charge of its operation. Upon the death of E. A. Leslie, vice-president and general manager of the Edison Electric Illuminating Company of Brooklyn, the position of general superintendent was created, and Mr. Wells received the appointment. This position he held until a few years ago, when he was appointed acting general manager and finally general manager of the company as successor to Mr. W. W. Freeman. Mr. Wells has made many contributions to technical literature. He is a fellow of the American Institute of Electrical Engineers and a member of the National Electric Light Association and of numerous other bodies.

Mr. J. G. White, well-known consulting engineer of New York, has established three scholarships in the Spanish language at the Pennsylvania State College. He offered the prizes as a stimulus to the students to fit themselves for handling Latin-American trade.

Mr. O. R. Jones, the newly elected president of the Association of Iron & Steel Electrical Engineers, began his career in electrical work thirty-two years ago by installing an arc-lighting system in the plant of the Brown-Bonnell Company at Youngstown, Ohio. This was the first steel mill in the country to install the more modern method of lighting. Brush lamps were used by Mr. Jones. Following this he spent a few years in the West building bridges and doing other engineering work. On his return he joined the Youngstown Tube & Iron Company as electrician and did some excellent work in building up the mill. He was later with the Youngstown Gas & Electric Company and then became chief electrician of the municipal lighting plant at



O. R. JONES

Meadville, Pa. In 1901 he went with the Youngstown Sheet & Tube Company, Youngstown, Ohio, as chief electrician, a position which he occupies at present. Mr. Jones has been very active in the association work and was first vice-president of the organization in the past year.

Mr. William Eugene Keily, who has resigned as associate editor of the *Electrical World*, with headquarters at Chicago, to engage in independent literary work, has been in close touch with electrical progress, particularly in the North Central States, for the last twenty-three years, beginning with a department on "Electricity at the World's Fair" in the old *Western Electrician* of 1891 to 1893. Born in Utica, N. Y., June 4, 1865, and as a boy a student in the Syracuse (N. Y.) schools, young Keily early manifested a bent toward printing, newspaper work and the delights of literature. In 1880 he entered a printing office, becoming a compositor, and five years later, at the age of twenty, he secured a place as reporter on the *Post-Express* of Rochester.



W. E. KEILY

A reporter for that paper had been killed in a railroad accident, and young Keily, reading the account, applied for a place on the staff and got it. His first city editor was the late Dexter Marshall, afterward managing editor of the *Philadelphia Press* and later of the *McClure Newspaper Syndicate*, and always a staunch friend. In January, 1891, Mr. Keily and Mr. Samuel G. Blythe, the magazine writer and author, served as delegates from the Rochester Newspaper Guild to the International Press Club convention at Pittsburgh. Since 1891 Mr. Keily has been a resident of Chicago and engaged in electrical journalism, becoming a student of electrical development. He was made managing editor of the *Western Electrician* in 1899, when the late John B. O'Hara retired. In 1908 W. A. Kreidler, the principal owner of the paper, died; the paper was sold, and on Nov. 1 of that year Mr. Keily resigned. A short period of free-lance work followed, and on March 1, 1909, Mr. Keily became associate editor of the *Electrical World*—a position which he held until his resignation took effect Oct. 1. Mr. Keily's career as a journalist has been an active one, of much constructive help and value to the electrical industry. He has written articles and pamphlets, served on committees, reported meetings, drafted resolutions, described installations, prepared statistics, planned special issues, corresponded, conferred and negotiated with

authors, inventors and contributors, ransacked libraries, noted tendencies, celebrated anniversaries, contributed to books and reviewed books, made schemes of illustration and edited copy—all in the general line of electrical advancement. He was editor of the *Convention Daily* of the National Electric Light Association at the last five annual conventions of that body. He has also contributed to a number of non-electrical periodicals. Mr. Keily is an associate of the American Institute of Electrical Engineers, a member of the Illuminating Engineering Society, a Class E member of the National Electric Light Association and also a member of the Commercial Section of that body, member of the Jovian Order, Electric Vehicle Association of America, Electric Club of Chicago (of which he has served as a director and vice-president), Chicago Jovian League, National Geographic Society and the City Club of Chicago. On Saturday, Sept. 26, Mr. Keily was the guest of honor at a luncheon tendered him by President James H. McGraw and fourteen members of the Chicago staff of the McGraw Publishing Company. Appreciative addresses were made by the men, and an engrossed parchment memorial was presented to Mr. Keily testifying to the esteem in which he is held by his former associates and expressing their regret at his departure.

## Obituary

Frank Bear, superintendent of the Kutztown (Pa.) Electric Light Company, was instantly killed Sept. 24, in touching a live wire after a storm. He is survived by his widow and three children.

J. Frank Byrne, for a number of years cashier of the Commonwealth Edison Company, Chicago, died at his home in that city on Sept. 20 last.



J. F. BYRNE

Mr. Byrne was one of the older employees of the company in term of service. He was not only respected but was popular among the men in all departments, and his untimely death is deeply regretted. He was born on July 31, 1874, and entered the service of the Chicago Edison Company, predecessor of the Commonwealth Edison Company, in July, 1892. He was an office boy at first, but step by step he worked his way up until he became cashier of the present great organization. Mr. Byrne is survived by a widow and two children, who have the sympathy of his many firends.

Hugo Reisinger, art expert, connoisseur and merchant of New York, died at Langenschwalbach, Germany, Sept. 28. Mr. Reisinger was born at Langenschwalbach Jan. 29, 1856. He was graduated from the Royal Gymnasium at Weisbaden in 1875 and engaged in the general importation of merchandise in New York in 1890. In 1904 Mr. Reisinger was an honorary commissioner to Europe for the St. Louis Exposition, and when he went to Europe in April he was appointed honorary commissioner of the Anglo-American Exposition of London. Outside of the electrical profession, in which his firm was the largest importer of carbons in this country, Mr. Reisinger was best known as a patron of art. He was a director in the Linde Air Products Company, of New York and Buffalo, and the Owens European Bottle Machine Company, of Toledo, Ohio. He was elected an honorary fellow for life of the Metropolitan Museum of Art and vice-president of the Germanic Museum of Harvard and of the Germanistic Society here. Columbia conferred the degree of A. M. on him in 1910. He was Commander of the Order of the Prussian Crown, Commander Order of Merit, with the star of St. Michael, privy councillor to Prince Regent Ludwig of Bavaria, and a member of these clubs: Lotos, National Arts, German, Railroad, Garden City Golf, Englewood Country, Automobile Club of America, and the Imperial Automobile Club of Berlin. He leaves a widow and two sons.



## Construction

### New England

**BELLOWS FALLS, VT.**—The Fall Mountain El. Lt. & Pwr. Co., of Bellows Falls, is contemplating extending its lines to furnish electricity for lighting the streets of Litchfield and also for manufacturing purposes.

**BENNINGTON, VT.**—Extensive improvements are contemplated by the Lake Shaftsbury Corp., including the installation of an electric-light plant, pumping station, garage, pavilion, etc.

**AMESBURY, MASS.** The Amesbury El. Lt. Co. is extending its service to Salisbury Plains to furnish electricity for street-lighting and commercial purposes.

### Middle Atlantic

**ALBANY, N. Y.**—Bids will be received by Duncan W. Peck, superintendent of public works, Capitol, Albany, N. Y., until Oct. 20, for improving the Cayuga and Seneca Canal, including power plants, electrical equipment and machinery for operating and lighting docks as follows: Cayuga and Seneca Canal, Locks 1, 2, 3 and 4, under Contract M, Section 1. Plans and specifications, proposal blanks, form of contract and bonds required and other information may be obtained at the office of the superintendent of public works at Albany, at the office of the assistant superintendent of the public works for the western division at Rochester, and at the canal office, Spaulding's Exchange, Buffalo.

**EAST ROCKAWAY, N. Y.**—The Village Trustees have entered into a contract with the Queensborough Gas & El. Co., of Far Rockaway, for lighting the streets of the village. The contract calls for 117 40-watt tungsten lamps.

**FULTON, N. Y.**—Preliminary surveys have been completed by Eaton & Brownell, of Watertown, for another large hydroelectric power plant on the Oswego River, to be erected at the village of Fulton. The plant, of the Co.'s plant. The new building, it is said, will be located at the east end of the upper dam.

**MALONE, N. Y.**—The Malone Lt. & Pwr. Co. expects to install an ornamental street lighting system (about 3000 ft.) in the near future. The company would like to receive designs and estimates of costs on same. H. C. Wilder is secretary.

**NEW YORK, N. Y.**—Sealed bids will be received at the engineering architect's office, Washington, until Oct. 22, for a conduit and wiring system and lighting fixtures for the United States Appraisers' Warehouse, New York. Drawings may be obtained at the office of the Superintendent of Buildings, U. S. Customs House, New York, or from O. Wenderoth, Treasury Department, Washington, D. C.

**NEW YORK, N. Y.**—Bids will be received at the office of C. E. J. Snyder, superintendent of school buildings, Department of Education, corner of Park Avenue and Fifty-ninth Street, New York, until Oct. 5, for installing electric equipment in Public School 52, on Academy Street, between Broadway and Vermilyea Avenue, borough of Manhattan. Blank forms, plans and specifications may be obtained at the above office.

**NEW YORK, N. Y.**—Bids will be received by C. E. J. Snyder, superintendent of school buildings, Department of Education, corner of Park Avenue and Fifty-ninth Street, New York, until Oct. 5, for installing electric equipment in the addition to and alterations in Public School 21, on East 225th and 226th Streets, near White Plains Road, borough of the Bronx. Blank forms may be received at the above time and place for installing electric equipment in the addition to Public School 20, on Broadway, between Vreeland and Elizabeth Streets, Port Richmond, borough of Richmond. Blank forms, plans and specifications may be obtained at the above office, and also at the branch office, Borough Hall, New Brighton, borough of Richmond.

**PULASKI, N. Y.**—The work of rebuilding the system is rapidly progressing preliminary to receiving electricity from the Salmon River Pwr. Co. on Oct. 1. A substitution is to be erected on Full Street and a new system of street lighting will be inaugurated. In the business section of the town nitrogen-filled tungsten lamps of 500 cp will be substituted for the incandescent tungsten lamps now in use. A 24-hour service will soon be inaugurated here. H. Clayton

Burkett is superintendent of the Pulaski El. Lt. Co.

**SYRACUSE, N. Y.**—The Public Service Commission for the Second District has approved the franchise of the North Syracuse El. & Pwr. Co. for an extension of its lines into Cicero and Hastings, subject to any vested rights which may be possessed by F. J. Auburn under franchises given him in Hastings and Brewerton.

**TROY, N. Y.**—The ordinance authorizing the city to enter into a five-year contract with the Troy Gas Co. has been passed by the City Council. Under the terms of the new contract the present contract for lighting the streets and public buildings, which expires Oct. 1, 1915 is to be rescinded. The new contract provides for the installation of an ornamental lighting system in the business district.

**BROOKVILLE, PA.**—A boulevard system of light-transmission lines will be installed along the main streets of this place, it is said, by the Solar El. Co., which operates in this city and is making some extensive changes to its plant. George W. Heber is secretary and general manager.

**INTERCOURSE, PA.**—In Intercourse and Ronks there will be installed within the next thirty days 25 32-cp, 40-watt tungsten lamps. Enos L. Zimmerman is general manager of the Intercourse El. Lt. & Pwr. Co.

**LANSFORD, PA.**—Within the next two months the Panther Valley El. Lt. & Pwr. Co., of Lansford, expects to build a substation with an output of 600 v., erect 5 miles of 2300-volt transmission lines and install 225 40-wp arc lamps and four 75-wp incandescent lamps; also to purchase switches and lighting arresters for two incoming three-phase lines, and to install 1,000 250-watt 2300-volt feeder circuits and five arc circuits, and two carloads of 35-ft., 40-ft. and 45-ft. poles. Wallace Drumsheisen is manager.

**MARTINSBURG, PA.**—The installation of an electric-light plant in Martinsburg is reported to be under consideration.

**MONESSEN, PA.**—The West Penn El. Co., of Pittsburgh, has closed a contract with the Vesta Coal Co. to furnish energy to operate its No. 2 mine at Monessen. The equipment will consist of one 150-kw motor-generator set.

**WOODVILLE, PA.**—The County Commissioners of Allegheny County have awarded the contract for the electric work in the new tuberculosis hospital at Woodville to the Iron City Engineering Co., of Pittsburgh, Pa.

**BUTLER, N. J.**—The bids for the construction of an electric-light plant, for which \$30,000 was recently voted, exceed this sum by approximately \$6,000. The contract, however, has agreed, however, that a margin of \$6,000 may be allowed in making the appropriation. George J. Fritz is borough clerk.

**WHEELING, W. VA.**—Bids will be received at the United States Engineer's Office, Wheeling, W. Va., until Oct. 28, for furnishing two 60-hp water turbines and two 250-cu. ft. air compressors at Dam No. 28, Ohio River. For further information address J. E. Jervey, major engineers.

**LYNCHBURG, VA.**—The Southern Ry. Co. is planning to build a small power house in Lynchburg to furnish electricity to operate its electrical signal system in this district.

**WASHINGTON, D. C.**—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Oct. 13, for furnishing at the various navy yards and naval stations supplies and materials as follows: Schedule 7327—miscellaneous electrical fittings and hardware, Norfolk, Va.; Schedule 7329—one double surfacing machine. Bids also will be received until Oct. 20 as follows: Norfolk, Va.; Schedule 7328—two gasoline engines; also 140 porcelain insulators f.o.b. works, Washington, D. C.; Schedule 7331—160 sound chestnut telephone poles (30 ft. long, 4 in. diameter); Schedule 7330—two brass stem pressure gages; Schedule 7369—one electric hoist; Schedule 7395—1000 ft. 600-volt, three-conductor cable, miscellaneous single conductor cable; New Orleans, La.; Schedule 7386—six 1/4-hp portable ventilating sets. Brooklyn, N. Y.; Schedule 7386—ten 1/4-hp applicator, portable ventilating sets. Application for proposals should designate the schedule desired by number.

### North Central

**BAY CITY, MICH.**—Bids will be received by the Bay City Electric Light Department until Oct. 7 for a turbo-generator exciter and surface condenser. William H. Fitzhugh is superintendent.

**DETROIT, MICH.**—Contract for the equipment of the new Detention House which will be situated at Hancock Avenue and Rivard Street, will be let about Oct. 11. The equipment to be installed will include two 60-hp, 1800-rpm turbo-generator sets, two stokers, one 50-kw. turbine, 250 volt direct current, and one 50-kw. generator panel. At a later date there will be purchased 500 100-watt tungsten lamps. F. J. Vetter, architect, 1112 Union Trust Building, Detroit, Mich., has prepared the plans.

**ATHENS, OHIO.**—The Hocking Pw. Co., of Nelsonville, has reported to have purchased the municipal electric-light plant at Athens for \$15,000, and in addition has secured a 25-year franchise for street and commercial lighting. A ten-year contract for operation of the water-work system was also made. The company has agreed entirely to re-equip the distribution system for light and motor service by March 1, 1915. A large central power station is being erected by the Hocking Pw. Co. at Floodwood, between Athens and Nelson, where it owns about 1000 acres of coal lands. The company is Fomeroy and Middleport on the Ohio River and several towns in the Hocking and Sunday Creek Valley. Howard Mannington is president of the company and G. H. Campers is chief engineer.

**CINCINNATI, OHIO.**—The contract for the electrical work in the assembling plant for the Ford Motor Co., to be erected in Cincinnati, has been awarded to A. L. Fin Co. of this city. Considerable electric equipment will be required, including three electric elevators.

**CINCINNATI, OHIO.**—The Diamond Lt. Co., operating a block electric-light power plant, it is reported, is planning to compete with the Union Gas & El. Co. with out a franchise, by the establishment of numerous small plants in the city section, which can be operated without a franchise, as no use of the streets or alley would be involved.

**COLUMBUS, OHIO.**—Extensions and improvements are contemplated by the Ohio State El. Co. in the city of Columbus in the Columbus district (involving an expenditure of about \$500,000), which include the Columbus, Washington C. H., Lancaster and other companies. Plans have been completed and work will start immediately. J. G. McMeen is president.

**DAYTON, OHIO.**—The extension of the ornamental lighting system in Dayton is under consideration.

**DAYTON, OHIO.**—At the next election, it is reported, a proposition will be put before the voters for the issuance of \$500,000 bonds for the construction of a municipal electric-light plant. Henry M. Wall is city engineer.

**DAYTON, OHIO.**—Negotiations are under way for the extension of the transmission lines of the Dayton Pwr. & Lt. Co. to Martinsville and other towns and villages south of urban to Wilmington. F. M. Tait is president of the Dayton company.

**NELSONVILLE, OHIO.**—Close Brother of London, Eng. (who control the Hocking Pwr. Co.), it is reported, have arranged to furnish \$100,000 for the improvement of Hocking and Sunday Creek traction line between Nelsonville and Athens.

**SANDUSKY, OHIO.**—It is reported that the new rates for street lighting given by the Sandusky Gas & El. Co., after a long and hard fight, will cause legislation passed for a municipal plant to be repealed. Reductions in rates have been made to residence lighting and also for electric power purposes.

**VALLEYVIEW, OHIO.**—The Falls Avenue Park Entrance Improvement Association is agitating the installation of an ornamental lighting system on Falls Avenue and other streets.

**LEXINGTON, KY.**—The Kentucky Utility Co. proposes to erect within the next three months two 500-hp boilers at Varrill. The equipment has been purchased.

**PRINCETON, KY.**—The proposal to issue \$15,000 in bonds for the installation of a municipal electric-light plant will be submitted to the voters at the regular November election.

**BRISTOL, IND.**—A franchise, it is reported, has been granted to A. H. Timm, of constant, to install an electric lighting system in Bristol.

**ALTON, ILL.**—The Illinois State Board of Administration has awarded the Alton Gas & El. Co. a ten-year contract for fu-

ashing from 100 hp to 500 hp for the new State hospital for the insane to be erected in Alton. The new hospital is to be fully equipped with electrical devices such as laundry machinery, corn shredders, churns and other motor-operated farm machinery. A plant will be built on the hospital site and energy will be furnished by the Alton company from this station to the various buildings.

ATWOOD, ILL.—A special election will be held at Atwood on Oct. 3 to vote on the proposition of issuing \$65,000 bonds for the erection of an electric-light plant.

AURORA, ILL.—The City Council is considering an ordinance providing for the covering of overhead wires in the East Side business district.

DECATUR, ILL.—The board of supervisors of Macon County has appointed a committee to investigate and arrange for the installation of a new lighting plant in the city of Decatur. Those on the committee are Supervisors Chynoweth, Charles Stouffer and G. A. Austin.

IRSEYVILLE, ILL.—Plans are being considered for improvements to the street-lighting system. Louis H. Brockman is installing the system.

MAITTON, ILL.—To replace the gantry which was blown down last July at Marion power station, the Central Illinois Pub. Ser. El. Co., of Mattoon, is installing a similar apparatus of much greater capacity. The last of the contracts for the work has been awarded to the Robins Conveying Belt Co., of New York, which will install an electrically operated and magnetically controlled gantry bridge at a cost of \$50,000. The new span will be 8 ft. long, the old one having been 150 ft. long. The new span will have a capacity of 200 tons of coal an hour.

MOLINE, ILL.—The Tri-City Ry. & Lt. Co. is contemplating the installation of a street-lighting system in Moline and Rock Island, to cost about \$60,000.

SULLIVAN, ILL.—Plans are being prepared by Hyatt Mills, consulting engineer, St. Louis, Mo., for improvements to the municipal lighting plant, it is said.

MANITOWOC, WIS.—Plans are being considered for extensions and improvements to be municipal electric-light plant.

MANITOWOC, WIS.—Plans are being considered by the Wisconsin Pub. Ser. Co., of South Bay, to extend its transmission lines to Manitowoc. The company will ask for a franchise here.

MARTHA, WIS.—Estimates, it is reported, have been compiled by A. J. W. Smith, 20 West Jackson Boulevard, Chicago, Ill., for a municipal electric-light plant, to cost about \$60,000.

WAUPACA, WIS.—The Waupaca El. Lt. Co. has under consideration a new plant and power house financial conditions improve. Irving P. Lord is president and general manager of the company.

AURORA, MINN.—The Village Council awarded the contract for an electric-lighting station to the Great Northern El. Co. for \$20,495. The village owns the building and the Great Northern Co. will supply the energy to operate the municipal system.

ELY, MINN.—Bids will be received by the City of Ely at the office of the city clerk on Oct. 1 for furnishing one cross compound, Messer gear crank and flywheel steam engine, having a capacity of 100 hp and 100 hp of horse power, including current generator, one steam pipe for direct connection to above engine, and a 300,000-gal. steel tank on steel wheels. Plans and specifications are on file at the Builders' Exchange at Minneapolis, St. Paul and Duluth, and at the office of C. Buck, of Minneapolis, consulting engineer, and at office of I. Wiestra, Jr., city clerk Ely.

FAIRMONT, MINN.—An ornamental street-lighting system will be installed in the town within the next six months and about 75 posts will be purchased. Alfred E. Jones is manager of the municipal electric-lighting and water plant at Fairmont.

NEEWATIN, MINN.—The contract for construction of a new power plant at Neeawatine has been awarded to the A. C. Turner Co. of Hibbing, Minn.

ST. PAUL, MINN.—The Northwestern El. Equipment Co. has been awarded the contract for the electric-light fixtures for the new library. The contract involves

VIRGINIA, MINN.—The Great Northern El. Co., Duluth, Minn., has started work on the erection of a transmission line from Minto to Biwabik, where it will furnish power for light and motor service. J. T. Crane is commercial engineer of the Great Northern Pwr. Co.

AUDUBON, IA.—The local electric-light plant, it is reported, was recently destroyed

by a tornado, causing a loss of several thousand dollars.

BEACON, IA.—A franchise has been granted to the Oskaloosa (Ia.) Traction and Motor Ser. Co. in Beacon, Ia., to supply electric light.

CARROLL, IA.—The Carroll Lt. & Ht. Co. is contemplating improvements to its electric distributing system, heating mains and power plant, to cost about \$35,000. The Carroll El. Co. is a special election held recently in Carroll to select the municipal electric-light plant to the Union Co., of Omaha, Neb., was carried. The company agrees to install a new plant and to make extensions and improvements to the system.

FOREST CITY, IA.—The Forest City El. Lt. & Pwr. Co. expects to purchase wire, meters and lamps and also household appliances. Frank Kellogg is manager of the company.

INDEPENDENCE, IA.—The transmission lines of the municipal water and electric plant will be extended 2 miles within the next thirty days. The purchase of a 150-hp generator is contemplated within the next six months. George D. Weaver is superintendent of the plant.

KELLOGG, IA.—The Grinnell (Ia.) El. & Ht. Co. has applied for a franchise in Kellogg.

KEOKUK, IA.—The building of an electric road with Keokuk as a northern terminal and extending to Jefferson City, Mo., it is reported, is the plan of H. W. Knight, of Chicago, Ill., who is promoting the plan. The system will extend chiefly through Missouri towns.

MOUNT VERNON, IA.—A number of minor changes will be made in the plant of the Mount Vernon El. Co., of which Kenneth Lindsay is manager.

ROCK VALLEY, IA.—The Rock Valley El. Co. has recently installed a 125-hp Corliss engine, with two 60-in. by 16-ft. boilers, and a 100-hp Corliss engine. The company will shortly install another Corliss engine rated at from 50 hp to 75 hp. Four miles of transmission and a substation have recently been erected. The line connects with the 4-mile line built by the Doon (Ia.) El. Co. The city of Alford will soon build a line to connect with this one. S. Thayer is manager of the Rock Valley El. Co.

ARMSTRONG, MO.—The contract for the construction of an electric-light plant in Armstrong is reported to have been awarded to E. H. Fisher, of Omaha, Neb. Tuttle & Pike, Shubert Theater Building, Kansas City, Mo., are engineers.

CARTHAGE, MO.—Bids will be received by the County Court of Jasper County, Carthage, Mo., Oct. 14, for the construction of a building for the Jasper County Almshouse. Bids will be received for the entire work, and separate bids will be received as follows: (A) General construction of building including electric lighting and septic tank; (B) plumbing and heating, including sewerage to inlet of septic tank. Copies of plans and specifications may be obtained from E. H. Schuch, architect, 22 Miners' Bank Building, Joplin, Mo., for which a deposit of \$25 will be required, to be refunded upon return of same. L. M. Thomas, of Carthage, is county clerk.

CLARKSVILLE, MO.—C. K. Lee, manager of the Pike County El. Lt. & Pwr. Co. of Bowling Green, it is reported, is contemplating the installation of an electric-lighting plant in Clarksville.

EDINA, MINN.—The Edina Lt. Co. recently closed a 10-year contract with the city of Edina for fifty-eight 100-cp and 200-cp street series lamps and also ten five-lamp and fifteen single-lamp ornamental posts, to be installed in an ornamental street-lighting system, to include sections of First and Second Avenues and Roberts Streets.

LOWRY CITY, MO.—The installation of a street-lighting system in Lowry is under consideration. The plan for the main line of the system is to be supplied by the plant of George Delozier.

PAIMYRA, MO.—The City Council has awarded the contract for improvements to the municipal electric-light and water plant to the Arrow Engineering Co., of St. Louis, Mo., at \$28,500. Freeman D. Martin, of Kansas City, Mo., is engineer in charge.

ST. LOUIS, MO.—In addition to the street lamps will be installed in this city in the fall. A. L. Utz is superintendent of the municipal electric-light plant.

CANDO, N. D.—It is likely that an adjustment will be made with the Cando El. Co., which was recently shut down, and the plan to erect a municipal plant will be abandoned. L. D. Robertson is city auditor.

FARGO, N. D.—Plans and specifications have been adopted by the city engineer for the installation of an ornamental street-lighting system, to include sections of First and Second Avenues and Roberts Streets.

MOHALL, N. D.—A franchise has been granted to Louis Heiner, of this city, for the erection of an electric-light plant. The plant is to be commenced within six months, and the ordinance stipulates that it is to be of direct-current, 110-volt type and that incandescent lamps are to be used for street lighting.

STANLEY, N. D.—Negotiations are said to be under way for the installation of a private electric-light plant.

WIMBLEDON, N. D.—The electric-light plant here began operations on Sept. 12. Main street is illuminated with four cross-suspension arc lamps of 120 cp each and 12 double bracket lamps varying in candle-power from 48 to 80. Forty to fifty lamps are already wired, and it is expected that this number will be doubled within a very short time.

DE WITT, NEB.—The De Witt El. Lt. & Pwr. Co., it is reported, has been offered to the city for \$14,000. The City Council will submit to the voters the proposition to issue bonds for this purpose.

JANSEN, NEB.—Arrangements have been made whereby the town of Jansen will secure energy from the Lincoln Co. electric-light plant at Fairbury (12 miles distant) for lighting the town. A company has been organized under the name of the Jansen El. Lt. & Pwr. Co. to institute electric here.

KEARNEY, NEB.—An application has been filed by the State Railway Commission with the Kearney Wtr. & Lt. Co. for permission to issue \$35,000 in bonds, the proceeds to be used to enlarge its plant.

LINCOLN, NEB.—The Lincoln Gas & El. Lt. Co. has recently purchased a 1500-kw. General Electric turbine and a Leblanc condenser and new cooling tower. G. A. Montgomery is general manager of the company.

LINCOLN, NEB.—The contract for electrical work on the new building at the insane hospital has been awarded by the State Board of Control to Brugeman Brothers, of Norfolk, Neb. The cost of the building is estimated at \$50,000.

LINCOLN, NEB.—Bids will be received at the office of the city clerk, Lincoln, until Oct. 15, for furnishing and installing machinery and equipment for the municipal electric-light plant as follows: (1) a horizontal 750-kw, three-phase, 60-cycle, 4400-volt turbo-generator, one surface condenser for above turbo-generator, with motor-driven (three-phase, 4400-volt, 2200-hp) centrifugal circulating pump, steam-engine-driven vacuum pump with condensate pump attached, one panel switch-board and exciter; (2) one surface condenser for 18-in. by 36-in. by 42-in. cross compound Corliss type engine, now running non-condensing, with motor-driven three-phase, 4400-volt, 2200-hp centrifugal circulating pump, engine-driven vacuum pump with condensate pump attached; (3) a separate proposition for furnishing and installing the spray-nozzle condensing water-cooling system, including all valves, fittings and piping required in both suction and discharge water lines to and from machinery installed and the cooling pond. Theodore H. Beck is engineer.

GREENSBURG, KAN.—Within the next three months there will be purchased for the municipal electric-lighting plant a 200-hp engine, either oil or gas; a 175-kva alternating-current generator, 2300 volts, 50 cycles, three-phase, and the material for a 11-mile transmission line.

LIBERAL, KAN.—Within the next three months the Liberal Lt. & Pwr. Co. expects to purchase for the city \$100,000 worth of heating appliances. H. A. Grader is president and manager of the company.

OSKALOOSA, KAN.—Within the next six months Moley & Co., owners of the electric light plant, expect to purchase a 75-hp 100-hp gas engine and two or three small transformers. W. A. Payne is superintendent of the plant.

RUSSSELL, KAN.—Within the next three months there will be purchased for the municipal electric-lighting plant a 100-hp engine and a 75-kva alternator. M. C. Fox is general manager of the plant.

## Southern States

ASHEVILLE, N. C.—Final preparations are now being made for the development of a great water-power near the Tennessee-North Carolina border. It is reported that the development calls for an expenditure of between \$5,000,000 and \$10,000,000. The enterprise is in the hands of New York and Boston capitalists. The project has been a company was organized with a capital stock of \$1,000,000 as a preliminary. Since that time the company has been acquiring water-power sites for the development. It is reported that the intention to deliver energy to many



points in the South, including Birmingham, Nashville, Montgomery and Mobile. Pryor Nelson, Murphy, N. C., is executive head of the concern.

**WHITEVILLE, N. C.**—The Whiteville Commercial Club has under discussion the establishment of an electric-light plant. At the present time a part of the city is being supplied with energy from the Whiteville Lumber Co., but this plant cannot supply electricity for the whole town, it is said. J. A. Newsome, of Jacksonville, Fla., has been preparing estimates for the proposed new plant. E. M. Brown, is making a canvass of prospective consumers in Whiteville.

**WILSON, N. C.**—The installation of additional machinery and equipment in the municipal electric-light plant is under consideration by the Council.

**ESTILL, S. C.**—At a special election held Sept. 16 the proposal to issue bonds for the installation of an electric-light plant, water works and sewer system was carried. It is understood, will be taken immediately to install the plant. N. W. Ellis is a member of Board of Commissioners.

**ORANGEBURG, S. C.**—The decision handed down by the State Supreme Court declares the \$60,000 bond issue, for the erection and extension of the electric-light plant and water-works system, to be invalid. The court states that there should have been a hearing on the amount to be expended for each system.

**LYONS, GA.**—At an election to be held soon the proposal to issue bonds to enlarge the municipal electric-light plant will be submitted to the voters.

**MOUNT VERNON, GA.**—The proposal to issue \$50,000 in bonds for the installation of a municipal electric-light plant will be submitted to the voters at the election to be held Nov. 3.

**PALBO BEACH, FLA.**—The proposition to issue bonds to the amount of \$10,000 for a municipal lighting plant was carried at the recent election.

**DANDRIDGE, TENN.**—The Dandridge Pwr. & Lt. Co. is planning to install a garage and repair shop in connection with its new plant now under construction.

**GADSDEN, ALA.**—It is reported that the city is considering the erection of a municipal electric-light plant.

**CORNING, ARK.**—The citizens recently subscribed \$25,000 to a stock company to rebuild the state mill and electric-light plant which were recently destroyed by fire at a loss of \$50,000. A concrete, fireproof building will be erected. George A. Booser, owner of the old plant, is reported to be one of the large stockholders in the new company.

**FORT SMITH, ARK.**—Estimates for the cost of a municipal plant to be erected in connection with the water-works, give the total cost of such plant at approximately \$209,677.10. H. H. Reed is city engineer.

**SHREVEPORT, LA.**—The North Louisiana El. Ry. Co., it is reported, has closed a contract for the construction of an interurban electric line between Shreveport and Monroe (97 miles long), to cost about \$4,000,000.

**COMMERCE, TEX.**—Ornamental street lamps for Main Street and the square and lamps for the residence section will shortly be installed here.

**RIVIERA, TEX.**—A municipal electric light plant, it is reported, is being installed in Riviera.

**WALNUT SPRINGS, TEX.**—The Glen Rose & Walnut Springs Ry., which has finished the grade for its interurban electric railway between Glen Rose and Walnut Springs, a distance of 14 miles, is planning to construct a power plant.

## Pacific States

**SEATTLE, WASH.**—A resolution has been adopted by the City Council providing for the installation of cluster lamps on Madison Street from Railroad Avenue to First Avenue, bids for which, it is understood, will soon be asked by A. L. Valentine chairman board of public works.

**SEATTLE, WASH.**—Investigations are being made by the city engineering department, under the direction of C. H. Moore, of several power sites in the Olympic Mountains. The preliminary surveys are being undertaken under the recent ordinance directing the investigation of the Lake Cushman and other sites, for which \$5,000 was appropriated.

**PORTLAND, ORE.**—Arrangements are being made for the installation of a mental lighting system on Fourth Street, from Jefferson to Burnside. George Strong,

manager of the Corbett estate, is interested in the project.

**SUMMERVILLE, ORE.**—Preparations are being made by the El. & Pwr. Co. to erect a transmission line in the Grand Ronde Valley. It is proposed to furnish electricity to farmers along the lines as well as to the smaller towns.

**WARRENTON, ORE.**—The City Council has granted the Pacific Pwr. & Lt. Co. of Astoria, a franchise to furnish electricity in Warrenton for a period of 30 years. Work, it is understood, will begin at once which will involve an expenditure of about \$50,000. Later the company will probably extend its service from Warrenton to Hammond and Flavel. W. H. Galvani, engineer, of Astoria, will have charge of the work.

**YONCALLA, ORE.**—The proposal to install an electric-lighting system (to cost about \$6,000) will be submitted to the voters at an election to be held in December.

**BANNING, CAL.**—C. H. L. Ghreist & Son have begun the installation of an electric-light plant at this place.

**HEMET, CAL.**—The City Council has appointed a committee to investigate the cost of installing a municipal electric-light plant and water system.

**OCEANSIDE, CAL.**—It is reported that the Southern Sierras Pwr. Co., of Riverside, Calif., has decided to extend its high-tension lines to Oceanside, to connect with the system at Elsinore, 40 miles to the north. The company expects to spend about \$500,000 in Oceanside and the immediate vicinity as soon as financial conditions warrant.

**POMONA, CAL.**—A special committee, consisting of F. E. Whitehouse, Wade Carper, William Spud, W. J. Blackmon, and Richard Richardson, has been appointed by the Chamber of Commerce for the purpose of promoting the installation of an ornamental street-lighting system in the business district.

**MALAD CITY, IDAHO.**—Preparations are being made by the Evans Lt. Co., of Malad City, it is reported, for the construction of a new electric-light plant, to be located near this city.

**SPENCER, IDAHO.**—The Public Utilities Commission of Idaho has granted the Wood Livestock Co. permission to construct and operate an electric light and power plant in Spencer. F. J. Hagenbarth is president.

**MESA, ARIZ.**—Arrangements are being made by the South Side Gas & El. Co. for the construction of a substation (to cost about \$10,000), to enable the company to distribute electric energy generated at the power plant at the Roosevelt Dam. Equipment for the proposed station has been purchased. H. L. Chandler is general manager.

**PHOENIX, ARIZ.**—A large dam will be constructed across the Little Colorado River in Arizona and a hydroelectric plant will be erected to generate energy for operating mines and other industrial plants. It is proposed to construct a transmission line to Globe, Hayden and Ray, more than 175 miles distant from the site of the main power plant. The dam will impound 447,500 acre-ft. of water and will afford a sufficient supply to irrigate a large tract of land. F. G. Baum, engineer, 1404 Chronicle Building, San Francisco, Cal., has filed the plans for the work in the State Land Office at Phoenix.

**SIDNEY, MONT.**—The Sidney Lt. & Pwr. Co., recently incorporated, is planning to install an electric-light plant in Sidney.

**WIBAUX, MONT.**—A special election will soon be held to submit the proposal to grant a franchise to the Wibaux Pwr. & Lt. Co. to install and operate an electric-light and heating plant in Wibaux. The cost of the proposed plant is estimated at from \$20,000 to \$30,000.

**LARAMIE, WYO.**—The Intermountain Ry. Lt. & Pwr. Co. has recently taken over the electric plants at Chardon and Crawford, Neb. A new steam-heating system has been installed in the latter place, and other improvements are planned for both cities. A. E. Anderson is superintendent at Laramie.

**LAHONTAN, NEV.**—The Board of County Commissioners has granted the Nevada Valleys Pwr. Co. a franchise to erect a transmission line from Lahontan to Hazen, and from Hazen to the county line on route to Lovelock and Rochester.

**ROCHESTER, NEV.**—The Consolidated Mining & Milling Co. has entered into a contract with the Nevada Valleys Pwr. Co. to furnish electricity to operate its new mill in Rochester. Work, it is understood, will begin at once on the erection of the transmission line into Rochester.

**WINNEMUCCA, NEV.**—The County Commissioners have granted the Nevada

Valleys Pwr. Co. a franchise to erect transmission lines for through all the public streets of all incorporated towns and villages in Humboldt County.

**TYRONE, N. M.**—The Phelps-Dodge Co., it is said, will install a power plant at this place. Diesel engines will be used. The work will be in charge of Albert Kohl.

## Canada

**KINGSTON, ONT.**—The Civic Utilities Commission is considering a proposal submitted by J. M. Campbell offering to furnish the city with electrical energy to the amount of 700 hp generated at Kingston Mills.

**MERRICKVILLE, ONT.**—The by-law authorizing the loan of \$30,000 to the Merrickville El. Lt. & Pwr. Co. for the construction of an electric power plant has been approved by the ratepayers.

**SARNIA, ONT.**—The Sarnia Gas & El. Co. has placed an order with the Canadian Westinghouse Co. for a 1000-kw turbo-generating apparatus.

**ST. CATHARINES, ONT.**—The Marathon Tire Co., it is announced, will equip its factory with electrically operated machinery and will purchase energy from the city plant.

**ST. MARY'S, ONT.**—At a recent meeting of the water, heat and light commission it was decided not to install a complete new street-lighting system, but the present small lamps are to be replaced by ones of greater candle-power.

**SIMCOE, ONT.**—The bonds for an extension of the Hydro-Electric Commission's lines to this place were sold on Sept. 15. Work will commence at once and service is promised for Nov. 14. If possible, the circular annex of the old gas plant will be used as a transformer station.

**TORONTO, ONT.**—The Board of Control has recently passed a resolution instructing the corporation counsel to apply to the Dominion Railway Board for an order compelling all railway companies to equip their system within the city limits and two miles outward for electrical operation.

**TORONTO, ONT.**—The Civic Board of Control has decided to recommend to the City Council a by-law authorizing an appropriation of \$2,000,000 for extensions and improvements to the Toronto Hydro-Electric Power Commission system. The proposed work includes extensions to street and park lighting, to cost \$24,627; increasing supply of energy for operation of civic car lines, \$34,713; increasing the capacity of system, \$1,260,985, making a total of \$1,320,325.

## Miscellaneous

**PANAMA.**—Bids will be received at the office of the general purchasing officer, Panama Canal, Washington, D. C., until Oct. 16, for furnishing, under Circular 868-D, one automobile hose car, one electric motor, 2000 lb. manganese dioxide, 10,000 lb. potassium chloride and 300,000 lb. aluminum sulphate. For further information address Major F. C. Boggs, general purchasing officer.

**PANAMA.**—Bids will be received at the office of the general purchasing officer, Panama Canal, Washington, D. C., until Oct. 16, for furnishing electric cable, cable bells, transformers, electrical attachments solder, tape, steel rods, turnbuckles, steel slates, paint, mastic, and other electrical supplies and materials. Bids and general information relating to this circular (No. 868-G) may be obtained from the above office or the offices of the assistant purchasing agents, 24 State Street, New York, N. Y.; 614 Whitney-Central Building New Orleans, La., and 1088 North Point Street, San Francisco, Cal. Major F. C. Boggs is general purchasing officer.

## New Incorporations

**LITTLE ROCK, ARK.**—The Arkansas Lt. & Pwr. Co. has been incorporated with a capital of \$650,000. The company's business offices will be in Little Rock, and it will operate in Arkadelphia, Camden, Malvern and other points. H. C. Couch is president and J. L. Longino is secretary of the company.

**FARMINGTON, MONT.**—The Jennison Lt. & Pwr. Co. has been organized with a capital of \$50,000. C. W. Jennison, Williston N. D., is president.

# Directory of Electrical Associations

ALABAMA LIGHT AND HEAT ASSOCIATION. Secretary-treasurer, H. O. Hanson, Mobile Gas Co., Mobile, Ala.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. Permanent secretary, L. O. Howard, Smithsonian Institution, Washington, D. C.

AMERICAN ELECTRIC RAILWAY ACCOUNTANTS ASSOCIATION. Secretary-treasurer, E. B. Burritt, 29 West 39th St., New York.

AMERICAN ELECTRIC RAILWAY ASSOCIATION. Secretary, E. B. Burritt, 29 West 39th St., New York. Annual convention, Atlantic City, N. J., Oct. 12-16.

AMERICAN ELECTRIC RAILWAY ENGINEERING ASSOCIATION. Secretary, E. B. Burritt, 29 West 39th St., New York. Annual convention, Atlantic City, N. J., Oct. 12-16.

AMERICAN ELECTROCHEMICAL SOCIETY. Secretary, Prof. J. W. Richards, Lehigh University, South Bethlehem, Pa.

AMERICAN ELECTROLYTIC ASSOCIATION. Secretary, Dr. J. H. Travell, 27 East 11th St., New York.

AMERICAN INSTITUTE OF CONSULTING ENGINEERS. Secretary, Eugene W. Stern, 101 Park Ave., New York City.

AMERICAN INSTITUTE ELECTRICAL ENGINEERS. Secretary, F. L. Hutchinson, 33 West 39th St., New York. Board of directors meets monthly. Sections and branches in the principal electrical centers throughout the country.

AMERICAN PHYSICAL SOCIETY. Secretary, Prof. A. D. Cole, Ohio State University, Columbus, Ohio.

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS. Secretary, William H. Ross, 154 Nassau St., New York City.

AMERICAN SOCIETY FOR TESTING MATERIALS. Secretary-treasurer, Edgar Marburg, University of Pennsylvania, Philadelphia.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS. Secretary, Edwin A. Scott, 29 West 39th St., New York.

AMERICAN WATER WORKS ASSOCIATION. Secretary, J. M. Diven, 47 State St., Troy, N. Y.

ARKANSAS ASSOCIATION OF PUBLIC UTILITY OPERATORS. Secretary, W. J. Sharp, Little Rock, Ark.

ASSOCIATION OF EDISON ILLUMINATING COMPANIES. Assistant secretary, Walter Neumuller, Irving Place and 15th St., New York.

ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS. Secretary, W. T. Snyder, Jessport, Pa.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS. Secretary-treasurer, Jos. A. Andreucci, Chicago & Northwestern Railway, Chicago.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS. Secretary, F. W. Drew, 12 West Adams St., Chicago.

CALIFORNIA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, W. S. Hanbridge, 408 Merchants' National Bank Building, Los Angeles, Cal.

CANADIAN ELECTRICAL ASSOCIATION. Affiliated with N. E. L. A. Secretary-treasurer, Allan Sullivan, 610 Confederation Life Bldg., Toronto, Can.

COLORADO ELECTRIC CLUB. Secretary, C. Oehlmann. Meets every Thursday at Alamy Hotel, Denver, Col.

CONNECTICUT ELECTRIC LIGHT, POWER AND RAILWAY ASSOCIATION. Secretary-treasurer, F. Kennedy, 900 15th St., Denver, Col.

COMMERCIAL SECTION, N. E. L. A. Secretary, J. F. Becker, 1170 Broadway, N. Y.

EASTERN NEW YORK SECTION, N. E. L. A. Secretary, C. S. Van Dyck, Schenectady,

Electric Club of Chicago. Secretary, Edward Ehrlich, 60 South Dearborn St., Chicago. Meets every Thursday noon at Hotel Sherman.

ELECTRICAL CONTRACTORS' ASSOCIATION OF WEST BOSTON. Secretary, R. S. Hale, 39 Gibson St., Boston.

ELECTRICAL CONTRACTORS' ASSOCIATION OF MASSACHUSETTS. Secretary, H. D. Temple, 7 Foster St., Worcester, Mass.

ELECTRICAL CONTRACTORS' ASSOCIATION OF NEW YORK STATE. Secretary, Geo. W. Russell, 2 West 42d St., New York.

ELECTRICAL CONTRACTORS' ASSOCIATION OF THE CITY OF CHICAGO. Secretary, M. N. Humenuth, 179 West Washington St. Meets at noon on the second and fourth Wednesday of each month at 424 South Ashab Ave.

ELECTRICAL CONTRACTORS' ASSOCIATION OF STATE OF MISSOURI. Secretary, A. J. Burns, 318 West Tenth St., Kansas City, Mo.

ELECTRICAL CONTRACTORS' ASSOCIATION OF WISCONSIN. Secretary, Albert J. Petermann, 626 Lloyd St., Milwaukee, Wis.

ELECTRICAL CREDIT ASSOCIATION OF CHICAGO. Secretary, Frederic P. Vose, 1343 Marquette Building, Chicago.

ELECTRICAL CREDIT ASSOCIATION OF PHILADELPHIA. Secretary, John W. Crum, 1324 Land Title Building, Philadelphia.

ELECTRICAL SALESMEN'S ASSOCIATION. Secretary, Francis Raymond, 125 Michigan Ave., Chicago, Ill.

ELECTRICAL SUPPLY JOBBERS' ASSOCIATION. General secretary, Franklin Overbagh, 411 South Clinton St., Chicago, Ill.

ELECTRICAL TRADES ASSOCIATION OF CANADA. Secretary, William R. Stavelly, Royal Insurance Building, Montreal, Can.

ELECTRICAL TRADES ASSOCIATION OF THE PACIFIC COAST. Secretary, Albert H. Elliott, Harding Building, 34 Ellis St., San Francisco, Cal. Meeting at San Francisco, second Thursday of each month.

ELECTRIC VEHICLE ASSOCIATION OF AMERICA. Executive secretary, A. Jackson Marshall, 29 West 39th St., N. Y. Sections in New York, New England, Chicago, Philadelphia, Washington and Los Angeles. Annual convention, Philadelphia, Oct. 19-21.

EMPIRE STATE GAS AND ELECTRIC ASSOCIATION. Secretary, Charles H. B. Chapin, 29 West 39th St., New York.

FARADAY ELECTRICAL ASSOCIATION. Secretary, W. J. Collins, 1129 Masonic Temple, Chicago. Meets at noon on the first and third Wednesday of each month at Planters' Hotel.

FRANKLIN INSTITUTE. Secretary, Dr. R. B. Owens, Philadelphia, Pa.

GAS, ELECTRIC AND STREET RAILWAY ASSOCIATION OF OKLAHOMA. Secretary-treasurer, Prof. H. V. Bozell, Norman, Okla.

GEORGIA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, J. M. Clayton, Atlanta, Ga.

HYDROELECTRIC SECTION, N. E. L. A. Secretary, S. A. Sewall, 29 West 39th St., New York.

ILLINOIS STATE ELECTRICAL ASSOCIATION. Secretary, H. E. Chubbuck, Peoria, Ill.

ILLUMINATING ENGINEERING SOCIETY. General secretary, J. D. Israel, Engineering Societies Building, 29 West 39th St., New York. Sections in New York, New England, Philadelphia, Chicago and Pittsburgh.

INDEPENDENT ELECTRICAL CONTRACTORS' ASSOCIATION OF GREATER NEW YORK. Secretary, A. Newburger, 1153 Myrtle Ave., Brooklyn, N. Y.

INDEPENDENT TELEPHONE ASSOCIATION OF AMERICA. Secretary, W. S. Vivian, Grand Rapids, Mich.

INDIANA ELECTRIC LIGHT ASSOCIATION. Secretary, Thomas Donahue, Lafayette, Ind.

INDIANA STATE ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, George Skilman, Indianapolis, Ind.

INSTITUTE OF OPERATING ENGINEERS. Secretary, L. H. Houmiller, 29 West 39th St., New York.

INSTITUTE OF RADIO ENGINEERS. Secretary, E. J. Simon, 71 Broadway, New York.

INTERNAL COMBUSTION ENGINEERS' ASSOCIATION. President, Charles Kratsch, 416 East 12th St., Chicago. Meeting second Friday of each month at Lewis Institute.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS. Secretary, C. R. George, Houston, Tex.

INTERNATIONAL ELECTRICAL CONGRESS. Secretary-treasurer, Preston S. Millar, 50th St. and East End Ave., New York.

INTERNATIONAL ENGINEERING CONGRESS. Secretary-treasurer, W. A. Cattell, Foxcroft Building, San Francisco, Cal. Congress, San Francisco, September, 1915.

INTERNATIONAL ELECTROTECHNICAL COMMISSION. (International body representing various national electrical engineering societies contributing to its support). General secretary, C. le Maistre, 23 Victoria St., Westminster, London, S. England. Meeting at San Francisco, Sept. 9-11, 1915.

IOWA ELECTRICAL ASSOCIATION. Affiliated with N. E. L. A. Secretary, W. H. Thomson, Des Moines, Ia.

IOWA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, M. T. Humphrey, Water-

IOWA STREET AND INTERURBAN RAILWAY ASSOCIATION. Secretary, H. E. Weeks, Davenport, Ia.

JUVAN ORDER. Juniper (president), W. N. Matthews, St. Louis, Mo., Mercury (secretary), E. C. Bennett, Syndicate Trust Building, St. Louis, Mo. Annual congress, St. Louis, Mo., Oct. 14-16.

KANSAS GAS, WATER, ELECTRIC LIGHT AND STREET RAILWAY ASSOCIATION. Secretary-treasurer, Ivor Thomas, 237 South Main St., Wichita, Kan. Annual meeting Oct. 23-24.

LOUISIANA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, J. J. Ziegler, 227 Bourbon St. Meeting every Wednesday, Audubon Building, New Orleans.

MAINE ELECTRIC ASSOCIATION. Secretary-treasurer, Walter S. Wyman, Waterville, Maine.

MICHIGAN ELECTRIC ASSOCIATION. Affiliated with N. E. L. A. Secretary, Herbert Silvester, 18 Washington Boulevard, Detroit, Mich.

MINNESOTA ELECTRIC ASSOCIATION. Secretary-treasurer, F. A. Otto, St. Paul Gas Light Company, St. Paul, Minn.

MISSISSIPPI ELECTRIC ASSOCIATION. Affiliated with the National Electric Light Association. Secretary-treasurer, H. P. Wheeler, Hattiesburg, Miss. Next annual meeting, Hattiesburg, April 12-14, 1915.

MISSOURI ELECTRIC, GAS, STREET RAILWAY AND WATER WORKS ASSOCIATION. Secretary-treasurer, F. D. Beardslee, Union Electric Light & Power Co., St. Louis.

NATIONAL ARM, PIN AND BRACKET ASSOCIATION. Secretary, J. B. Magers, Madison, Ind.

NATIONAL ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary-treasurer, Wm. L. Smith, Concord, Mass.

NATIONAL DISTRICT HEATING ASSOCIATION. Secretary, D. L. Gaskill, Greenville, Ohio.

NATIONAL ELECTRIC LIGHT ASSOCIATION. Executive secretary, T. C. Martin, Engineering Societies Building, 39 West 39th St., New York.

NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION OF THE UNITED STATES. Secretary, George H. Duffield, 41 Martin Building, Utica, N. Y.

NATIONAL ELECTRICAL CREDIT ASSOCIATION. Secretary, Frederic P. Vose, 1343 Marquette Building, Chicago.

NATIONAL FIRE PROTECTION ASSOCIATION. Secretary of electrical committee, Ralph Sweetland, 141 Milk St., Boston, Mass. Open meeting, New York, March, 1915.

NATIONAL INDEPENDENT TELEPHONE ASSOCIATION. Secretary-treasurer, J. B. Earle, Waco, Tex.

NEBRASKA SECTION, N. E. L. A. Secretary-treasurer, S. J. Bell, David City, Neb.

NEW ENGLAND ELECTRICAL CREDIT ASSOCIATION. Secretary, Alton F. Tupper, 60 State St., Boston, Mass.

NEW ENGLAND SECTION, ELECTRIC VEHICLE ASSOCIATION OF AMERICA. Secretary, L. L. Edgar, 39 Boylston St., Boston, Mass.

NEW ENGLAND STREET RAILWAY CLUB. Secretary, H. A. Faulkner, 12 Pearl St., Boston, Mass. Meets last Thursday of each month.

NEW ENGLAND SECTION, N. E. L. A. Secretary, Miss O. E. Bursiel, 149 Tremont St., Boston, Mass.

NEW ORLEANS ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, S. J. Stewart, 312 Carondelet St., New Orleans, La. Meetings, second and fourth Tuesday of each month.

NEW YORK ELECTRIC RAILWAY ASSOCIATION. Secretary, Charles C. Dietz, 365 East 21st St., Brooklyn, N. Y.

NEW YORK ELECTRIC RAILWAY ASSOCIATION. Affiliated with the National Electric Light Association. Secretary, Franz Neilson, 80 Wall St., New York.

NEW YORK ELECTRICAL SOCIETY. Secretary, G. H. Guy, 33 West 39th St., New York.

NORTHWEST SECTION, N. E. L. A. Secretary, N. W. Brackett, Pioneer Building, Seattle, Wash.

NORTHERN WHITE CEDAR ASSOCIATION. Secretary, R. N. Boucher, 743 Lumber Exchange, Minneapolis, Minn.

OHIO ELECTRIC LIGHT ASSOCIATION. Secretary, D. L. Gaskill, Greenville, Ohio.

OHIO SOCIETY OF MECHANICAL ELECTRICAL AND STEAM ENGINEERS. Secretary, Prof. F. E. Sanborn, Ohio State University, Columbus, Ohio.



AMERICAN ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, F. C. Green, 291 East Morrison St., Portland, Ore.

PENNSYLVANIA ELECTRIC ASSOCIATION (State Section, N. E. L. A.). Secretary-treasurer, H. N. Müller, Pittsburgh, Pa.

RAILWAY SIGNAL ASSOCIATION. Secretary-treasurer, C. E. Rosenberg, Times Building, Bethlehem, Pa.

SOCIETY FOR ELECTRICAL DEVELOPMENT, INC. General manager, J. M. Wakeman, 29 West 35th St., New York.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION. Secretary, Dean F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.

SOUTHEASTERN SECTION, N. E. L. A. Secretary-treasurer, Geo. H. Wygant, Tampa, Fla.

SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Secretary, H. S. Cooper, 405 Vlaughter Building, Dallas, Tex.

VERMONT ELECTRICAL ASSOCIATION. Sec-

retary-treasurer, A. B. Marsden, Manchester, Vt.

WESTERN ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary, W. S. Boyd, 76 West Monroe St., Chicago, Ill.

WESTERN SOCIETY OF ENGINEERS, ELECTRICAL SECTION. Secretary, J. H. Warder, 1737 Monadnock Block, Chicago.

WISCONSIN ELECTRICAL ASSOCIATION. Secretary, George Allison, 1419 First National Bank Building, Milwaukee, Wis.

## Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED  
SEPT. 22, 1914.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York, N. Y.]

1,111,014. RAILWAY SIGNAL DEVICE; L. B. Edgecombe, Traverse City, Mich. App. filed June 24, 1913. Operates signal lights on a dangerous curve.

1,111,024. TWO-PARTY TELEPHONE SYSTEM; H. F. Joeckel, Camp Point, Ill. App. filed Feb. 15, 1912. Selective signaling between the parties and central station.

1,111,033. CONTACT WHEEL FOR SIGNAL CIRCUITS; W. O. Powers, Jr., Ossining, N. Y. App. filed April 23, 1914. Has a thin web connecting the teeth, which can be broken away to give different arrangements of signals.

1,111,038. MAGNETIC VIBRATOR; F. V. Smith, Floriston, Cal. App. filed Nov. 28, 1911. Electromagnet operates an armature carrying a tappet.

1,111,049. METHOD OF REDUCING ORES; R. S. Wile, Pittsburgh, Pa. App. filed Dec. 5, 1913. Maintains a bath of slag by means of an electric current passing through the same in a vertical direction.

1,111,050. APPARATUS FOR REDUCING ORES; R. S. Wile, Pittsburgh, Pa. App. filed Dec. 15, 1913. Has a deep crucible of larger cross-sectional area than the stack portion of the furnace.

1,111,127. TROLLEY POLE; W. Blocker, Jackson, Miss. App. filed Nov. 12, 1913. Can be reversed by the motorman through compressed-air connections.

1,111,150. CONTROLLER FOR SELF-STARTERS FOR ENGINES; R. H. Hassler, Indianapolis, Ind. App. filed Nov. 23, 1912. Has a control switch which connects the dynamo-electric generator and the battery when the engine speed is between predetermined maximum and minimum limits.

1,111,165. APPARATUS FOR ELECTRICALLY FORMING TOES AND HEELS ON HORSESHOES; W. A. Miller, Pittsburgh, Pa. App. filed July 12, 1910. Current localized at heel and toe portions to produce welding heat thereat.

1,111,178. ELECTRICAL CONTROLLING APPARATUS; O. H. and F. Pieper, Rochester, N. Y. App. filed Nov. 4, 1912. For regulating the motors of dental engines.

1,111,182. TEMPERATURE INDICATOR FOR INCUBATORS; M. L. Rouse, Columbia, Mo. App. filed Sept. 22, 1913. Signal given upon undue increase or decrease in temperature.

1,111,186. GALVANIC BATTERY; C. B. Schoenmehl, Waterbury, Conn. App. filed July 10, 1913. Track-circuit battery for railway signaling.

1,111,201. PROCESS OF EXTRACTING ZINC FROM ITS ORES OR COMPOUNDS; E. E. Watts, Kingston, Ontario, Canada. App. filed Nov. 20, 1913. Uses an electrolyte of highly concentrated solution of zinc sulphate.

1,111,213. ELECTRICAL SIGNAL SYSTEM; A. H. Caven, Youngwood, Pa. App. filed Aug. 20, 1912. Block signaling for overhead trolleys.

1,111,214. TROLLEY SWITCH; A. H. Caven, Youngwood, Pa. App. filed Nov. 15, 1913. For signaling purposes; is engaged and operated by trolley wheel.

1,111,215. ELECTROMAGNETIC SWITCH; A. H. Caven, Youngwood, Pa. App. filed Dec. 17, 1913. Stop-by-step switch for indicating entrance or departure of car to or from block.

1,111,236. THERMOSTAT; H. E. Reeve, New York, N. Y. App. filed Jan. 16, 1913. For fire alarm or sprinkler systems, has a molded insulating base.

1,111,240. OVERLOAD MOTOR-CONTROLLING APPARATUS; A. Sundh, Yonkers, N. Y. App. filed Aug. 16, 1907. Automatic means for operating a circuit-breaker in event of long or excessive flow of current to the motor.

1,111,253. LOUD-SPEAKING TRANSMITTER; H. C. Egerton, Ridgewood, N. J. App. filed Oct. 19, 1911. For announcing systems; special diaphragm lever and button electrode construction.

1,111,257. RAILWAY SIGNALING MECHANISM; H. A. Hoischen, Omaha, Neb. App. filed April 3, 1906. Plurality of signal-actuating instruments operating independently of each other are connected in a single-line circuit.

1,111,263. CONSTANT-POTENTIAL ELECTRICAL SYSTEM; D. R. Lovejoy, Irvington, N. Y. App. filed July 19, 1909. Storage batteries used for bell ringing and like purposes and charged from the house lighting circuit.

1,111,271. JUNCTION BLOCK; A. Plesh, Windber, Pa. App. filed Sept. 17, 1913. Quickly assembled portable type.

1,111,289. ELECTRICAL CONDENSER; J. W. Aylsworth, East Orange, N. J. App. filed Nov. 8, 1913. The dielectric comprises a solid halogen substitution product of a carbo-cyclic hydrocarbon.

1,111,296. ELECTRIC SIGNALING MECHANISM; W. Cook and M. W. Breuer, Denver, Col. App. filed Jan. 17, 1912. Special motor mechanism and gearing for operating the semaphore arm.

1,111,301. PROCESS OF CARRYING OUT CHEMICAL REACTIONS IN CASES BY MEANS OF ELECTRIC ARCS; E. Edwin, M. Hahnle and B. Strasser, Ludwigshafen-on-the-Rhine, Germany. App. filed July 3, 1913. Maintains atmosphere rich in hydrogen in actual zone of reaction while maintaining in the space outside said zone an atmosphere principally of atmospheric air.

1,111,341. METHOD FOR REDUCING ORES; R. S. Wile, Pittsburgh, Pa. App. filed Dec. 15, 1913. The bath of slag surrounds and protects those portions of the upper electrodes which project within the furnace.

1,111,344. ELECTRIC TRAIN-CONTROL SYSTEM; E. Woltmann, New York, N. Y. App. filed Dec. 7, 1908. Has a sectionalized power conductor.

1,111,345. SIGNAL APPARATUS; F. W. Wood, Brooklyn, N. Y. App. filed March 11, 1914. For indicating speed of rotation of a ship's screws.

1,111,351. SUBMARINE SIGNAL-RECEIVING INSTRUMENT; C. Berger, New York, N. Y. App. filed Nov. 4, 1912. Adheres to ship's skin by magnetic attraction.

1,111,358. SHORT-CIRCUITING DEVICE; E. Bretsch, St. Louis, Mo. App. filed Feb. 14, 1914. Plurality of pivoted short-circuiting plates to engage the commutator segments.

1,111,365. SYSTEM OF DISTRIBUTION; E. E. F. Schenectady, Schenectady, N. Y. App. filed March 30, 1911. For determining the line upon which trouble exists and the permanence of such trouble without subjecting the station apparatus to injury.

1,111,381. ARC-LIGHT ELECTRODE; W. L. Harraden, Lynn, Mass. App. filed March 14, 1912. Whereby the arc current enters the arc in substantially equal branches.

1,111,383. ELECTRIC CLOCK; F. Holden, London, Eng. App. filed Nov. 30, 1912. Small electric motor operates the clock mechanism, instead of the pendulum operating it.

1,111,394. ELECTRIC TRAIN-CONTROL SYSTEM; H. N. Latey, New York, N. Y. App. filed March 5, 1909. Sectionalized power conductor normally maintained unbroken by switches having a bias for open position.

1,111,406. PLUG RECEPTACLE AND PLUG THEREFOR; H. R. Sargent, Schenectady, N. Y. App. filed Feb. 2, 1914. Has automatic closure.

1,111,420. INSULATING COMPOSITION AND THE METHOD OF MAKING THE SAME; L. E.

Barringer, Schenectady, N. Y. App. filed May 7, 1914. Sulfurized oil, saponified oil and copal.

1,111,443. METHOD FOR APPLYING A CONDUCTIVE COATING TO THE SURFACE OF MOLD USED IN THE ART OF ELECTROTYPING; G. E. Dunton, New York, N. Y. App. filed Jan. 18, 1913. Inverts the mold and provides a conductive coating upwardly against the same.

1,111,444. METHOD FOR TREATING MOLDS USED IN THE ART OF ELECTROTYPING; G. E. Dunton, New York, N. Y. App. filed Oct. 24, 1913. Sprays the mold with an alkaline soap solution to break the adhesion between the mold and the grease thereon.

1,111,451. STORAGE BATTERY CELL; B. Ford, Philadelphia, Pa. App. filed March 14, 1914. Cellular for indicating when cell has been filled to predetermined level.

1,111,453. LIGHTNING ARRESTER; G. Giles, Fribourg, Switzerland. App. filed July 10, 1913. Adjustable spark-gap in series with a high resistance and with a series of discharges between which spark gaps are provided.

1,111,463. HORN AND SIMILAR INSTRUMENT; M. R. Hutchison, Bronxville, N. Y. App. filed Sept. 15, 1905. Electro-magnetically operated horn.

1,111,464. INDICATING DEVICE FOR BINS; T. E. Ibberson, Minneapolis, Minn. App. filed April 28, 1913. Pressure of the grain in the bin closes an indicating circuit.

1,111,468. AUTOMATIC SECTION INSULATOR; W. H. Kempton, Mansfield, Ohio. App. filed July 13, 1910. Switch for sectional trolley line.

1,111,504. COMMUTATING DYNAMO-ELECTRIC MACHINE; C. H. Smoot, New York, N. Y. App. filed Jan. 6, 1914. Interposed commutating poles having magnetic shields.

1,111,527. CARBURATOR; C. E. Corson, Ridley Park, Pa. App. filed May 27, 1913. Electrically heats the vaporizer of the carburetor.

1,111,546. POCKET ELECTRIC LIGHT; P. H. Oelman, Dayton, Ohio. App. filed Aug. 11, 1913. Has a clip for securing it in a vest pocket, which serves also as a contact device.

1,111,555. TROLLEY SWITCH; J. C. Atterbury, Danville, Ill. App. filed Sept. 4, 1913. Throws automatically at same time track switch is thrown.

1,111,566. TELEGRAPH REPEATER; R. T. Davenport, Williams, Ariz. App. filed Nov. 7, 1913. For single lines; provides increased speed of transmission.

1,111,570. INSULATOR; E. Friedlander, Bradock, Pa. App. filed March 22, 1913. For third-rails.

1,111,574. LINE PROTECTOR FOR TELEGRAPH AND TELEPHONE SYSTEMS; T. Gonzalez y Sebasco, Havana, Cuba. App. filed May 25, 1914. Comprises a base section and a removable fusesecuring section.

1,111,615. AUTOMOBILE SIGNALING SYSTEM; J. A. Ross, New York, N. Y. App. filed Jan. 10, 1914. Electromagnets operate signal panels.

1,111,616. ELECTRIC-OPERATED ALARM; H. W. Fryling, Lowell, N. C. App. filed March 8, 1913. For indicating heating of a journal.

1,111,695. TYPE-PRINTING TELEGRAPH APPARATUS FOR LINE AND RADIO-TELEGRAPH; A. N. Hovland, Christiania, Norway. App. filed Nov. 17, 1911. Embodies a cryptographic mechanism.

1,111,708. AUTOMATIC FIRE-ALARM SYSTEM; J. B. Simms, Sacramento, Cal. App. filed Sept. 24, 1913. Gives a continuous alarm in a number of places.

13,862 (reissue). AUTOMATIC ELECTRIC EX-NEW CHANGE SYSTEM; W. R. Binkley, New Bedford, Mass. App. filed Dec. 16, 1904. (Original patent No. 717,327, dated Dec. 30, 1902.) Automatic telephone.

# Electrical World

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No. 15

## Limited Dealings in Bonds

The plan of the investment bankers to resume limited dealings in bonds will tend to help banking conditions

rather than the investment market. So far as securities can be sold at prices approximating those of July 30 the transactions will mean an invaluable moral support for the collateral security of loans. The announcement of the committee representing the investment dealers shows that the desire is to apply the proceeds of sales to the reduction of loans; if prices are not far from those which prevailed when trading ended in July, any fair volume of transactions will mean a corresponding decrease in the liabilities of dealers to banks and, in the same degree, an increase in the strength of the banking position. The cautious steps in the direction of limited trading which the dealers are thus taking represent a reasonable, determined effort to go ahead and do business. They cannot be interpreted fairly as a sign of anything but a brightening of the outlook. As the days pass funds awaiting investment are piling up. Some of these funds, belonging to shrewd buyers, will be put into securities that can be bought at sacrifice prices. Others will be held until the return of confidence, presaging the end of the war. But a certain part of the money will be invested gradually, and later, if not immediately, in securities at prices and rates of yield that will not differ seriously from those prevailing before the war. Available investment funds are likely to increase rather than decrease, and the careful testing of the market by the bond dealers hastens the day when new financing can be undertaken.

## South American Trade Problems

As compared with former conditions, there is now less effervescent enthusiasm over the outlook for immediate trade in Latin America but a more earnest appreciation of neglected possibilities. This is as it should be. It means that manufacturers here realize more keenly than ever before that they have carelessly allowed their long indifference toward overseas markets to blind them to the great advantage of permanent commercial and neighborly relations with the people of South America. They know now that if they expect to have these relations in the future they must give time, effort and money to the cultivation of them. When the fearful European upheaval was started the general expectation here was that commercial activities of the belligerent nations would necessarily end. With the demand for men for army service and conditions of war upon the high seas, it did not appear to be possible that any foreign markets could be supplied from Europe.

As later developments showed, this was too hasty a conclusion. The main consideration in South American trade at present, however, is not that some of the European nations are continuing industrial activity but that the financial consequences of the war, even in remote South America, are so appalling. Both industrially and for governmental requirements South American countries have been financed so largely in Europe that the interruption of their usual supplies of capital is a serious detriment to current business and future advancement. The problem before manufacturers of this country is not the mere easy sale of goods. It is not the capture of a market left to roam at large without friendly protection. It is the consideration of methods that shall promote neighborly relations with the people of Latin America—social, banking, shipping and commercial. It is such methods that are now receiving serious attention from many in this country of large outlook and interests. Traditional custom and desire make plain commercial rivalry and friendliness our means of conquest in South America.

## Rate-Making for Gas Utilities

The paper on gas rates read by Mr. Henry L. Coleman before the Empire State Gas and Electric Association and reported elsewhere in this issue shows that the commercial possibilities of better rate-making in that industry are being realized. The subject of rate-making has, in fact, been taken up by the American Gas Institute, a committee of which is to render a report on Oct. 22. For many years there has been little change from the old-time practice of selling gas at a fixed price per unit of volume used, but in some localities different rates have been made for different kinds of service with resultant advantage to the producer and without loss to the user. As a whole, the gas industry has been backward in its application of scientific rate-making systems. Crude as some of the rate-making schemes of other utilities have been, they have been more defensible commercially and scientifically than the fixed flat rate, and they have resulted in increases in output and in both gross and net earnings. Whatever criticism may be made of electrical rate-making, it cannot be said fairly that it has prevented the growth of a great industry. It has really greatly accelerated the growth of the industry. Fortunately electrical service is of a kind which in most applications has no competitor that can furnish the required energy as simply, economically or reliably. In other respects it must meet competition, and where it does that fact must necessarily be taken into consideration in rate-



making. Rate-making is a failure unless it results in business advantageous alike to the utility and its customers, and in all attempts to develop a more scientific basis for this vital feature of management this material consideration must be kept in mind.

### The Nature of Reflection

Dr. P. G. Nutting's paper before the Illuminating Engineering Society on specular and diffuse reflection is an excellent summary of the situation to date. The whole story is that when light falls on any substance part of it is reflected, following the ordinary law of mirrors, and part of it is diffused, no substance being sufficiently smooth to scatter no light or sufficiently matte to scatter it all. From a practical standpoint the reflecting properties of paper such as is used for printing give the most important example of mixed reflection. The subject has been considerably discussed, and sufficient data have been accumulated by the author of this paper and others to be of practical service. As Dr. Nutting points out, there is no difficulty in getting a measurement of the ratio between the specular and diffuse reflection by a number of different methods. The main point to consider in choice of the method is that when a pencil of light falls obliquely on a surface, giving mixed reflection, part of it is specularly reflected in a given direction, the rest is diffusely reflected in all directions from the point of incidence. To obtain in absolute measure the ratio in question it is necessary, first, to measure the specular component and, second, to integrate the diffused component over the hemisphere through which it is distributed. The distribution in this hemisphere is approximately determinable from the ordinary theory, but the residual errors, particularly with some surfaces, are likely to be large.

It is not even probable that the locus of the diffuse reflection, if plotted to scale, would be a surface of revolution. While exact figures are therefore difficult to obtain, it is extremely easy, as Dr. Nutting himself and others have shown, to obtain approximately relative values of the two elements of reflection either by direct photometry or by the polarization methods which depend on the fact that at a suitable angle the specularly reflected light is nearly or quite polarized, as can readily be seen by looking at a printed page in the sunlight through a Nicol prism. The detailed study of the light diffusely or specularly reflected in different directions from a piece of paper was first suggested, so far as we know, by E. C. Pickering nearly forty years ago, but oddly enough it is only after the lapse of this long period that the advance in the theory and practice of artificial illumination has brought the subject again to the front. Now, for practical purposes it does not very much matter what particular method is taken for the measurement or whether that method gives the absolute ratio between the light reflected in one way or the other. What is of importance is that a criterion following some definite method of measurement should be determined separating good surfaces from bad as con-

sidered from the standpoint of vision. Whatever criterion may be selected, we are very favorably impressed by Dr. Nutting's suggestion of "glossiness" as the defining name. It strikes us as being much preferable to "glare," which refers to a physiological rather than a physical matter. The main point to be considered is to determine that amount of glossiness which can be conveniently tolerated in papers used for printing, and to apply the criterion rigorously.

### Some Aspects of Industrial Chemistry

The address by Dr. L. H. Baekeland, at Columbia University, to inaugurate the Charles F. Chandler lectureship contains much interesting history and offers many excellent suggestions. The importance of industrial chemistry in modern life is enormous. Human beings are, in a certain sense, chemical engines, and their supply of food is, from the same point of view, an operation in industrial chemistry. As Dr. Baekeland points out, all agriculture is but a branch of industrial chemistry. Man differs from other animals in being able to carry on, with scientific skill, those photochemical processes which result in the production of proteids and hydro-carbonaceous food, whereby a very large surface density of life can be maintained in the cities of our planet.

One of the greatest problems confronting agriculture is the supply of a sufficient quantity of nitrogen to the plants forming the world's crop. Although our atmosphere is about 80 per cent nitrogen, and each square centimeter of the earth's surface therefore supports nearly a kilogram of nitrogen gas, yet plants living in this atmosphere may starve for want of nitrogen in their composition. It is only in recent years that industrial processes have been developed for capturing nitrogen from the air into chemical unions producing solids or liquids available as fertilizers for feeding plants. Already three processes have become available, one causing nitrogen to unite with oxygen in the electric furnace, and another causing atmospheric nitrogen to combine with calcium carbide. The third effects the synthesis of ammonia by the combination of hydrogen and nitrogen.

The address contains an appeal for closer co-operation between financial and engineering interests in this country. Capital is at a disadvantage when it seeks to support a new industrial process, because exaggerated statements are so apt to be made concerning the possibilities of a new undertaking, and because it is difficult to discover the particular new project which has the greatest hope of success. On the other hand, new engineering projects of value often fail merely for the want of reasonable and prudent financial support. Organized methods of effecting closer co-operation between these two forces are slowly making themselves indispensable, from the success attending existing prudent combinations. The value of patent monopoly to enterprise and civilization is pointed out in this connection, since no individual, group or corporation can reason-

ably embark upon a new process necessarily involving large initial development expenditures unless protected through patents by the expectation of a subsequent temporary monopoly of the process in question.

### Station Reconstruction

Rebuilding an electric station without interruption of service is always a feat involving much ingenuity and sometimes a very high degree of engineering skill. The reconstruction of the Fort Wayne power house outlined on another page shows no exception to this rule. The station reorganized had been built only seven years and when constructed gave promise of exceptionally good results. It was of the double-decked type with the turbines on the second floor directly over the boilers, an arrangement which in principle is a good one, leading to short steam connections and an economical design of station; in fact, stations of this character have proved very satisfactory. In this instance, however, whether from the character of the stresses derived from horizontal turbines or from other causes unknown, an amount of vibration developed which made reconstruction and abandonment of the double-deck scheme imperative. All attempts to balance the turbine so as to suppress vibration seem to have failed, and when the conditions of load demanded an increase in equipment advantage was taken of the opportunity to make a complete change in the arrangement of the units and thereby remedy the existing trouble.

The plant contained both twenty-five-cycle and sixty-cycle generators, and the increasing load demanded an increase of sixty-cycle equipment which was met by the installation of a pair of 6250-kva turbo-generators. To accommodate these a building was erected alongside the original station with its turbine floor on the level of the old boiler floor, and a basement was provided for the auxiliaries. The result was a new and efficient plant for the sixty-cycle service, the new turbines being more efficient than the older ones. The main twenty-five-cycle machines had to be moved without interrupting the service on the railway lines to which they fed energy. At least one of these had to be in operation all but continuously except during periods of the very lightest load. The railway turbines were dismantled one at a time, and the pieces were carefully lowered by the traveling crane through a hole in the turbine-room floor, loaded on a flat car and shunted around to the new portion of the station. The ground-floor equipment of auxiliaries was then transferred to the new turbine room, and the whole equipment was put to work without interruption of service, leaving all of the active generating equipment alongside the boiler room in the new building. The old turbine floor was then put to good use by placing in it substantially all the control and switching apparatus for the station, and also installing there three large motor-generator sets, two used for the direct feeding of the railway lines and the third as a frequency changer to enable the night load to be carried from the sixty-cycle generators.

One specially interesting feature of the new portion of the plant is a corridor in the basement for the entrance of cooling air for the generators. After passing through the generators the warm air is turned into the boiler room through suitable ducts. Two of the large condensers and some of the auxiliary appliances as well are installed in this air corridor, and the large entrances into it under the turbo-generators serve to limit to the basement a considerable amount of the noise from the machines which otherwise would be unpleasantly perceptible in the turbine room itself. There is little doubt that lessening the noise conduces to efficiency in the operating staff, for while the attendants become accustomed to the din after a while it is very likely to affect their usefulness to a material extent. Quiet operation of the generating plant is certainly to be desired, and when, as in this case, other useful results can be brought about by the suppression of the noise the result accomplished becomes doubly desirable.

### Colored Screens and Light Filters in Photometry

In modern photometry difference in the color of the lamps under comparison causes much trouble. Any appreciable color difference reduces considerably the precision of the photometric comparison. It is possible to use a flicker photometer in such cases, but many photometrists are inclined to mistrust the flicker photometer and prefer the ordinary steady-illumination photometer, even with all the uncertainties that beset color differences.

If, however, a colored screen can be inserted on one side or the other of the photometer, so as to bring about an approximate color match, then there ceases to be any unusual difficulty in the photometric comparison; but a question immediately arises as to what is the numerical absorption coefficient of the color screen. The color difficulty has thus been shifted, but not eradicated. However, the hope is always before us of arriving at standardized color screens which may be regularly obtainable, durable and easily checked.

Two papers were presented at the Cleveland convention of the Illuminating Engineering Society on this quest of the standard color screen—one, by Messrs. Herbert E. Ives and Edwin F. Kingsbury, on experiments with liquid screens, and the other, by Dr. C. E. Kenneth Mees, on solid screens. The results reported by Dr. Mees on his series of experiments with liquid screens show how difficult it is to produce a standard glass filter cell. Great care had to be given to the mechanical, optical and chemical constituents before cells were produced which gave consistent results. In fact, it would seem that the technique involved is more suited to the standardizing laboratory than to the ordinary photometry room. It is evident that if a satisfactory set of solid-glass screens could be made reproducible within proper limits they would be greatly preferable to liquid screens, although the latter might be resorted to for the standardization of the glass filters.



# The News of the Week

## Activities and Events in the Electrical Field— Reports of Meetings—Commission Findings, Etc.

### New England Section, N. E. L. A., Gives Lecture Service

In accordance with plans advanced at the recent Narragansett Pier convention of the New England Section of the National Electric Light Association a special lecture service has been inaugurated for this fall and winter to present publicly the advantages of using electrical labor-saving appliances in the home. The plan is for central-station companies to make arrangements with women's clubs, etc., for the presentation of these lectures. If any company desires a demonstrator or wishes to have the lectures illustrated, it will receive the co-operation of the section secretary, Miss O. A. Bursiel, who has headquarters at 149 Tremont Street, Boston.

### Washington Dims Residence Street Lamps

Extremely bright lamps will not be allowed on the residence streets of Washington after Oct. 21. A regulation to this effect has been adopted by the commissioners of the District of Columbia, on the recommendation of the Washington City Electrical Engineer.

The regulation prohibits the use of lamps or clusters of lamps exceeding 100 cp on streets other than business streets and so designated by the commissioners. Lamps of unusually bright quality have recently been placed before isolated stores on residence streets, with the result that numerous complaints have been made by householders.

Another new rule in Washington is a regulation requiring a minimum height of 15 ft. for all private lamps or clusters of lamps suspended over sidewalks or other public space. This rule also requires that all such lamps shall be inclosed in opalescent glass in order that eyes of passers-by shall be protected from glare.

Many motion-picture theaters and private hotels, as well as stores, in Washington are affected by the new regulations.

### Toronto Hydro-Electric Needs More Funds

Subject to the consent of the City Council and the Ontario Railway Board, the Toronto Hydro-Electric Commission purposes to increase its capital stock by another \$2,000,000. It is stated the money is required to increase the size of the system and for extensions of the lighting of the streets and parks of Toronto. Included with the amount, however, are a sum of \$443,100.56, the difference between the face value of the debentures already issued and the amount realized by their sale, and a further sum of \$220,428.45 as an allowance to cover the cost and contingencies of the sale of the proposed new issue. The balance of the issue will be expended as follows: Extensions of street and park lighting, \$24,627.93; increasing the supply of energy for the operation of the civic car lines, \$34,713.49, and additions to the system, \$1,260,985.66.

The previous issue of debentures amounting to \$5,650,000, authorized under bylaws, have been sold and the proceeds used on construction and bringing the system to its present standard. It is estimated that the

proposed new issue will be self-sustaining, producing a revenue of \$469,927, of which \$9,927 will be paid by the taxpayers, for extra street and park lighting. After all charges have been met a surplus of \$9,398.46 is anticipated.

### Service Standards of the Illinois Commission

In the rules establishing standards for gas and electric service for the State of Illinois which, by order of the commission, are to become effective Nov. 1, sixty days may elapse between the setting of a customer's meter and checking the same meter for correct connection, proper mechanical conditions, suitability of location, and accuracy of measurement within 4 per cent. Concerning voltage variation on lighting circuits, the rules specify that fluctuation shall not exceed 5 per cent plus or minus for a longer period than one minute at each instance. On motor-service circuits a fluctuation of 10 per cent is allowable. The rules require that free line extension shall be made for a single customer or group of customers, provided that the line extension does not require more than twice as many poles at standard spacing as there are individual applicants.

### Senate Adopts Trust Bill Report

The Senate on Oct. 5 adopted the conference report on the Clayton anti-trust bill, which is the equivalent of passing the bill, provided that no alterations are made in the report by the House, and it is definitely understood that none will be. If anyone in the House should attempt to make any alterations, it is stated in Washington that the rules committee will bring in a rule shutting off debate. The bill will be sent forthwith to the White House for signature.

There is but one possibility in the way of this, and that is that Southern Democrats in the House may attempt a filibuster to prevent the passage of any legislation unless the House agrees to pass some measure for the relief of Southern cotton growers.

President Wilson has told callers at the White House during the week that the sharp attacks that have been made on the Clayton bill conference report have but confirmed him in his approval of the work of the conferees. He will sign the bill.

The report was adopted in the Senate by a vote of thirty-five to twenty-four. Senator Reed did his best to have the bill recommitted with instructions to restate for violations of certain sections criminal penalties which were in the bill as it was passed by the Senate and were taken out by the conferees. In this he failed. Two other Democratic Senators voted with him against the adoption of the report, Senators Lane and Martine. His first test of strength, which was on motion to recommit the report, brought him five votes of Democratic Senators, namely, Lane, Martine, Thomas Vardaman and Williams. Senator Root was the only Republican who voted against the motion. Later he voted against adopting the conference report. Senator Poindexter, the only Progressive Senator in the cham

ber, voted against the Reed motion to recommit, but for the motion to adopt.

Immediately after the final vote was taken on the bill Senator Reed announced that he intends to introduce a new bill to restore the criminal penalty clauses contained in the original bill.

The present plan in Washington is for Congress to take a recess from about Oct. 15 to about Nov. 15. Congress has been in session eighteen months.

### American Patent Law Association

As a meeting of the Washington Patent Law Association held Sept. 28 several amendments to the articles of association were adopted to define more clearly the national character of the organization. For a long time the number of members residing outside the District of Columbia has exceeded the number residing within the District, and the growth of the membership from the country at large has been so rapid that the non-resident members now outnumber the resident members three to one. The association has on its rolls a large proportion of the leading patent lawyers of the United States and a goodly number from other countries.

At the meeting the name was changed to the "American Patent Law Association," and provision was made for the organization of advisory councils in different localities throughout the United States. It is thought that such a plan will be of advantage to the association in carrying on its work in connection with matters pertaining to legislation and administration relating to the patent system. The action was taken after the submission of the proposition to the entire membership and its nearly unanimous indorsement.

The present officers of the association are: Mr. Ernest W. Bradford, president; Mr. Frank L. Browne, first vice-president; Mr. J. H. Brickenstein, second vice-president; Mr. Eugene G. Mason, secretary, and Mr. Langdon Moore, treasurer. These officers, together with Messrs. James M. Spear, H. E. Peck, W. B. Kerkam, A. S. Steuart, T. E. Robertson and W. S. Hodges, constitute the board of managers.

### Hearing in Boston on Electric-Vehicle Charging Equipment

A hearing was given at Boston, Mass., recently by Fire Hazard Commissioner James H. O'Keefe to a group of representative electric-vehicle, insurance and central-station men upon proposed regulations governing the installation of electrical equipment in garages in the Boston metropolitan district. President Day Baker of the Electric Motor Car Club of Boston marshaled the following list of speakers on behalf of a set of proposed regulations designed to afford safe operating conditions without handicapping installations of electrical apparatus: Messrs. W. H. Blood, Jr., insurance expert of the National Electric Light Association; J. A. Hunnewell, chairman New England Section Electric Vehicle Association of America; F. A. Barron, C. M. Greene and A. H. Abbott, of the General Electric Company; T. J. Pace, of the Westinghouse Electric & Manufacturing Company; C. H. Miles, Edison Electric Illuminating Company of Boston; I. Osgood, Boston Board of Fire Underwriters, and G. S. Lawler, Factory Mutual Fire Insurance Companies, Boston.

The proposed regulations provided that switchboards and charging panels in garages containing gasoline must have all circuit-opening devices either placed at least 4 ft. above the floor or inclosed with a wire screen

of not more than No. 14 mesh, or they must be installed in a separate fireproof room or inclosure provided for this purpose. It was also provided that motors or dynamos not actually a part of a vehicle, if not placed at least 4 ft. above the floor, must be of the fully inclosed type, and that motors installed above the floor, if not of the fully inclosed type, should be provided with a wire screen of not over No. 14 mesh over the opening at the commutator end. The speakers stated that, so far as had been learned, no garage fire had ever originated from electric charging apparatus, and that the adoption of the proposed rules, which compare closely with similar regulations in New York and Chicago and which the various electrical interests are prepared to recommend for adoption in the National Electrical Code, will entirely safeguard garages from the electrical fire hazard.

Commissioner O'Keefe stated that he was highly pleased with the method adopted by the electrical interests in presenting the matter and that he would weigh all the arguments and adopt rules that would protect the community against undue fire hazard, without interfering with business.

### New York Electrical Show

With almost 100 different companies and societies represented, the New York Electrical Exposition and Motor Show opened at the Grand Central Palace Oct. 7, and, judging from the large attendance and the keen interest shown in everything electrical on the opening days, the show promises to be the most successful of its kind ever held. All the exhibitors evinced a spirit of optimism, and there was generally a feeling that business confidence is being again felt.

One of the noteworthy features of the exposition is the prominent part that the United States government is taking in the various displays. Apropos of the universal interest being taken at present in war and its developments, the exhibits of the Army and Navy Departments are particularly timely.

The various uses to which electricity is being put in the manufacture of cartridges is shown in an exhibit from the government arsenal at Frankford, Pa. The different processes are demonstrated, from the drawing of the brass shell to the loading and fixing of the steel-jacketed bullet. An interesting piece of apparatus of the army exhibit is a hand-operated generator for use by the signal corps. This machine is operated by two men and supplies sufficient energy for a field wireless outfit. Navigating appliances, steering devices and a signal system make up part of the naval demonstration. The wireless equipment of a ship-of-war is demonstrated by a class from the Brooklyn Navy Yard. What is left of the lighting generator used on the United States ship *Maine*, which was destroyed in Havana harbor, is also on display. The Treasury Department is represented by a fully equipped mint from the United States establishment in Philadelphia. This exhibit shows the whole process of coin production from the melting furnace to the stamping and weighing machines.

Among the commercial and industrial booths those of the Edison Electric Illuminating Company of Brooklyn, the New York & Queens Electric Light & Power Company, the New York Edison Company and the United Electric & Power Company—the four large central-station companies of New York—are of interest. The Westinghouse Electric & Manufacturing Company and the General Electric Company and its affiliated concerns are also well represented. Numerous other manufacturing companies have booths, and practically every phase of the electrical industry is represented in



one way or another. One of the interesting features of the show is the automobile track, on which are demonstrated various types of electric vehicles.

## AMERICAN ELECTROCHEMICAL SOCIETY

Highly Successful Convention Held at Niagara Falls—Abstracts of the Papers Presented—Interesting Practical Demonstrations

The twenty-sixth general meeting of the American Electrochemical Society, held in Niagara Falls on Oct. 1, 2 and 3, proved exceedingly enjoyable and successful. A novel feature of the professional session was a symposium on the practical side of electrochemical investigations. The attendance was over 200.

The first session was called to order by President F. A. Lidbury in the convention hall of the Clifton Hotel. In the afternoon of Oct. 1 an excursion was made to Foster's Flats, near the Whirlpool Rapids, while the evening was devoted to a most elaborate and lively smoker under the auspices of Section Q and its chairman, Mr. L. E. Saunders.

On Friday morning the works of the International Acheson Graphite Company were visited, where the pressing of large amorphous carbon electrodes and their subsequent transformation into graphite electrodes in electric furnaces were shown. The party then proceeded to the plant of the Niagara Alkali Company, where potassium chloride is electrolyzed in the Billiter (Siemens & Halske) cell. The products are caustic potash and chlorine gas, which is worked up into bleaching powder, hydrochloric acid and liquid chlorine. Finally one-half of the party visited the triple-plating department of the Spirella Corset Company, the other half the power house of the Cliff Electrical Distributing Company.

The second session was held at the Clifton Hotel on Friday afternoon. The evening was devoted to a banquet at the same place, followed by a brilliantly illustrated lecture on the physical nature of color, by Dr. C. E. Kenneth Mees, director of the research laboratory of the Eastman Kodak Company.

Abstracts of many of the papers presented follow. Others on "Base-Metal Thermocouples," "Determination of Radium," "Silicidized Carbon-Silfrax," "Electrolytic Insulation of Aluminum Wire" and "Electro-Percussive Welding" will appear in a subsequent issue.

### Electrometric Titrations

A paper by Mr. Henry Ziegel, of Brookline, Mass., on electrometric titrations dealt with a possible technical application of the change in potential at the end point when a bichromate solution is reduced by a solution of ferrous salt. The change in potential in the ferrous iron-bichromate titration is about 0.2 volt or greater. The author has been successful in applying this change in potential to the regulation of the burette stopcock in such a manner that the stopcock closes automatically when the end point of the titration is reached. When the change of potential takes place immediate contact is made in a relay circuit.

### Copper Electrode

A paper by Prof. Frederick H. Getman, of Bryn Mawr College, on the reproducibility of the copper electrode reaches the conclusion that of the various forms of copper electrode which have been studied that in which spongy copper is employed is the only form which is constant and reproducible. The irregularities observed with electrodes of massive copper and with electrodes of platinum covered with an adherent deposit of copper may be ascribed to a condition of metastabil-

ity. The spongy modification of the metal is to be regarded as the stable modification under ordinary laboratory conditions.

### Nickel Determination

A paper by Mr. W. Judson Marsh on the electrolytic determination of nickel discussed some difficulties experienced with the usual method of Classen and described a new electrolytic method which gives very satisfactory results.

### Impurities in Cathode Copper

In a paper by Mr. Lawrence Addicks, of Douglas, Ariz., the sources of impurities in cathode copper were discussed on the basis of a large quantity of data collected from six large electrolytic copper refineries.

Impurities in refined copper may (a) cause a low electrical conductivity, (b) result in brittleness or weakness, or (c) be a source of loss of by-products of value. The first class is represented by phosphorus, aluminum, silicon, arsenic and antimony; the second by bismuth, lead, tellurium and selenium, and the last by silver, gold, platinum and palladium. It is further interesting to note that class (a) forms with copper alloys of excellent mechanical properties while class (b) is practically insoluble in copper, forming a brittle matrix around the copper grains in the cast bar.

From the refining point of view, impurities may be due to (d) electrolytic deposition, (e) inclusion of electrolyte in the crystalline structure of the cathode, (f) mechanical contamination from anode slimes suspended in the electrolyte and attaching themselves to the cathode, and (g) substances entering during melting from furnace, fuel and tools, and from other outside sources. It must be remembered that the finished copper is guaranteed to run at least 99.88 per cent copper, that it commonly does run 99.93 per cent in the melted bar, and that it is very unusual to find 0.01 per cent of any one impurity except oxygen, probably as cuprous oxide in solid solution, or possibly some other dissolved gas, such as argon or carbon monoxide.

From the author's careful analysis of his evidence, it appears that slimes, including electrolyte, and direct deposition all have a hand in the fouling of cathodes, but that it is not possible to assign definite values to each cause. However, the author has established a definite relation between arsenic and nickel in the electrolyte and in the wire bars.

In discussing the paper Dr. W. R. Whitney emphasized the importance of electrolytic copper refining for the electrical industries, as it is of utmost importance to make electrical apparatus as small as possible and as light as possible, so that the copper should be as highly conducting and therefore as chemically pure as possible.

### Electroplating

The last four papers of the Friday afternoon session dealt with subjects of electroplating.

A paper by Prof. W. Lash Miller, of the University of Toronto, dealt with the formation of a badly conducting film on copper anodes in copper cyanide solution; one by Prof. Frank C. Mathers, of Indiana University, with the electrodeposition of lead from lead acetate solutions; one by Messrs. Frank C. Mathers and Barrett W. Cockrum with the electrodeposition of lead from lead lactate and lead formate solutions, and finally one by Messrs. Frank C. Mathers and Barrett W. Cockrum with the electrodeposition of tin from tin salts of mineral acids.

### Evaporation in Electrochemical Plants

Mr. Otto Mantius, of Buffalo, N. Y., read a paper on the evaporation and the power problem in electrochemical plants. The principal object of the paper was to point out the economic and practical disadvantage of a high-

pressure straight triple effect when handling caustic liquor up to 50 deg. Baumé, and the good results that may be obtained from a compound or triplex condensing engine when working in connection with a double-effect evaporator or a combination of low-pressure triple effect and single effect with a cast-iron heating surface.

#### Symposium on the Practical Side of Electrochemical Investigation

The whole of Saturday was devoted to a symposium on the practical side of electrochemical investigation held at the FitzGerald Laboratories, which are ideally suited for this purpose on account of the splendid facilities available. The symposium consisted of informal demonstrations of apparatus, methods and materials used in electrochemical investigations or as aids to chemical investigations. Each demonstration was followed by an informal discussion.

Mr. F. A. J. FitzGerald showed the heating of a carbon rod and the formation of a fused silica tube from sand placed around the carbon rod, with a convenient arrangement of four transformers which can be connected up in different ways for furnace regulation.

Mr. L. E. Saunders showed a resistor furnace arrangement useful for melting point determinations, the charge in the chamber being heated by radiation from a resistor at the top in the form of a graphite plate sawed in such a way as to force the current to pass in a zigzag path through the plate. Mr. Saunders then showed the behavior of an amorphous carbon tube in short-circuit between graphite blocks in a 50-volt circuit. The construction of wire-wound tube and crucible laboratory furnaces with alundum as refractory was shown, the method of winding being demonstrated by Mr. J. B. Glaze. Nichrome ore is used as the resistor material for temperatures up to 1000 deg. C.

Mr. FitzGerald showed a 50-volt, 1200-amp arc furnace with graphite electrodes and demonstrated in it the melting of lime.

Mr. A. T. Hinckley exhibited a new refractory brick of the National Carbon Company called "vitrocarbon brick," which withstands temperatures up to 2400 deg. C. in a reducing or neutral atmosphere, and also a sample of a new heat-insulating brick.

Mr. Hinckley then demonstrated the method of measuring the resistance of joints of carbon electrodes screwed together.

Mr. E. R. Cole demonstrated the great ease of machining graphite and the production of the most varied forms of graphite articles for special purposes, for instance, the production of a resistor tube by sawing a special curve into a graphite tube, graphite terminals for mercury-arc rectifiers, etc.

Mr. Dantzzen showed a molybdenum-wire-wound alundum-tube furnace of the General Electric Company for temperatures up to the melting point of alundum (about 1900 deg. C.).

Dr. Carl Hering, of Philadelphia, Pa., exhibited a simple model of his pinch-effect furnace in which he demonstrated the melting of lead, the agitation produced by the "pinch effect" being clearly shown.

Mr. L. W. Chubb demonstrated the electro-percussive method of welding aluminum wires together.

Mr. Wile demonstrated an electric furnace for melting tin dross, in which the tin dross is melted below a layer of glass as resistor, while the two electrodes extend from above at the two sides into the glass in the furnace. The furnace has also been used for melting glass.

The Cottrell electrostatic process for the precipitation of solid particles from fumes was demonstrated by Mr. Landolt, of the Research Corporation. Direct current was produced by a special commutator at an emf of

40,000 volts. The demonstration was made successfully with zinc oxide, and later with phosphorus fumes.

Mr. Hinckley demonstrated a method for determining the rate of oxidation of electrode materials used for different purposes.

Mr. FitzGerald exhibited a tube furnace for melting point determinations in which the tube is embedded in granular carbon, which is the resistor. A thermoscope, using silver sulphide, was also demonstrated by the FitzGerald Laboratories.

After a hearty vote of thanks the meeting adjourned. The next meeting will be held in April, 1915, at Atlantic City, N. J.

## MEETING OF EMPIRE STATE ASSOCIATION

### Tungsten-Lamp Renewals and Variable Rates for Gas Among the Subjects Under Discussion

Tungsten-lamp renewals, meters, variable rates for gas, a review of the work of the last year and the election of officers were the matters which received attention at the annual meeting of the Empire State Gas and Electric Association held at the Engineering Societies Building, New York, on Oct. 2.

#### Hydroelectric Policy of New York

In his annual report Mr. James T. Hutchings, of Rochester, the president, discussed the work of the association during the last year and mentioned particularly the question of the hydroelectric policy of New York State. The association supplied information which was used in public argument by the member companies. Mr. Hutchings believes that this active campaign on the part of member companies had a great influence in the defeat of the public ownership plan of the Conservation Commission. The policy has been to maintain the position of the industry through frank discussion and presentation of the facts, and the executive committee believes that this policy should be continued, that the industry is of sufficient importance to receive attention at the hands of the State, and that the best manner of presenting the case is along straightforward lines such as were adopted in the case of the letter sent to Governor Glynn recommending for New York State the water-power policy adopted by the National Conservation Congress.

It is the belief of Mr. Hutchings that in the session of the Legislature to be held during the coming winter it will be possible to assist in the passage of sane legislation along conservation lines which will settle this vital question in the right way for the future. Representatives of companies should, wherever possible, ally themselves with such organizations as the National Conservation Congress and the New York State Waterways Association, as the influence of these associations has had a great effect upon legislative enactment for conservation.

Mr. Hutchings also spoke of the development of the gas and electrical industries and declared that each one should act separately in building up its own business. In conclusion he mentioned the effect which the war will have in lessening the supply of capital.

Mr. Stuart Wilder, Mount Vernon, N. Y., presented his report as treasurer, showing that the association is in excellent condition financially.

#### Report of Committee on Meters

The report of the committee on electric meters, which is composed of Messrs. C. G. Durfee, Rochester, N. Y., chairman, and S. G. Rhodes, was presented by Mr. Durfee. From the report of the meter committee of the Association of Edison Illuminating Companies and from



the remarks of Prof. Elihu Thomson, of the General Electric Company, the committee feels that there is good reason to hope for the production in the near future of satisfactory maximum-demand and integrating meters of small size at a considerably lower price than any now available.

The report was discussed by Messrs. S. G. Rhodes, H. W. Peck, F. B. H. Paine, E. M. Ellsworth, J. T. Hutchings and C. A. Graves.

#### Variable Gas Rates

Mr. Henry L. Coleman, general manager Empire Gas & Electric Company, of Auburn, N. Y., described variable gas rates. In order to obtain the maximum sales of gas it is necessary to adopt rates that place gas in the strongest competitive position with any other source of light, heat and power. Mr. Coleman outlined a system of rate-making that follows the ideas suggested by the Railroad Commission of Wisconsin in the case of the State Journal Printing Company versus the Madison Gas & Electric Company; that is to say, a division of the annual expenses into two classes of costs—first, those which bear relation to the number of consumers or meters, called consumers' expenses; second, those which vary with the number of cubic feet of gas used, or output expenses.

Engineers should be employed to analyze costs, and especially to arrive at a fair figure for consumers' expenses. Expense items that are considered to be wholly consumers' expenses should be definitely allotted as part of that cost. Interest, profit and depreciation on the value of service and value of meters are figured. Other expense items should be divided between the two expense classes as seems fair and just. The result of such an investigation in one town showed an annual consumers' expense of \$6.04 per consumer. Upon this information a rate was made of 50 cents per month per meter consumer's charge plus 80 cents per 1000 cu. ft. for all gas consumed.

Mr. Coleman said that with a rate of this kind representatives would have a powerful argument for the use of gas for fuel. Such a system of rate-making does away with rates that might be regarded as special and discriminatory. The old sliding scale rate, in the opinion of Mr. Coleman, is less satisfactory than the system which he outlined.

Through discussion of a new rate-making plan by representatives of the company and newspapers, Mr. Coleman said that considerable publicity is obtainable. People who have not previously considered the many points involved will analyze costs in their own cases, and this is certain to be of estimable value to the new-business department. In one community where a system of charging similar to that outlined was established the rate is 50 cents per month per meter consumer's charge plus 90 cents per 1000 cu. ft. for gas. In summing up the operation of a system including the principles which he discussed Mr. Coleman emphasized the following points:

Uniform rates are economically wrong. Maximum sales depend on the competitive position of gas. Unprofitable consumers would pay at least what it costs to serve them. The profitable consumer would be relieved of the burden of the unprofitable one. Reductions in rate would be based on total net revenue instead of being made by the haphazard method previously employed. Lower rates would be possible, benefiting the whole community. New business would be acquired more easily and at less cost. A better standing before the Public Service Commission would result, as the rate is on a scientific basis. Better relations would exist with the public.

One part of the paper of Mr. Coleman was devoted to the subject of special rates for special uses. The

speaker said that rates for gas and electric energy are more analogous to railroad freight rates than to any other class of rates. However, it has been thought proper in gas and electric industries to make rates according to the quantity used. Mr. Coleman thinks that rates based on this theory are discriminatory, but that it would not be a discrimination to give a lower rate for gas to a baker for baking bread than to a large dry goods store for lighting. A large amount of business can be obtained by gas and electric companies only when they make special rates for special uses. The only way to reach this business, in the opinion of Mr. Coleman, is to make rates comparable with railroad commodity rates; that is to say, rates are based on use.

The paper of Mr. Coleman was followed by a long discussion which brought out many points that were of interest to both the gas and the electric representatives. Among those who discussed the paper were Messrs. T. R. Beal, H. W. Peck, R. M. Searle, J. B. Klumpp, L. C. Purdy, A. D. Dudley, E. H. Palmer, C. G. M. Thomas, L. H. Scherck, William McClellan, C. H. Graf and J. T. Hutchings.

#### Tungsten-Lamp Renewals

Mr. J. W. Lieb, Jr., New York Edison Company, presented a paper on the subject of tungsten-lamp renewals. He first outlined the development of lamps and then stated the four methods by which renewals could be made. First, there could be free supply and renewals; second, the company could supply lamps at cost, foregoing any profit; third, the company could supply lamps at list prices, making a profit thereon; fourth, the company could refrain from handling lamps at all.

The paper of Mr. Lieb contained a full discussion of the various questions and considerations involved. He presented concisely and fairly the arguments advanced by the exponents of the different methods. One of the chief reasons which, he said, are advanced in favor of the policy of free supply and renewals is that this method gives the central station control of the lamp situation, enabling it to prevent the use of poor-grade lamps and the resultant poor service which follows.

In the discussion that resulted from the points suggested by the paper of Mr. Lieb some of those who were present expressed the opinion that the only way for a central station to retain control of the lamp situation, and therefore of the resultant service, is through the policy of free supplies and renewals. Others did not agree with this conclusion, but it was agreed by all who discussed the subject that it was absolutely necessary that the central station should control the lamp situation in order to protect the quality of its service. Those who discussed Mr. Lieb's paper were Messrs. J. C. De Long, E. H. Palmer, J. T. Hutchings, E. M. Ellsworth, L. H. Scherck, C. G. M. Thomas, H. W. Peck and J. O. Carr. At the conclusion of the discussion Mr. Hutchings asked that all of the member companies send letters to the executive committee expressing their views on the questions raised by the consideration of this subject.

#### Election of Officers

Mr. Whitney, of Oswego, then presented the report of the nominating committee. The secretary was instructed to cast one ballot for the nominees. The new officers are: President, Mr. J. C. De Long, Syracuse; first vice-president, Mr. E. H. Palmer, Geneva; second vice-president, Mr. Stuart Wilder, Mount Vernon; treasurer, Mr. H. W. Peck; secretary, Mr. Charles H. B. Chapin. Members of the executive committee to serve two years: Mr. A. B. Tenney, of Boston; Mr. G. M. Cole, of Plattsburg, and Mr. S. J. Magee, of Ithaca. Members of the executive committee to serve three years: Mr. J. T. Hutchings, of Rochester; Mr. C. H. Graf, of Albany, and Mr. William R. Huntley, of Buffalo.

## REPORT ON SEATTLE MUNICIPAL SYSTEM

### Objections Raised to Unit Costs Made Therein and to Rates for Street Lighting—Superintendent Ross Answers Criticisms

The lighting department of the city of Seattle, Wash., has recently issued its second report, which covers the years 1912 and 1913. Besides giving a condensed history and description of the property, the report contains a schedule of costs which shows the money spent for each part of the electric-lighting plant, as well as tables of unit costs of various kinds of construction work done by the department. The table printed herewith gives the total costs of each of the main subdivisions of the system and the cost per kilowatt of generator equipment. The rating of the generators is taken as the output on a 40 deg. C. temperature rise. In order to reduce costs to a unit basis, each item of the plant has a rating in kilowatts

COST OF SEATTLE MUNICIPAL POWER PLANT, DEC. 31, 1912

Division of Plant	Cost	Cost per Kw on Basis of 15,400 Kw Rating
Wood crib dam	\$61,863.80	\$3.96
Penstocks	299,471.59	19.32
Power station	354,387.44	22.86
Transmission lines	232,029.62	15.01
Substations	242,096.21	15.62
Lake Union auxiliary station	95,550.32	6.16
<b>Total generating system</b>	<b>\$1,285,998.98</b>	<b>\$82.96</b>
Commercial distributing circuits, with poles, installations, meters, service lamps, motors, etc.	\$966,906.87	\$62.38
Street-lighting system	616,416.25	39.77
Cluster street-lighting system	358,049.33	23.10
Underground distributing system	398,165.94	25.69
Street cars	128,797.73	8.12
	774.44	.05
<b>Total of distributing system</b>	<b>\$2,466,110.56</b>	<b>\$159.11</b>
<b>Total cost of plant, exclusive of new masonry dam now under construction</b>	<b>\$3,752,109.54</b>	<b>\$242.07</b>
Cost per hp at generators, on a basis of 20,800 hp rating:		
Generating system	\$61.83	
Distributing system	118.36	
<b>Total system</b>		<b>\$180.39</b>

assigned to it, and to simplify comparison the dam, penstock and generating units are rated in terms of the output at the generator. Detailed tables of unit costs for wires in place, poles, service and installations cover seven pages and were compiled by the department from the records of the actual cost of doing this work. During the last two years the number of customers has increased from 18,720 to 29,095, and in the face of two rate reductions the earnings have increased from \$727,383 in 1911 to \$910,477 in 1913.

A review of the financial statement, together with a synopsis of reviews and expenses of the lighting department from the years 1905 to 1913 inclusive, occupies the second half of the report, which is a 136-page document and is illustrated throughout with views of various parts of the system and of streets, commercial and industrial establishments, residences, public buildings, churches, etc., in which electricity purchased from the municipal system is used.

#### Accuracy of the Report Questioned

Shortly after the issuance of the report complaint was made that the hydroelectric cost data and much of the other information given in it were not founded on facts, and a member of the staff of the *Electrical World* was detailed to look into the matter. According to Mr. W. J. Grambs, of the Puget Sound Traction, Light & Power Company of Seattle, the report would

give the impression that the municipal lighting plant has been constructed at a remarkably low cost. The method employed in arriving at the cost per kilowatt of the generating system, he maintains, was to take the total cost at the end of 1912 of the crib dam, penstocks, power station, transmission lines, city substations and the Lake Union auxiliary station and divide each of these costs by 15,500, the assumed rating of the generating system. In the report the crib dam is rated at 9000 kw, penstocks at 11,000 kw, generators in the Cedar Falls station at 13,500 kw, and the generator in the Lake Union auxiliary station at 1900 kw. Mr. Grambs said that at a recent hearing before the Public Service Commission of Washington, at North Yakima, the superintendent of the municipal system had testified that the penstocks would probably fail at 11,000 kw, even if the water were available, and that he had repeatedly stated officially, when urging the acquisition of additional water-powers by the city, that the system had reached its maximum output at 10,000 kw. As a matter of fact, the maximum output of the Cedar Falls plant as shown by the load data sheets kept in the generating stations occurred in November, 1913, and was 10,100 kw. Mr. Grambs said that the Cedar Falls station contains two 1200-kw units and two 4000-kw units, making a total of 10,400 kw, which should be the figure used in determining the cost per kilowatt of the system. For the purpose of the report the rating of the 4000-kw units is given as 5000 kw and the 1200-kw units are given a rating of 1750 kw, while the 1500-kw machine in the Lake Union station is rated at 1900 kw, making a total of 15,400 kw, which for the purpose of calculation has been raised to 15,500 kw.

The investment in crib dam, penstocks, Cedar Falls plant, transmission lines and substations, as given in the report for 1912, is \$1,190,448.66. To this should be added certain items shown in the report such as transmission-line right-of-way, substation sites, etc., amounting to \$29,397.28, making a total investment of \$1,219,845.94, which on the basis of 10,400 kw gives a unit cost of \$117.29 per kw of the generating system, exclusive of the Lake Union auxiliary plant. Moreover, the report shows that up to Dec. 31, 1912, \$618,628.25 has been expended on a new masonry dam, which is being erected below the crib dam, and inasmuch as the contract calls for a dam carried up to practically the same height as the crib dam, the new dam will add very little to the present rating of the plant. The cost of this dam should be taken into consideration in arriving at the cost per unit in the plant. Mr. Grambs also pointed out that the cost of the Lake Union auxiliary plant is given at \$6.16 per kw. This station is rated at 1500 kw and cost \$95,550.32 up to Dec. 31, 1913, so that the unit cost would be \$63.70. The load-factor of this plant is entirely different from that of Cedar Falls in that the water department, which owns the reservoir, will not permit water to be drawn for a longer period than two hours at a time without notice. The lighting department pays the water department 1 cent per kw-hr. for all energy generated at the Lake Union plant, and in 1913 54,500 kw-hr. were generated; besides this, 45,100 kw-hr. were purchased during the year from the Schwager-Nettleton Mill Company. Since the hydraulic development was made by the water department, and the lighting department installed the generating plant, the latter occupies the position of a purchaser of power. It would therefore be proper to capitalize a part of this charge of 1 cent per kw-hr. and get a unit cost. This should be added to the \$63.70 per kw in order to arrive at a fair unit cost of the Lake Union station.

If the cost per kilowatt of the Cedar Falls plant at the end of 1913 be taken, the report shows that a total



investment of \$1,282,301.42 was made, which on a 10,400-kw basis gives the cost per kilowatt as \$123.30. In addition to this, there had been expended on the new masonry dam up to Dec. 31, 1913, the sum of \$1,037,807.28. This would add \$99.79 to the unit cost, making the total cost of the generating system \$223.09 instead of \$82.96 per kw. The report of the cost of the system includes the Lake Union auxiliary, and at the end of 1913, according to Mr. Grambs, the investment in the dam when completed to approximately the same height as the crib dam will be \$1,250,000, so that the cost per kilowatt of the system will be \$243.49.

Mr. Grambs also maintained that an analysis of the report would show that the average rate per kw-year paid by the municipality for street lighting is \$189.99, while private consumers buy energy for lighting service at the average rate of \$62.82 per kw-year. According to the report, the street lighting for lamps consumed 4,799,670 kw-hr. at the rate of 4.39 cents per kw-hr. Lamps are said to burn 4000 hours a year. With the prevailing rates private consumers using light in business houses for 4000 hours a year would be charged only 2.53 cents per kw-hr. On Oct. 9, 1912, the Puget Sound Traction, Light & Power Company offered to furnish energy for lighting the city of Seattle at its tariff rate of 2.75 cents per kw-hr., maintain the street-lighting system at its own expense and turn the same over to the city in first-class condition at the expiration of the contract, pay 25 cents per pin rental on city poles, and in addition offered to pay the city \$40,000 a year as rental for use of the street-lighting system owned by the municipality.

While private consumers enjoy a rate of from 1.5 cents to 2 cents for energy for motors, public buildings pay a rate of 3 cents per kw-hr. for energy for lighting and 2.5 cents per kw-hr. for energy used by motors. In 1905, the last year in which the city lighting service was supplied by a private company, the city paid \$66 a year flat for a 6.6-amp arc lamp. These lamps were purchased by the city when it took over the private company's street-lighting system and are still in use. According to Mr. Grambs, the data supplied by the superintendent for the municipal system show that the municipality is being charged \$77.40 per lamp a year for this same service when the energy consumed is measured at the lamp and \$89.33 per year if the energy consumed is measured in the substation.

#### Superintendent of Municipal System Defends His Figures

When these charges were brought to the attention of Mr. J. D. Ross, superintendent of the Seattle municipal lighting department, he said that his report was filed with every effort and intention to present the facts exactly as they were and intimated that Mr. Grambs' position with the competing Puget Sound Traction, Light & Power Company was responsible for his misconstruction of the figures given in the report. To get at a unit cost per kilowatt installed the basis taken was the 40 deg. rating of the machines. Each of the 4000-kw, 35 deg. C. rise machines, he said, is operating at over 5000 kw and is rated at 5000 kw 40 deg. C. rise, while each of the 1200-kw machines will run continuously at 1750 kw with 40 deg. C. rise. The Lake Union station, he said, delivers 2000 kw. With the new dam, now nearly complete, the penstocks, which would now fail at about 11,000 kw, will carry the full 13,500 kw without any change whatsoever owing to the raising of the lake and the shortening of the pipes.

The Lake Union plant takes its water from the overflow of the water department's reservoir, as stated in the report. The cost given includes \$41,456.51 for a steel penstock from the reservoir to the plant. The station is intended for emergency use and seldom runs

more than a few minutes during interruption to the regular service. The costs given do not include real estate or plant under construction, nor any store or office equipment. All the items included are listed with as much detail as possible, and no attempt, Mr. Ross claims, was made to make a showing of cheap construction. The actual costs were given with the hope of adding to the value of the report for engineers who might make use of the cost data. The unit cost of \$117.29 per kw, as given by Mr. Grambs, based on a name-plate rating, is certainly not unreasonable, but is misleading because the real continuous rating of the machines is more, and rating them at 40 deg. C. rise is standard practice.

When the new dam is finished and added to the plant, and before any more generating units are installed, the unit cost of the system will certainly be raised. An ultimate development of 33,500 kw will cost about the same per kilowatt as the present plant. It is not true, Mr. Ross said, that the new dam will be the same in height as the old. The present contract calls for an elevation of spillway of 1590 ft., while the present dam has an elevation of 1550 ft. The new dam, which will cost \$1,400,000, will be of solid masonry instead of timber and rock, so that the added safety is enough to warrant its being built, aside from the fact that it increases the storage sevenfold.

As to the rates charged by the lighting department to the city and to private consumers, the only deviation that is made from the printed schedule is to favor the water department, which pays 2 cents per kw for energy for motor service with no minimum charge although the pumps run only a few months in summer. In no case is any city building paying more for energy than is shown on the printed schedule. As to the street lighting rate, which is fixed by the City Council, this rate includes maintenance, fixed charges on the lighting system and operation, including replacement of globes and lamps. This service is not comparable to that furnished as "business lighting," which requires the customer to own and care for his lamps and fixtures. Very few arc lamps of the old type are now in use, most of them having been replaced with tungsten and nitrogen-filled lamps. The rate is now on a kilowatt hour basis, which makes the arc cost more and the incandescent less than in 1912, the average being considerably less. The 400-cp nitrogen-filled lamp now used in place of the arc lamp will cost the city \$45 per year in 1914. Mr. Ross states that the proposal of the Puget Sound Traction, Light & Power Company to furnish energy for street lighting failed to provide for depreciation of the system and for the great amount of new construction and reconstruction work necessary, and that the rental of \$40,000 per year is inadequate. In answer to the charge of discriminatory rates the department asserts positively that with the exception in favor of the water department noted above there is absolutely no discrimination.

#### Franchise Agreement in Sandusky, Ohio

The city of Sandusky, Ohio, and the Sandusky Gas & Electric Company have reached an agreement, and ten-year franchise will be granted. The company's last proposition, which was accepted, provides for a rate of 7 cents and 4 cents per kw-hr., instead of the old rate of 8 cents and 5 cents, with a reduction in the quantity that must be used in order to secure the smaller rate. The minimum charge was also reduced from 75 to 5 cents. The contention over rates has lasted for five years, and two municipal bond elections have been held while a third was fixed for Nov. 3.

# Export and Domestic Trade Conditions

Developments and Information Relating to the Commercial Problems Created for Manufacturers by the European Conflict

## GOVERNMENT STUDY OF SOUTH AMERICA

Mr. H. N. Douthitt, Special Agent of Department of Commerce, Will Investigate Possibilities for Electrical Manufacturers

Mr. H. N. Douthitt, special agent of the Department of Commerce, has been in New York for two weeks and has met a number of manufacturers who are interested in his proposed trip to South America. Mr. Douthitt has returned to Washington, where he will be for a short time before leaving for Rio de Janeiro, Brazil, the first point which he will visit.

This trip by Mr. Douthitt is taken at the personal suggestion of Secretary of Commerce Redfield, who thinks that a representative of the government will be able to obtain much information that will be of value to American manufacturers of machinery. The investigations of Mr. Douthitt will be confined entirely to a study of the market in South America for manufacturers of general outside machinery and general engineering supplies, including electrical machinery and apparatus. Mr. Douthitt will look into the matter of equipment for machine shops, but will not make any investigations of markets for textile machinery.

In talking with a representative of the *Electrical World* Mr. Douthitt said that he had lived in Brazil for some time, where he was interested in hydraulic engineering projects. He speaks Portuguese. As the result of his experience he concludes that American manufacturers should seek markets in South America based on the high quality of the goods they produce. He thinks that the high quality of the goods is the best feature of American products and believes that this is thoroughly appreciated by men in South America who have traded with manufacturers of this country.

Mr. Douthitt spoke of some generators installed by a large American electrical manufacturing company at Bellohorizonte, State of Minas Geraes, Brazil, which had been cited all over that country as showing the superiority of American machinery. They had been in operation about fifteen years and had worn out two sets of blades on the turbine. When he last heard of the plant its operation was as satisfactory as at the beginning. If company will do as certain of the large electric companies have, Mr. Douthitt said, and will try to market their products on the argument of the high quality which they are justified in making they will get, in his opinion, satisfactory results.

A great deal of unnecessary criticism has been heard about the packing of goods. Mr. Douthitt said that it was possible that small companies needed to heed the criticism, but the packing of the larger companies was as good as that of the German manufacturers.

The method which Mr. Douthitt will follow will include a call on the American consul in each city, with whom he will advise, and a personal canvass among users of heavy machinery. As far as possible he will get a thorough description of the machinery now in use, will find where it was purchased, what it cost and what is needed now. Mr. Douthitt will also discuss financial conditions frankly in the various countries in order to find out whether buyers are in a position to pay cash, or, if not, what terms of credit they expect and what the countries can offer to this country that may be taken in exchange for goods. Under present

financial conditions Mr. Douthitt says that it is not a question of how much American manufacturers can sell to South American buyers but how much South American buyers will want to buy while financial conditions remain as they are.

Unless a manufacturer is prepared to have a representative remain for a year in South America without showing a profit on his sales, Mr. Douthitt does not advise any manufacturer to send a representative down there. He believes that it is advisable, however, for manufacturers who want to enter the South American market to secure their own representatives and not to try to do business through English and German commission houses, which already have extended connections with manufacturers in their own countries.

## TRADE PROSPECTS IN CENTRAL AMERICA

Letters from Engineers and Business Men Regarding Opportunities for United States Manufacturers

Replies have been received by the McGraw Publishing Company, Inc., to letters sent to prominent engineers and business men in Central America asking for information in regard to business prospects.

Mr. Juan J. de Jongh, architect, Guatemala, says that the reasons why United States manufacturers have not had more Central American trade were of their own making. The United States should educate its young men; manufacturers should scrupulously carry out all contracts to the letter; traveling salesmen should be specialists in the branches they represent; payment in sixty or ninety days does not allow sufficient time; steamship freight rates are too high from the United States to Central America.

Mr. F. Maury Gillespie, San José, Costa Rica, says that the immediate needs for electrical apparatus are negligible as the present condition of affairs has put a stop to practically all projected works. With the exception of metallic-filament lamps and a few motors, the United States has practically all the electrical business in the country. With a few isolated exceptions every alternator in the country is of American manufacture. Telephones, arc lamps, etc., are practically all of American manufacture. He has not seen a single piece of hydraulic apparatus in the country that does not bear the name of an American manufacturer. One reason why European goods are preferred by many in Latin America is that the majority of American manufacturers act as if they were acquainted better with local conditions and requirements than people on the ground. One American manufacturer of electrical apparatus packed his goods in the best way of all the examples that Mr. Gillespie has seen.

Mr. W. T. Penny, Guatemala, writes that while the war in Europe has paralyzed practically all construction work, he believes that the general effect will be to make consumers and buyers turn more to the United States.

Mr. S. Vilar y Boy, Guatemala, writes that at present there is not much business to be done. The condition of best quality of American goods would not counterbalance their higher prices compared with European merchandise, especially German, in Guatemala because the depreciation of native money means a large demand for low-priced merchandise rather than for high quality.



## HOW MANUFACTURERS VIEW THE OUTLOOK

### Grounds for Reasonable Confidence in Regard to the Future Business Prospects

The following statements have been given by manufacturers to the *Electrical World*:

#### Looks for Better South American Trade

Mr. J. Nelson Shreve, treasurer Electric Cable Company, Bridgeport, Conn.: "Our business is one in which there is practically no export demand at the present time. England and Germany control the South American market and do not import any wire themselves. We are now receiving inquiries from various parts of Europe. We do not believe that South American countries will use as much wire this year as they did last, but whatever they do buy will have to be purchased in this country. We have already taken steps to develop export trade by circularizing South America, and we look for better business from that country in the near future. Most of our raw materials, setting aside the flurry in rubber, are arriving regularly, and we are only short a very small part of our supplies, for which we can readily substitute other materials without affecting our costs."

#### Optimistic Regarding Recovery

Mr. Henry B. Smith, secretary and treasurer Michigan Pipe Company, Bay City, Mich.: "Our company unfortunately has not a great deal of export trade. The writer has kept in touch in a certain measure with the recent developments in this connection brought about by the European disturbance, and, while there is no question about an enormous amount of trade being diverted from the European countries to the United States and flowing to the south, I do not think that it will in any way approach in volume the usual amount of export business which the United States has enjoyed to foreign countries outside of South America. Added to this is the psychological condition caused by the decided shock occasioned everywhere by the various declarations of war and subsequent unsettled condition of the warring countries. I am, personally, optimistic regarding our recovery from this shock, and think that it is already in evidence, but anticipate that it will take us the remaining three months of this year and possibly two months in the next year to realize fully anything approaching normal conditions again. Our business has been very poor this year, and in repeated instances we have worked business up to the point of purchase and then had the entire work delayed."

"We find that smaller towns are very conservative regarding buying, while last year we enjoyed a very good trade in this direction. We have not been dependent upon Europe for any raw materials, but are associated with some manufacturing institutions which are so to a certain extent. We refer to one company that manufactures hosiery. It is dependent on Germany for its dyestuff. This, of course, is entirely shut off, which will mean the education of the American people to the use of undyed materials, or—and this I hope for—the education of our chemical engineers in the production of these materials in our own country."

#### More Inquiries for Exports

Mr. J. E. Lonngren, Murray Wire Company, Newark, N. J.: "Some answers to your questions can be given as due entirely to the effects of war. There are other questions which in our opinion would have come up anyway, although the war may have hastened them. I am speaking simply of conditions as found by our company. Some materials that we use are imported. Soon after war was declared we found that we were unable

to get any of these. We have been promised shipment of all we need except one, which is pure nickel. Regarding exports, would say that we had a number of inquiries before the war broke out and have had more since that time. It is a question whether the latter are due to the war or other conditions. I am frank to state that we will give the *Electrical World* credit for a great deal of it. We have no doubt that with closer relationship between our country and South American states we shall reap profits, with the rest of the manufacturers."

#### Looks for Improvement in Business

Mr. H. N. Fenner, president New England Butt Company, Providence, R. I.: "Our export trade is rather limited and to date we have not realized any effect of the war, although recent inquiries from London for machinery in our line built largely in Germany have been received. Our trade with South America has been limited and so far as we know there is a limited demand for our line from any source, although the demand for the product of our machines may require production in some of those countries. We have made no change in our organization or plant anticipating increase in business. We are not dependent on foreign sources for any kind of material in our business. We are looking forward for improvement in business in this country affected by the war in Europe."

## ELECTRICAL NEWS IN GERMAN PAPERS

### Increase in Prices by Electrical Manufacturing Companies Criticised as Economically Unsound

In the *Elektrotechnische Zeitschrift* of Sept. 10 (Nos. 36-37, containing twenty pages of text and twenty pages of advertisements) there is a note on "war and industry" signed by the initials of the editor (Mr. C. Zehme) referring to a statement of the commander-general of the Seventh Army Corps of the German army to the inhabitants of the provinces of Rhineland and Westphalia. In this statement it is emphasized that Germany needs its men not only for the war but also for maintaining some of the most important industries; that in order to make a successful issue of the war possible it is necessary above everything else to keep the coal mines of the district in full operation and in the same way the metallurgical works making war materials; but that it is also necessary to keep open the boat traffic on the River Rhine, the mills, the water-works and the electric central station.

It is pointed out by the editor that the electrical industries have lost 25 to 30 per cent of their employees, who have gone to the front. Some departments of the industries had to be restricted, others had to be extended in operation. The editor thinks that in view of the importance of keeping the electrical industries in full swing, the recent raise of price made by several of the German electrical manufacturing companies is of doubtful economic soundness.

Under trade notes it is stated that the Gottfried Hagen Storage-Battery Company in Cologne has raised the price of plates and batteries by 10 per cent as a result of the rise in the price of lead.

On the front page the editors and publishers make the following announcement: "On the supposition that the mail facilities permit it, one number of the *Elektrotechnische Zeitschrift* will be issued at least every two weeks. We hope that political conditions will soon enable us to resume the issue of weekly numbers and in any case to bring the current yearly volume to a complete conclusion."

## PUBLIC SERVICE COMMISSION NEWS

## Maryland Commission

The commission is investigating reports that three Pennsylvania companies are supplying energy to consumers in Maryland without having submitted their schedules to the commission for approval. All of the companies under investigation have their plants just across the border line.

## California Commission

The Railroad Commission has issued a supplemental order authorizing the Southern California Edison Company to sell \$187,000 bonds to the Harris Trust and Savings Bank of Chicago. The bonds are to be sold at not less than 87½, and the proceeds will be used to discharge a note of \$150,000 held by the bank. Any remainder will be turned into the company's treasury to be used in such manner as may be permitted by the commission.

## Colorado Commission

A statement concerning the public utilities law which has become effective has been issued by the Public Utilities Commission of Colorado. The commission expresses the hope that its effort will meet with the approval of the public and will result in bringing the people and the utility corporations of the State into closer and more harmonious relations, to the lasting and enduring benefit of all.

## Idaho Commission

The Public Utilities Commission has ruled, in a controversy over electric motor-service rates between the Marsh Mining Company of the Cœur d'Alene mining district and the Washington Water Power Company, that the latter company cannot discontinue service to the mining company while the rate case is pending. The power company wanted to discontinue service if the consumer did not pay its rates.

## New York Commissions

At the hearing before the New York Public Service Commission, Second District, on Sept. 30, Mr. John L. Swayze, counsel for the New York Telephone Company, stated that he believed that the company would be able to submit a complete valuation and inventory of its property in New York City by June 1, 1915. He thought that he could give an estimate based not on the opinion of the experts but on his own judgment at an earlier date.

Mr. L. P. Hale, counsel for the commission, submitted inventories of the approximate value of the property of the company which were furnished to the commission in 1910.

## Ohio Commission

Permission has been granted to the Massillon Electric & Gas Company to issue \$118,000 of 5 per cent first-mortgage bonds at 80. The company told the commission that the poor condition of the market prevented it from selling the bonds at par. Permission had been given on Aug. 24 for the issue, but at that time the condition was attached that the bonds must be sold at par.

The Youngstown & Sharon Street Railway has filed a formal protest with the commission against the application of the Mahoning Electric Light Company for permission to issue \$1,000,000 capital stock. The older company seeks to invoke the action of the clause of the law which gives the commission the right to decide whether there is public necessity for a new utility plant. The Youngstown & Sharon Street Railway alleges that there is not enough business in and about Youngstown

for two companies. This company made an oral protest at the hearing on Aug. 26, and the written complaint is in support of that argument.

## New Jersey Commission

The Board of Public Utility Commissioners has disapproved a proposed schedule of rates for electric lighting and motor service filed by the New Egypt Light, Heat & Power Company and calling for a charge of 18 cents per kw-hr. In holding this rate to be excessive the board suggests the following charges: Lighting, first 60 kw-hr. per month, 18 cents; all over such amount, 9 cents. Metered motor service, first 30 kw-hr. per month, 18 cents; in excess of 30 kw-hr. and up to 120 kw-hr., 9 cents; all over 120 kw-hr., 6 cents.

The board has approved the lease of the New Jersey Water & Light Company plant, Deal, Monmouth County, to the Atlantic Coast Electric Light Company, dating from July 1, 1914, and effective for ten years.

The board has handed down a decision favoring a proposed amendment of rates of the Standard Gas Company, particularly applying to Keansburg and Raritan Township. The company recently requested permission to charge a meter-rental fee of \$5 for installations in temporary summer tents and bungalows, holding that the supply of service thereto, together with the cost of necessary service pipes, resulted in a loss. The evidence showing such fact, the board recommends a rule for the collection of \$5 extra for service connections where the indications show that this will not be used for more than a season, thus broadening the company's proposal to include both meter rental and service installation costs.

## District of Columbia Commission

The annual report of the Public Utilities Commission of the District of Columbia, covering the ten months ended Dec. 31, 1913, refers to the work of the electrical inspection bureau. This bureau is conducted at present by inspectors of the electrical department of the District of Columbia under the direction of Mr. Walter C. Allen, electrical engineer, District of Columbia.

The report says that the work of testing electric meters by public utilities commissions offers a problem very different from that of testing gas meters, for the reason that electric meters tend to run more slowly the longer they are in service, while the inaccuracies that develop in gas meters follow no such rule. It is thus more to the financial interest of a lighting company to test its meters periodically with a view to keeping them up to their correct rating. The result is that electric meters in service read much more correctly than gas meters, and therefore a much smaller number of complaints of electric meters is made.

Thus far the experience of the commission has borne out this fact, and it now appears that the principal work to be performed under this bureau will be that of approving the types of electric meters to be used in the District of Columbia, the testing of meters before installation on the premises of the consumer, and the testing of the apparatus used by the electric-lighting company for carrying on its periodic tests of electric meters.

Mr. Allen has submitted a report recommending regulations to be adopted by the commission concerning the types of meters to be allowed to be used in the District of Columbia and concerning regulations governing the testing of electric meters. These regulations are now under consideration.

Since the organization of the commission five complaints of electric meters have been received and the meters tested. In all of these cases the meters were found to be less than 4 per cent incorrect, which is the limit of inaccuracy allowed by the commission.



## Current News Notes

**HYDROELECTRIC SERVICE REACHES WINDSOR.**—On the evening of Sept. 13 Hon. Adam Beck, chairman of the Hydroelectric Power Commission of Ontario, turned a switch which illuminated Windsor, Ont., with electric energy generated at Niagara Falls, 250 miles away. The ceremony marked the completion of the transmission line to Windsor, which is one of the longest in the world.

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**ELECTROMAGNETS FOR WAR SURGERY.**—At the recent meeting of the French Academy of Medicine Dr. A. Dastre explained the uses to which a powerful electromagnet could be put in removing shrapnel splinters and steel-jacketed bullets from wounded soldiers. It is claimed that an electromagnet used by Professor Rolet drew shrapnel fragments to the surface from a depth of 6 in. and bullets from a depth of  $2\frac{1}{4}$  in.

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**THIRTY-FIFTH ANNIVERSARY OF THE INCANDESCENT ELECTRIC LAMP.**—Oct. 21 will mark the thirty-fifth anniversary of the invention of the incandescent electric lamp by Edison, and the day will be observed by many lighting companies throughout the country. It is interesting to note in this connection that in 1881 the lamp factory at Menlo Park was manufacturing 1000 lamps a day. In 1896 the output of incandescent lamps was 45,000 a day, while the output of lamps to-day is approximately 300,000 a day.

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**COMMISSION PASSES ON COMPETITIVE RATES AT FORT WAYNE, IND.**—The Indiana Public Service Commission recently approved the competitive rate schedules filed by the municipal lighting station at Fort Wayne and by the Fort Wayne & Northern Indiana Traction Company, which has lighting and motor service circuits in the city of Fort Wayne as well as in many other Indiana cities. The rates of the municipal plant vary on a sliding scale from 7 cents per kw-hr. to 3 cents per kw-hr., while those of the privately owned company range from 7 cents a unit to 2 cents a unit.

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**NEW BEDFORD COMPANY OPENS NEW OFFICE BUILDING.**—An attractive new four-story office building was thrown open to the public on Sept. 29 by the New Bedford (Mass.) Gas & Edison Light Company. The new structure, which is situated at the intersection of Purchase and Spring Streets, is of mill construction with concrete exterior and marble interior furnishings. It adjoins a new electric garage maintained by the company for general vehicle service, with charging facilities for twenty-seven machines. Nine electric vehicles are now owned and operated by the company, which has taken up this development with sustained enthusiasm.

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**ELECTRIC SHOW AT KANSAS CITY, Mo.**—A fall festival electric show was held in the electric shop of the Kansas City Electric Light Company, Oct. 1-10. The leading manufacturers of electrical equipment had sections on the main floor for the display of their products, which embraced all of the numerous devices classed under household appliances. Special demonstration days were arranged as follows: Oct. 5, wash day; Oct. 6, ironing day; Oct. 7, housecleaning day; Oct. 8, "thé dansant," when the more delicate dishes were given prominence in the cooking demonstration; Oct. 9, baking day for ranges and small ovens; Oct. 10, "matinee maxime."

**AUTUMN SHOW-WINDOW DISPLAYS.**—A number of attractive window-display designs for central stations and electrical dealers have been prepared by the Society for Electrical Development, 29 West Thirty-ninth Street, New York, which intends that these designs shall be used to encourage "the buying spirit" already in evidence on the part of the public with the return of cooler days. After nightfall the windows of the electrical dealer, contractor, jobber and central station, it is pointed out, should be the best illuminated on the street. The display-service bureau of the society is ready at all times to answer inquiries in reference to show-window interior or exterior store display, show-window construction, show-window backgrounds and show-window lighting; decorative materials, home-made display fixtures, show-card writing suggestions or show-card writing supplies.

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### SOCIETY MEETINGS

**LUNCHEON MEETING OF JOVIANS AT LEXINGTON.**—At the first noonday luncheon meeting of the Jovians in Lexington, Ky., this fall a paper was read by Mr. G. C. Hyde, of the Kentucky Utilities Company, on "Transmission and High-Tension Wires." The paper was read after the luncheon, which was held in the Phoenix Hotel.

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**RAILWAY ELECTRICAL ENGINEERS TO MEET IN CHICAGO.**—The semi-annual convention of the Association of Railway Electrical Engineers will be held in Chicago at the Hotel La Salle, Oct. 26 to 30. The program will consist almost entirely of business meetings and reports of committees. Some of the engineering topics to be covered are: electrical headlamps, industrial trucks, electric traction, wire specifications, axle equipment, standard car wiring, railroad yard lighting and storage-battery charging.

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**SMALL-PLANT MEN TO TALK IN OHIO.**—The new-business co-operation committee of the Ohio Electric Light Association will hold its next meeting at the Hotel Gibson in Cincinnati Nov. 18, 1914. The program as arranged is as follows: "Electric Heating," by Mr. W. Rollins, of the Simplex Electric Heating Company; "Vital Points in Power Sales Work," by Mr. R. A. McGregor, Toledo, and four ten-minute talks by representatives of small central stations near Cincinnati on electrical advertising, wiring old houses, method of selling electric-heating appliances, and method of securing power business.

\* \* \*

**TELEPHONE PIONEERS OF AMERICA.**—The fourth annual meeting of the Telephone Pioneers of America will be held in Richmond, Va., on Oct. 29 and 30, 1914, with headquarters at the Jefferson Hotel. On Oct. 29 the morning session will be a business meeting, and in the afternoon papers will be presented. In the evening the annual banquet will be held at the Jefferson Hotel. On Oct. 30 a special steamer will leave Richmond at 9 a. m. for a day's trip on the James River, reaching Old Point Comfort for dinner at the Chamberlin Hotel. At 7 p. m. the trip will be continued by night steamer to Washington, where the meeting will disband. The American Telephone & Telegraph Company has invited members of the association, their wives or immediate members of their families accompanying them to be its guests at the banquet at the Jefferson Hotel, upon the day trip on the James River, at the dinner at Old Point Comfort, and on the night trip to Washington. Mr. Theo. N. Vail is president of the association.

## Rebuilding a Double-Decked Generating Station

**Rearranging and augmenting electrical equipment in a station of unique design during continued operation on a combined electric-lighting and railway system**

**V**IBRATION defying the efforts of experienced turbine balancers for more than seven years has caused the Fort Wayne & Northern Indiana Traction Company to rebuild its main power house on My Run Avenue in the city of Fort Wayne, Ind. When the double-deck station was built in 1906-1907 it was expected that the short steam-header connections could be productive of economic operation to a degree unobtainable with other types of stations. However, at this time new units have been installed under a guarantee which insures a steam consumption considerably less than that of the older machines. This great decrease in steam consumption does not, of course, come entirely as the result of rearrangement of the station or because turbines now are so much more efficient than the turbines of seven years ago, but has risen because the old arrangement was poor and because also some increase in turbine efficiency has been made.

When the station was put into operation early in 1907 its generating units consisted of twenty-five-cycle

railway apparatus and sixty-cycle lighting equipment. The twenty-five-cycle equipment consisted of one 400-kw and two 1500-kw machines, and the sixty-cycle energy was generated by one 500-kw and two 1500-kw units. These machines all operated with forced ventilation, the heated air from the generators being delivered into the boiler room, since calculations showed that the amount of air needed for draft very nearly equaled that delivered from the generators. Each of the 1500-kw turbines exhausted into a pair of 24-in. Bulkley twin condensers, the 500-kw and 400-kw units being served by 18-in. and 16-in. condensers respectively. The circulating pumps for all units were manufactured by the Boyts-Porter Company, Connellsville, Pa. The exhaust steam from these pumps and all other station auxiliaries was passed through two 3000-hp Platt Iron Works feed-water heaters.

Each turbine carried its own exciter on the main shaft, all exciter units, however, being arranged for connection to a common bus. On the marble switchboard standing upon an overhead gallery was a single

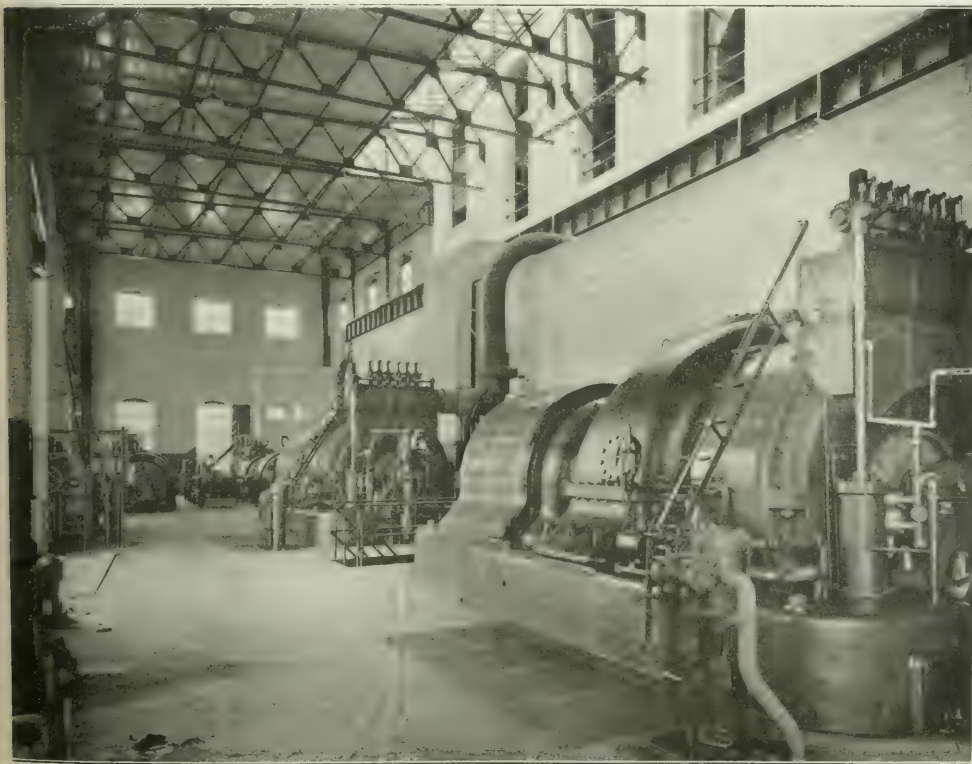


FIG. 1—NEW GROUND-FLOOR TURBINE ROOM, REPLACING DOUBLE-DECK CONSTRUCTION



set of buses for twenty-five-cycle energy and a set for sixty-cycle energy. All 33,000-volt apparatus was, and still is, installed at the south end of the station, six 375-kw transformers being set in brick compartments under the high-tension switching equipment.

As the first step in the reconstruction an addition measuring 60 ft. by 185 ft. was made on the east side

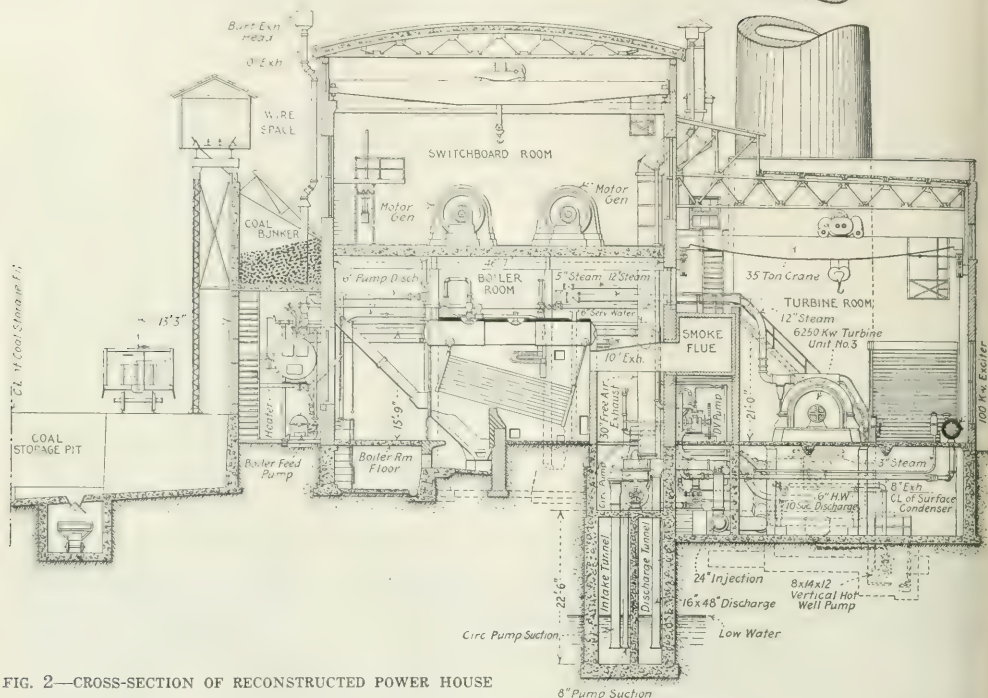


FIG. 2—CROSS-SECTION OF RECONSTRUCTED POWER HOUSE

and at the south end of the former station building. Excavation for this addition was begun in August, 1913, and the first of the two new General Electric 6250-kva, 2200/4000-volt, sixty-cycle, three-phase, four-wire turbo-generators was placed in operation in January, 1914. These machines with exciters on the same shaft were purchased primarily to care for the growing sixty-cycle load, but used in connection with two 1400-kw, 2300 600-volt motor-generator sets and a

1000-kva sixty-to-twenty-five-cycle frequency changer the sixty-cycle alternators may carry the entire system load at night. Both the motor-generator sets and the frequency changer have been placed on the old turbine room floor, occupying the former site of one of the twenty-five-cycle turbines. For emergency excitation or other direct-current service a General Electric 100 kw turbo-generator has been installed. This unit is of sufficient rating to supply excitation for the field coils



FIG. 3—EXTERIOR VIEW OF POWER HOUSE



FIG. 4—LOCOMOTIVE CRANE AND COAL CRUSHER

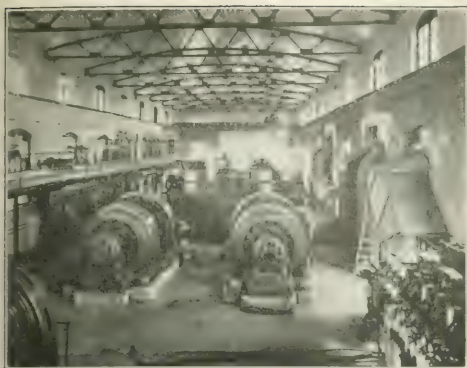


FIG. 5—VIEW OF FORMER TURBINE DECK

of all four station generators. Near this machine a three-panel switchboard, with rheostats in the rear, meters and controls the direct-current output of the machine.

Worthington condensers of the three-pass type with 12,000 sq. ft. of cooling surface receive the exhaust steam from the two sixty-cycle turbines and maintain approximately a 28-in. vacuum. Circulating water is taken from the Maumee River and forced through the condensers by Laidlaw-Dunn-Gordon steam-driven pumps. These engine-driven pumps have been placed under the smoke flue on the new turbine-room floor. Here they are unobtrusive, being partly hidden by wall panels, and yet are always under the watchful eye of the operators. It is interesting to note in connection with the old and new station auxiliaries that the circulating pumps for the new 6250-kw units are smaller than the ones used with the former 1500-kw machines. Gage boards on the wall panels carry instruments showing vacuum speed and steam pressure at each turbine.

While the changes were being made operation of the company's twenty-five-cycle, 33,000-volt lines made it imperative that one of the two 1500-kw, twenty-five-cycle turbines be kept running practically all of the time. During periods of very light load, however, the system could be operated from the steam station at Lafayette, Ind., 109 miles distant. To insure continuity of service while the two turbo-generator units were being moved from the upper deck to the new turbine-room floor only one was taken out of service at a time. As each machine was dismantled the pieces were lifted by a 20-ton electric crane and then lowered through a 15-ft. by 20-ft. hole cut in the northwest corner of the turbine deck. Here all heavy pieces were loaded upon a flat car and transported by means of a spur track to the new por-



FIG. 7—SWITCH-CELL STRUCTURE

tion of the station. Condensers and other turbine auxiliaries were also moved to their new position in like manner, the condensers being placed beneath the turbines and the circulating pumps being set on the turbine-room floor beside the unit which they serve. Although the 1500-kw, sixty-cycle machines have been removed from service, they are still in the turbine room, no provision as yet having been made for their disposal.

#### Switching Equipment Grouped on Former Turbine Deck

Practically all of the control and switching apparatus in the station, with the exception of the 33,000-volt equipment, has been rearranged and augmented, and it is planned that eventually all switchboards shall be on the former turbine floor. All multiple-gap lightning arresters have been supplanted by new units of the aluminum-cell type, and sectionalizing switches have been added to allow the long Lafayette and Bluffton

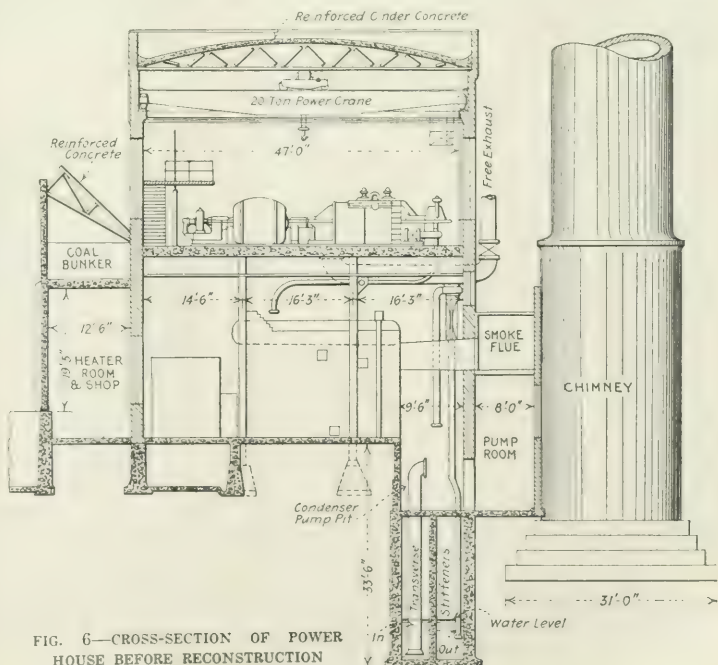


FIG. 6—CROSS-SECTION OF POWER HOUSE BEFORE RECONSTRUCTION



lines to be separated in case of trouble. For the four turbines and the exciters a five-panel black benchboard has been installed, communication between the switchboard operator and the machine attendant being established through a set of push-button visual signals. In the switchboard room the signal dial is mounted on the benchboard, but below in the turbine room an iron

pedestal erected beside each turbine carries the indicating dial.

#### What Has Been Accomplished by the Change

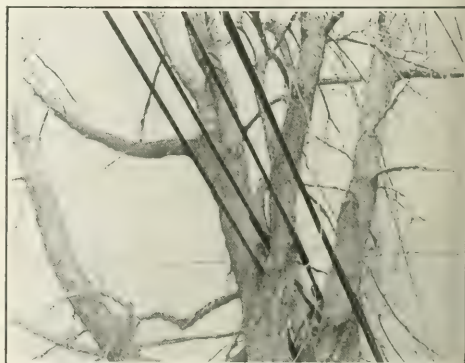
On the whole, the reconstruction of the station has resulted in many betterments. The turbo-generator sets have been placed on solid foundations and no longer give trouble due to vibration; the double-bus structure eliminates probability of service interruption from this part of the system; the noise of operating machines has been reduced to a minimum, and the over-all station efficiency has been greatly increased. Except for the addition of two 450-hp Babcock & Wilcox boilers, duplicate feed-water heater equipment and sectionalizing valves in the duplicate steam headers, and renewing the Roney stokers, no change was made in the steam end of the station.

The redesigning of the station was done under the direction of Messrs. Sargent & Lundy, Chicago, and the work of reconstruction was carried on under the supervision of Mr. E. S. Myers, chief engineer of the Fort Wayne & Northern Indiana Traction Company.

#### A Feeder Embedded in a Tree

The accompanying illustration affords evidence that wires and trees may, in some cases at any rate, long remain in intimate contact with each other without injury to the growth of the tree. The cables shown are all 500,000-circ. mil. railway feeders operated at 575 volts. The one seen furthest to the left in the picture was originally run through the crotch of the tree between the limbs. To protect the weatherproof insulation against abrasion due to the movement of the cable or the tree the cable was covered with a strip of wooden molding or "tree insulation." This wire was installed about eighteen years ago, but since that time the crotch between the limbs has closed up at the point where the cable lies, the tree meanwhile growing around the feeder so as completely to embed the cable in the wood. The cable will doubtless have to be cut at each side of the trunk when it eventually comes to be taken down.

In order to show the cables clearly the photograph



A 575-VOLT FEEDER EMBEDDED IN A TREE

was taken during the late winter. The leafless condition of the limbs does not, therefore, mean that the tree is dead. A good photograph could not have been taken in the summer time, since the wires are then too much hidden by the luxuriant foliage.

This interesting wiring "freak" was discovered on a road in Queens County, Long Island, N. Y.



FIG. 8—THREE NEW SWITCHBOARDS

pedestal erected beside each turbine carries the indicating dial.

Concrete compartments erected on the former operating floor contain oil switches for each generator, motor-generator set, frequency changer and feeder. A blank compartment has been provided for switches to operate a future 3000-kva frequency changer. Although the old station had but one set of buses, the new bus and switching equipment has been installed in duplicate and arranged so that any or all apparatus may be transferred from one set of buses to the other without interrupting operation. Direct current for operating these switches ordinarily is taken from the 125-volt exciter bus, but in case this potential falls below a predetermined value a sixty-cell storage battery is automatically brought into operation to supply the energy for the operating circuits and emergency station lighting.

From the longitudinal overhead switchboard gallery all twenty-five-cycle railway feeder and transformer panels were moved to the south end of the former turbine floor and placed in such a position that the operator may look down into the turbine room from the board. Lightning arresters now occupy the former switchboard gallery and in this position occasion less hazard to workmen and operators than was the case with the old arrangement.

#### Condensers and Pump Operate in Air Chamber

One of the features of the reconstructed station is the combination ventilating air and noise chamber. Beneath the four main turbines and extending the full length of the addition to the building an air-tight chamber has been constructed with walls of wire lath and plaster. Entering at the south end of the station, cooling air is conducted through the generators and discharged into the boiler room through four separate ducts. By including a large portion of the basement in this chamber and providing large openings from the generators a great deal of the noise caused by the rotating elements is conducted into the basement. Two of the large condensers and several auxiliary pumps operate in this air chamber, attendants entering when necessary through an air lock. This arrangement ren-

## Papers and Discussions at the I. E. S. Convention

**Gas-filled lamps, lighting through glass ceilings, mine lamps, electric light in disease treatment, eye tests by illumination, photometric filters and other subjects reviewed**

THE last two issues of the *Electrical World* contained an account of the Cleveland convention of the Illuminating Engineering Society, with abstracts of many of the papers and discussions. Following will be found notices of those papers and discussions not previously included.

### Characteristics of Gas-Filled Lamps

Mr. G. M. J. Mackay presented a paper entitled "The Characteristics of Gas-Filled Lamps," in which were discussed the properties of tungsten as a filament material and the effect of shape, size and temperature of filaments and the pressure of gas on the color of the light emitted, length of lamp life and unity energy consumption. It was pointed out that as the temperature of a substance increases the radiation increases more rapidly in the shorter wave-lengths, and the wave-length of maximum emission is displaced more and more toward the blue end of the spectrum. For the smaller sizes of filaments it is much more economical to use mercury vapor around the incandescent filament than nitrogen. Attention was also called to the fact that the inside of an incandescent helix of tungsten emits more light than a black body having the same temperature, as about 50 per cent of light falling on the surface of the tungsten will be reflected. Between pressures of one-fifth to one atmosphere the heat conduction of nitrogen affects the energy consumed per candle-power emitted very little. Furthermore, the evaporation of tungsten at a pressure of 1000 mm of mercury is about 0.01 of what it is in a vacuum. The life of a gas-filled lamp is shortened and the efficiency reduced by using small-sized filaments. In closing, the author discussed Dr. Langmuir's method of measuring filament temperature by the intrinsic brilliancy.

### Discussion

Mr. W. R. Rollinson, Cleveland, pointed out the fact that few of the new gas-filled lamps ever reach candle-powers as low as 80 per cent of their initial values, since they usually drop out of existence before suffering this loss in intensity. Dr. Worthing, Cleveland, explained that the end-loss to the terminals is much less in a coiled filament than it would be in a hollow cylindrical filament of the same outer diameter. Mr. J. B. Taylor, New York, suggested that the temperatures and colors of various parts of the filament could be easily studied by projecting an enlarged image of the filament onto a screen. Mr. E. J. Edwards, Cleveland, said that while the bulbs of the gas-filled lamps run pretty hot, the heat actually produced depends, of course, upon the watts rating of the unit and is identical with that for any other type of lamp of the same rating. In this respect the gas-filled lamp actually comes nearer to delivering "cold" light than does any other illuminant. The coiled form of the filament introduces a slight inductance, measured by Mr. Edwards as about 0.6 milhenry per lamp. The resulting power-factor of the lamp, said the speaker, becomes about 99.999 per cent, a value so near unity as to make the matter of power-factor altogether unimportant. Compared with the older vacuum-type

lamps, which on double voltage would last only a few seconds, the new gas-filled units require almost triple pressure to cause them to burn out in the same time. Mr. W. A. Darrah, Pittsburgh, Pa., predicted that because of the absence of the limitations imposed by the incandescent lamp, such as melting of the filament at high temperatures, etc., some lamp of the arc type will be the ultimate high-efficiency unit of the future.

### Lighting Through Translucent-Glass Ceilings

The lighting of special rooms through translucent-glass ceilings has been a difficult task from the standpoint of design, Mr. E. J. Evans declared in his paper entitled "The Lighting of Rooms Through Translucent-Glass Ceilings," owing to the lack of data regarding the properties of various glasses available. To eliminate spotted effect the glass must be more or less diffusing. The less diffusing it is, the narrower must be the spacing between the units or the higher above the glass must they be placed. The greater the diffusion, at least with the character of diffusion obtained with ordinary opal glass, the lower will be the efficiency of transmission. The ratio of spacing to mounting height is constant. The transmission efficiencies of the different kinds of glass vary considerably.

### Discussion

Mr. A. J. Sweet, Milwaukee, Wis., defined specular, spread and diffuse reflection, and compared the corresponding phenomena of light transmission through media giving direct, spread and diffuse transmission. Rough crystal glass, for example, gives spread transmission, and the "spots" of lamps behind it cannot be avoided except by increasing the distance between glass and lamps, so that the spots "spread" and merge with other spots, making a uniform illumination. Where the distances available are short, opal glass should be used, said Mr. Sweet. This glass prevents spotting and yet has a transmission efficiency as high as 54 per cent. Mr. E. B. Rowe, Cleveland, Ohio, stated that opal-glass skylights appear flat and monotonous, while crystal glass gives an attractive and sparkling effect. Mr. W. A. Durgin, Chicago, Ill., said that for daylight transmission skylight-glass efficiencies should not exceed 20 per cent, else the intensity beneath may become unbearable. Mr. S. G. Hibben, Pittsburgh, Pa., suggested that amber tints might be obtained more efficiently with lower-efficiency yellow lamps than with tinted glass causing large absorption. Mr. J. R. Cravath said that opal glasses will doubtless be developed to give lower absorptions than the glasses now available. Prof. F. C. Caldwell, Columbus, Ohio, suggested using opal glass above to cut down the entering daylight, with crystal glass below to conserve and diffuse the light from artificial sources.

### Requirements of Portable Mine Lamps

A brief history of the development in mine lamps, descriptions of modern portable lamps and references to investigations made of mine lighting by the Bureau of Mines were included in the paper entitled "Self-Con-



tained Portable Electric Lamps for Miners," by Mr. H. H. Clark. He pointed out that an ideal lamp should not be capable of causing gas ignition under any condition, should be reasonably light in weight and small in size, should give uninterrupted service for at least one shift, and should not be expensive to maintain in operating condition. The minimum value of light flux for hand lamps should be 3 lumens and for cap lamps 1.5 lumens.

#### Discussion

Mr. G. H. Stickney, Harrison, N. J., told of the limitations in weight, efficiency, hours' burning, etc., involved in the design of miners' lamps. Low-voltage lamps suffer a reduction in efficiency through the large heat-conduction losses at the ends of the filament. More difficulty is also experienced in making the product uniform than with high-voltage lamps. Mr. J. P. Langdon suggested the use of several cells in series, obtaining, say, 6 volts at the lamp. While involving a slight increase in weight, the filament end-losses would be reduced, enabling the center of the filament to be worked at a lower temperature for a given total lamp efficiency. Mr. R. P. Burrows, Cleveland, explained that the wide distribution of the beam from the miner's lamp—130 deg.—is made necessary in order that the workman may see about him in the mine chamber in which he works. The shot firers, on the other hand, need to have a relatively small area intensely illuminated.

#### Electric Light in the Treatment of Diseases

Dr. E. C. Titus stated, in a paper entitled "Some Uses of Light in the Treatment of Disease," that it has been found that the thermic effects of light extend to a depth of 2 in. or more below the skin, while convection heat is principally exerted upon the surface. The general application of phototherapy consists practically in the use of the electric-light bath. Among the conditions in which the electric-light bath has proved to be most serviceable are hardening of the arteries, gouty and rheumatic conditions, Bright's disease, diabetes, obesity and acute catarrhal affections of the respiratory tract. The effects of the baths are to induce intense hyperemia or reddening of the skin and to increase elimination by way of the lungs and skin. Local applications of light can be made by using an arc lamp in the form of a marine searchlamp with the glass front window removed or a 500-cp incandescent lamp with dome reflector.

#### Discussion

Mr. W. R. Mott, Cleveland, discussed the application of light from arc sources for the destruction of germs and the stimulation of the growth of healthy tissue. Prof. F. C. Caldwell, Columbus, questioned to what extent the observations in the paper represented simply the author's views and to what degree they represented the consensus of medical opinion. Mr. Robert Ely, Philadelphia, declared that many physician users of electric-light lamps, although protesting against the cost of operating carbon lamps, have found it inadvisable to install tungsten lamps on account of the lack of heat produced. Mr. J. B. Taylor, New York, remarked that since the body tissues are largely water, he thought that the deep penetration of the heat rays from the lamps was questionable.

#### Tests for Eye Fatigue

In a paper entitled "Some Experiments with the Ferree Test for Eye Fatigue," Mr. J. R. Cravath described a number of experiments with the method of testing for eye fatigue devised by Prof. C. E. Ferree. In this test the observer is required to gaze steadily for a short period of time at a card upon which are printed certain letters. These letters are of such a size that they are

barely distinguishable at the distance selected for the test. During the period of time that the observer gazes at the letters he is required to record on a stop watch by the pressing of a button the intervals when the test appears blurred. The percentage of the time which the observer sees the letters blurred is taken as an indication or measure of the amount of fatigue of the eye at the time the test is made. The general plan was to test each observer in the morning when the eyes were presumably fresh and before any work was done and then after a number of hours of work. The results obtained from the various tests indicate that the Ferree method is reasonably sensitive both to eye fatigue caused by illumination and to eye fatigue due to other conditions such as abnormal eye strain, headaches, unusually difficult eye work, and irritation due to dust in the eyes.

#### Eye Tests with Different Illumination

Messrs. C. E. Ferree's and G. Rand's paper entitled "Further Experiments on the Efficiency of the Eye Under Different Conditions of Lighting" was a continuation of the papers presented before the I. E. S. in 1912 and 1913. In it were described methods of testing the ability of the eye to maintain its efficiency for a period of work, the loss of efficiency of the fixation muscles, and the comparative tendency of different conditions of lighting to produce discomfort. A report was also given of the effect on the eye of varying the area and, conversely, the intrinsic brightness of the ceiling spots above the reflectors of an indirect system of lighting; the effect of varying the angle at which the light falls on the work in a given lighting situation; the effect of using an opaque eye shade with dark and light linings with each of the installations of artificial lighting employed in this and the previous work; the effect on the efficiency of the fixation muscles of three hours of work under these installations; the effect of motion pictures on the eye at different distances from the projection screen, and a comparison of the tendency of different conditions of lighting to produce discomfort and to cause loss of efficiency.

#### Discussion

Prof. Morgan Brooks, Urbana, Ill., cited experiments from which he concluded that the visibility of fine type under high illumination intensities is due to the superior acuity of the contracted iris, rather than directly to the high intensity itself. Mr. W. A. Durgin, Chicago, expressed fear that any test results obtained would be in accordance with the subject's original prejudices, and also pointed out that to the office worker who prefers, for example, direct lighting the satisfaction obtained from this form of illumination may totally offset the effects of glare involved. Mr. G. H. Stickney questioned the value of fatigue as a means of measuring the usefulness of a lighting system, and Mr. E. B. Rowe urged co-operation with oculists in reducing eye strain. Mr. D. M. Moore, Newark, N. J., declared that acuteness of vision varies cyclicly with the heart pulsations and supply of blood to the retina. Prof. F. C. Caldwell reported tests at Ohio State University which showed for direct lighting a rapid rise in fatigue for intensities above 3 ft.-candles, whereas the fatigue curve for direct lighting was practically horizontal. At intensities of 6 ft.-candles the fatigue noted for direct lighting was several times that for indirect. Mental strain must be distinguished from fatigue, cautioned Professor Caldwell, else the former will become a factor in the results obtained by test. Dr. C. E. Ferree pointed out the care taken to insure the accuracy of tests by his method. Every possible safeguard that could be suggested by psychologists and others was adopted and it was found possible to duplicate observa-

tions without variations greater than 1 per cent—indeed, the best observers came within a range of one-half of 1 per cent.

#### Light Filters for Photometric Use

Eight new photometric filters making it simpler to compare lights of different hues were described in a paper entitled "Light Filters for Use in Photometry," by Dr. C. E. Kenneth Mees. It was found that these screens were valuable in setting up lamps to give certain efficiencies by color as they eliminate the necessity of using integrating spheres for determining the spherical candle-power. Curves showing the transmission coefficients of these screens at wave-lengths between  $40\mu$  and  $70\mu$  were included in the paper.

#### Discussion

The paper was discussed by Messrs. E. F. Kingsbury, Philadelphia; G. M. J. Mackay, Schenectady; L. J. Lewinson, New York; C. S. Redding, Philadelphia; H. E. Ives, Philadelphia; W. F. Little, New York; J. B. Taylor, New York; Clayton H. Sharp, New York, and F. E. Cady, Cleveland. Mr. Mackay stated that the temperature of lamp filaments can be checked with optical pyrometer and light filters to about 5 deg. between 2000 deg. and 3000 deg. C.

#### Color-Absorbing Solutions

The composition of a solution which will correct the light emitted by any lamp, from a hefner unit to a gas-filled lamp, so that its intensity can be easily compared with that of a standard lamp was given in a paper on "Experiments with Colored Absorbing Solutions for Use in Heterochromatic Photometry," by Messrs. Herbert E. Ives and Edwin F. Kingsbury. A transparent tank for holding the solution was also described. The solution consists of 100 grams of cobalt ammonium sulphate, 0.733 gram potassium dichromate, 10 cu. cm of 1.05-gravity nitric acid, and distilled water to make one liter of solution at 20 deg. C. The methods of using and calibrating the solution were also described. A curve showing the transmission coefficient of the solution at different concentrations and at 20 deg. C. and methods of correcting two concentrations for temperatures between 15 deg. C. and 40 deg. C. were included.

#### Discussion

The paper was discussed by Messrs. F. E. Cady, Cleveland; T. H. Amrine, Harrison, N. J., and C. E. K. Mees, Rochester, N. Y. Mr. Cady remarked that the authors emphasized the need of some standardizing laboratory to supply colored filters or colored lamps to be used in obtaining a color match with any desired illumination. Mr. Amrine said that such difficulty was encountered in standardizing absorbing solutions that they had been abandoned by him.

#### Use of Characteristic Equations in Comparing Light Sources

In a paper entitled "Characteristic Equations of Tungsten-Filament Lamps and Their Application in Heterochromatic Photometry," Messrs. G. W. Middlekauff and J. F. Skogland gave an account of the difficulties experienced at the Bureau of Standards in calibrating lamps differing in color from the 4-watt per candle carbon primary standards which maintain the international candle. The authors proposed overcoming the difficulties of comparison by using tungsten-filament secondary standards. The intensity of these lamps can be measured at a match in color directly in terms of the primary standards, and their candle-power values at any other color determined from the corresponding measured voltages, by using characteristic equations which the authors have derived from the results of tests with tungsten lamps of various sizes and makes. In determining these equations the difficulties due to

color difference were dealt with once for all. Tables of values computed by means of these equations were given for use in practical photometry.

#### Discussion

The discussion was participated in by Messrs. C. H. Sharp, New York; T. H. Amrine, Harrison; F. E. Cady, Cleveland; H. E. Ives, Philadelphia; P. G. Nutting, Rochester; H. S. Dunning, East Orange, N. J.; E. L. Clark, Cleveland; G. M. J. Mackay, Schenectady; J. B. Taylor, New York, and E. F. Kingsbury, Philadelphia. The desirability of eliminating heterochromatic comparisons from routine photometry was brought out.

#### Photometer for Measuring Transmission and Reflection Coefficients

A photometer for measuring the transmission and reflection coefficients of substances having small areas was described in a paper entitled "A Transmission and Reflection Photometer for Small Areas," by Messrs. P. G. Nutting and L. A. Jones. The chief advantages of this instrument are as follows: Errors due to fluctuation in the standard light source are eliminated by utilizing the same source of light for the comparison light and for the source of transmitted or reflected light; no corrections for a shift in the zero are required as the two beams can be balanced with an open system; the object sighted is directly visible at all times, and an open linear scale reading from zero to 100 per cent is employed. There was no discussion.

#### Measurement of Specular and Diffuse Reflection

In a paper on "Mixed Specular and Diffuse Reflection," Mr. P. G. Nutting discussed the old and new methods of measuring the reflecting power of different surfaces. Probably the simplest method of determining the specular reflecting power is to measure the total reflecting power and the diffuse reflecting power separately and take the difference. If the diffuse reflection is measured perpendicularly with illumination at an angle of 45 deg. or more, all the light specularly reflected is thrown out of the field and a maximum value for the specular reflecting power will be obtained. In other methods use is made of the fact that the specularly reflected light is almost completely plane polarized while the diffusely reflected light is quite unpolarized. Of the polarization methods, probably the best is that used by Professor Ingersoll in the construction of his so-called glarimeter. In this the area and distance of the source of illumination and the angle of incidence are fixed and the relative brightness is determined by viewing through a nicol prism in two different positions. The method of determining diffuse and total reflecting power separately is essentially a laboratory method in that it requires expensive instruments. It is, however, simple, rapid and precise. Ingersoll's method is probably best adapted to practical testing, while the total reflectometer method will prove useful in connection with total reflection work. This paper, the author declared, grew out of criticism in the *Electrical World* of Professor Ingersoll's article describing his "glarimeter" for determining relative specular brightness.

#### Discussion

Dr. M. G. Lloyd, Cleveland, said that an ink surface upon a white background may be so glossy that for particular positions of the observer the ink may appear brighter than the background. In reply to a question by Dr. P. W. Cobb, Cleveland, Dr. Nutting stated that the formulas given in the paper do not apply to such reflection as that of sunlight on water.

#### Reflecting Standards

The absolute reflecting powers of various reproducible surfaces were listed in a paper entitled "Tests of Some



Possible Reflecting Power Standards," by Messrs. P. G. Nutting, L. A. Jones, and F. A. Elliott. Among substances tested were compounds of calcium, aluminum, magnesium and boron, with smooth, matte, brushed and rough surfaces. The effect of size of grain on reflecting power was also determined. It was found that extremely fine powdered crystals gave the best results. Magnesium oxide heated to a high temperature in a vacuum furnace to remove water of crystallization had the highest reflecting power, namely, 88.1, of any substance investigated. On exposure to air the reflection coefficient fell to 86.4 and finally to 85.3. Among other substances considered sufficiently reproducible for reflection standards were barium sulphate, boric acid, magnesium carbonate, sodium sulphite and starch.

#### Discussion

In discussing the paper, Mr. M. Luckiesh, Cleveland, remarked that the brightness of a glare spot depends upon the brightness of the source of light, while the diffuse illumination depends upon the distance from the source.

#### The Integrating Sphere

Messrs. N. K. Chaney's and E. L. Clark's paper entitled "Notes on the Integrating Sphere and Arc Photometry" contained an exhaustive analysis of the characteristics of integrating spheres, as affected by screens and opaque bodies. A mathematical expression was developed for the error of integration, which contains factors depending upon the reflecting power of the sphere walls, upon the relative size and position of the screen with respect to the light source and to the photometric window, and upon the distribution of the light flux from the sources under comparison. Experimental data verifying the general theoretical conclusions were also given. The use of translucent screens and the photometering of extended light sources were also discussed. The conclusion was reached that translucent screens are not desirable and that extended light sources of sizes now common among modern arc lamps do not give erroneous values when photometered in a properly designed sphere.

#### Discussion

The paper was discussed by Messrs. C. H. Sharp, New York; S. L. E. Rose, Schenectady; G. W. Middlekauff, Washington; W. F. Little, New York; C. S. Redding, Philadelphia; F. E. Cady, Cleveland; T. H. Amrine, Harrison; C. W. Jordan, Philadelphia; R. C. Chillas, Jr., Cleveland, and E. L. Clark, Cleveland. Mr. Little presented results of experiments showing that either an opaque reflecting screen or a translucent screen can be used satisfactorily for ordinary photometric work. Mr. Little, Mr. Rose and Dr. Middlekauff stated that use is made of white alabaster as inner coating of the spherical photometers in the laboratories where they make tests, while Mr. Clark said that factory white has been found to give the best satisfaction in his photometer.

#### Acetylene Flame as Light Source

A burner for producing a cylindrical acetylene-flame standard light source was described and results of photometric tests on the flame were tabulated in a paper by Mr. L. A. Jones. It was shown that the most desirable pressure is 9 cm and the height at which the flame's intensity varies least is about 18.4 mm above the burner tip. The intensity of the flame does not become stable until about thirty seconds after being ignited. Among the advantages of this light source are its constant intensity, good quality, definitely known spectral energy distribution and its simplicity of construction and operation.

#### Discussion

The discussion was participated in by Messrs. E. L. Clark, Cleveland; C. H. Sharp, New York; H. C. Chapin, Cleveland; C. O. Bond, Philadelphia; S. L. E. Rose, Schenectady; M. G. Lloyd, Chicago, and F. E. Kingsbury, Philadelphia.

#### New Data on Visibility

Visibility data obtained from observations of twenty-one subjects, together with a formula representing the visibility curve, were included in Dr. P. G. Nutting's paper on "The Visibility of Radiation." The apparatus employed in securing the data consisted of a wave-length spectroscop fitted with a Whitman disk flicker photometer arranged so that the pure spectral hue and a white surface illuminated by a standard lamp were viewed alternately. The experiments covered observations between  $0.40 \mu$  and  $0.70 \mu$ . The visibility curve thus obtained conforms fairly well with the curve represented by the following formula:

$$v = V_m r^a e^{a(1-r)} \text{ where } r = \lambda \max/\lambda \text{ and } a = 181.$$

$v_m$  is the ratio of the candle-power to the watt at the wave-length of maximum visibility. Methods of determining this ratio were described. The paper also contained references to works of others who have investigated the visibility of radiation.

#### Vision in Animals

Dr. H. M. Johnson in a paper entitled "Some Recent Experiments on Vision in Animals" described the results of visual tests with certain vertebrate animals. Each animal was placed in a situation in which he could be made to establish a discrimination habit. The method used was based on the fact that animals seek food and avoid punishment. It was determined that the monkey has visual acuity of the same order as that of man, while the visual acuity of the chicken is only 20 per cent to 25 per cent as good as that of the monkey and man. It was also found that the visual acuity of the dog is not over 4 per cent of that of the monkey and man.

#### Electrolysis of Reinforced Concrete

The cause of the cracking of reinforced concrete when the reinforcing material discharges current into the concrete has been found to be the formation of rust upon the anode. In the report of the committee on electrolysis at the Atlantic City convention of the International Association of Municipal Electricians, Mr. Leon Taylor, the chairman, said the Bureau of Standards found that this formation of rust takes place only at temperatures around 100 deg. Fahr., and that damage to the concrete is therefore not to be expected unless the density of the discharge is very high or some other conditions keep the concrete above the critical temperature. The addition of a fraction of 1 per cent of salt to concrete increases its conductivity and destroys the passivity of the iron, thus multiplying the corrosion many hundred times. Salt should, therefore, never be used in structures that may be subject to electrolytic action.

The passage of current from the concrete to the reinforcing material has been found to cause a softening of the bond between the iron and the concrete due to the accumulation of alkali there. The danger from electrolysis of concrete is greater where the current flows to the reinforcing material than where the current flows from the metal to the concrete. The passage of a current through unreinforced concrete has no effect upon the concrete other than that produced by the heating effect of the current. Electrolytic corrosion seems to be independent of the quality of the iron.

# Operating Costs of Commercial Electric Vehicles

**Further information on the plans of the Electrical World to collect, collate and publish authoritative information on cost of transporting freight and merchandise**

**L**AST week's *Electrical World* contained some account of the campaign undertaken by this publication to secure authoritative cost data on commercial electric vehicles. In our search for these data it is not our intention to impose on the maker or user the task of making the calculations. These will be made by the *Electrical World*, and complete information which can be readily verified will be placed in the hands of the users and owners. By this process a double purpose will be accomplished—the owner will be furnished with a competent audit of his transportation accounting, abstracted and distinct from whatever particular bookkeeping system he may employ, and he for his part will be able to reciprocate by testifying as a qualified authority what his experience with his own particular installation has proved his operating costs to be.

As a matter of fact, the costs of electric vehicles in merchandise transportation are fairly well known to some few competent authorities who have made a business of furnishing analytical services to the many owners of large installations and to vehicle manufacturers. In this manner authentic and correct data have been accumulated, covering almost every possible class of service in the principal cities of the country. This information is, however, not available for use other than in a general way, because each investigation is undertaken with confidential obligations for protection of the interests involved. Nevertheless, there is a resultant educational advantage which qualifies those engaged in this work to determine what the cost should be where the general conditions of application are known.

## Difficulties of the Investigation

It may be asked why, with the advantages of this general information on the subject, the questions at issue cannot be settled at once. They can and have been in very many cases, but there are a number of conflicting circumstances which tend to hamper their ready acceptance. First, as already stated, there are so many futile attempts being made in this general direction as to cause confusion as to which data are reliable and which are not, with the result that unless the figures bear the signature of the user they are not considered authentic. On the other hand, the user is not always in a position to testify what his costs are, for a number of reasons.

When horse-drawn vehicles were used exclusively it was not customary to keep accounts of stable and equipment service costs distinctly separate in bookkeeping systems from other business accounts. Consequently there was a lack of transportation-cost information. Later, when automobile sales activity commenced, stress was laid upon horse-service expense, and the facts in each instance were segregated with much difficulty, but without any serious endeavor to separate them permanently for future use. Subsequently, when machines were used on trial or partial installations made, little was done to provide for proper record-keeping. Therefore, when bills came in for the new materials required for their operation these naturally

attracted attention and created the impression that the new expenses were greater than the old. Without any ready means for comparison a feeling of doubt continually existed as to what the real economy of the electric vehicle was. That the machines performed more work or rendered better service is evidenced by the constant additions made to the equipment, but these were made from superficial observation or by instinct, rather than from any scientific business deduction based upon an accurate knowledge of all the economic facts in the case. This has been proved over and over again wherever individual analysis has been made.

Hence it will be recognized that every executive in those progressive commercial organizations which have adopted the modern electric method of transportation will welcome this comprehensive effort of the *Electrical World* to place in his hands the means by which his individual cost of operating electric-vehicle equipments will be made evident to him. To intending users this information, impartially prepared and authoritatively vouched for, will be appreciated as a very practical insurance of stability of prospective investments.

## Enterprise Must Be Based on Facts

In few cases in the business world are new ventures undertaken without all the facts being prepared in advance. "Will it pay?" is a prime question in every instance. "What are the facts and figures in the case?" "What have been the experiences of others?" are the fundamentals which every business organization desires before advancing funds. That so many commercial automobiles have been purchased without such advance assurances is simply due to the tremendous momentum of progress inherent in the commercial and industrial institutions in this country. Here a liberality of business enterprise permits and even fosters a limited amount of speculative undertaking in any direction where the use of new tools or equipment encourages a reasonable anticipation of operative improvement or economic business extension. However, there comes a time when reaction sets in as a matter of sound business principle, and a cautionary review of past performances becomes necessary. Further progress is checked until all elements of uncertainty are removed. Positive facts and figures alone can create confidence and lead to the extension of electric-vehicle equipment. Therefore information such as we have in preparation is certain to act as a stimulus in such situations.

The efforts of manufacturers to promote a knowledge of the cost of operating electric vehicles have been watched for many years with interest, and the *Electrical World's* espousal of the general cause with the idea of spreading the information broadcast should, as we have already good reason to believe it will, receive from the manufacturers universal approval. There is no denying the fact that if the economic principles and advantages attendant upon the employment of commercial electric vehicles were better established their general employment for nearly all city service would be forced upon all business men of sound judgment.

Our observation, particularly over the past decade, of



the progress of electric motor-vehicle business is that it is following the same course that characterizes all human effort in any direction which tends to build up a lasting development and which has the merit necessary to insure its permanency. Psychologists teach that initial efforts stimulated by enthusiasm resulting from the novelty of any undertaking produce extraordinary performances and accomplishments at first, and a curve graphically representing this accomplishment would go up with a sharp angle. Later, such a curve in its upward tendency would rise and fall with more or less obliquity, indicating the exhaustion and reaction which alternate when the struggle to proceed becomes more and more difficult and enthusiasm begins to wane. Periods of improvement are usually followed by stages of stagnation or retrogression. When little progress is being made the curve is flat and it is difficult to make it go upward unless some extraordinary pressure or influence is brought to bear to force further progress. The electric-vehicle business is at present in this position, and while general business conditions may have contributed largely to this situation it will be well for the responsible executive to recognize the natural or human factors also.

No more powerful influence can be exerted upon the present condition than a manifestation of the remarkable economy which can be effected in transportation by furnishing proof of the low cost at which electric vehicles are being actually operated. We are very much gratified with the hearty co-operation we are already receiving and which we hope will continue until we can place in the hands of each maker and user the concrete facts.

## ELECTRIC PUMPING IN CHICAGO

### Economies Effected by Substituting Electric Motors for Engines in City Pumping Stations

For many years the Fullerton Avenue pumping station in Chicago has been supplying flushing water from Lake Michigan to the city sewerage system through two 20-in. by 30-in. single-cylinder condensing engines. As installed with boilers, these two steam engines cost about \$60,000 and were capable of pumping 9000 cu. ft. of water a minute. On June 7, 1912, however, the operation of the engines was discontinued, and a 75-hp, 220-volt, sixty-cycle motor operating at 496-r.p.m. was installed in their stead. Since Sept. 9, 1912, this motor, directly connected to a screw-propeller pump, has been delivering 24,000,000 gal. of water a day against a head varying from 9 in. to 15 in. In addition to the main motor, three additional 5-hp units have been installed to operate gate valves and a sump pump.

Energy for the electrical equipment is secured from a nearby substation of the Sanitary District over three 12,000-volt cables. For this service the city pays the Sanitary District \$2.20 per hp a month, the horse-power charge being made on a basis of maximum demand.

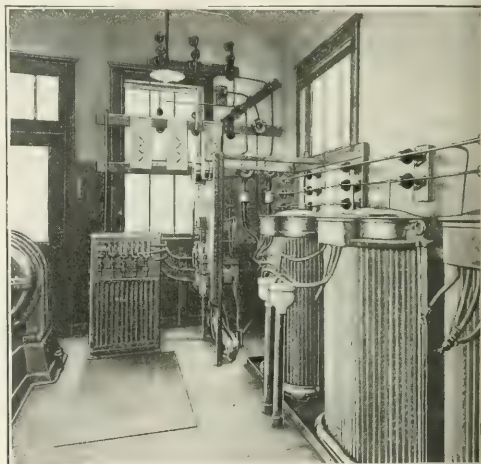
A glance at the accompanying cost data shows to what extent the electric service is responsible for reducing the water-pumping cost in the city of Chicago. While in the days of steam operation the cost ranged from \$16,000 to \$20,000, in 1913 it was approximately \$3,000 for operation and repairs.

Another interesting and more recent application of motor drive to city water pumping is that installed at the Jefferson Park station. Here three gasoline-engine-driven pumps were placed in operation on Nov. 25, 1912. These pumps discharge water from the Lake View station into the outgoing main at approximately 60-lb. pressure. Each gasoline engine was connected to a direct-acting triplex pump.

Owing to the rapid growth of the northwestern section of the city, these pumps were unable to supply the demand for water and maintain the 60-lb. head, so on July 30, 1913, their operation was discontinued, a 100-hp, 2200-volt, sixty-cycle, 900-r.p.m. slip-ring induction motor being installed. To this unit was connected a centrifugal pump capable of delivering 3,000,000 gal. of water a day against a 45-lb. head. Energy for this unit is also taken from the mains of the Sanitary District and is delivered through two 75-kw, 12,000/220-volt transformers operating in open delta.

Comparative figures show that during the time the gasoline engines were in operation the monthly cost of running the station was \$1,161. Since the motor-driven pumps have been installed this charge has been reduced to \$265 a month.

During the first few months of electrical operation there were times when the motor-driven pumps supplied much more water than the system could absorb, and during such times the operators, opening a by-pass valve, allowed the pump to discharge a part of the water



JEFFERSON PARK PUMPING STATION, CHICAGO

back into the suction line. Mr. J. F. Chinlund, electrical engineer for the city, discovering this condition, however, caused a five-step Cutler-Hammer rheostat to be installed in the rotor circuit, each resistor step

### EXPENDITURES FOR WATER PUMPING

Year	Operating Charge	Repairs
1906	\$18,117.83	\$1995.22
1907	20,391.43	3480.36
1908	16,796.60	3923.95
1909	18,759.29	1811.29
1910	17,982.25	1799.06
1911	14,071.36	1919.00
1912	8,060.45	470.43
1913	2,419.04	492.45

being arranged to provide a 5-lb. variation in the pumping head. Since this apparatus has been installed the operators are able to maintain a constant discharge pressure—namely, 60 lb.—and it is unnecessary to by-pass water. During the months that this control apparatus has been in service the pumping costs have been reduced further, now averaging about \$210 a month

# Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods and Current Practice Among Successful Utilities

## Obsolescence of the Unwired House

In pushing its wiring campaign this fall in the residential field, the Worcester (Mass.) Electric Light Company adopted a new plan in its newspaper advertising by discussing the decrease in value of the unwired house resulting from the demand of tenants for electrically equipped homes and the concession of these by builders. The company pointed out that of the hundreds of new buildings erected in Worcester last year only 2 per cent were unwired, and that of the buildings erected in the past three years probably over 95 per cent are electrically equipped. The company contended that this will gradually result in making the unwired house obsolete and a drag on the real-estate market. The company is continuing with success its plan whereby old residences are wired on the instalment basis, allowing a year for final payment. The work is awarded to local contractors, the company having no wiring department.

## New Telephone Order System Used by the Commonwealth Edison Company

A new system of handling customers' applications by means of the telephone has been in operation in the contract department of the Commonwealth Edison Company, Chicago, for several months. It is a telephone order system and has been very successful in expediting the work of connecting up customers' installations to the central-station system. Already it has been subjected to the severe test of the moving-day rush of May 1, and its value has been demonstrated. Mr. E. W. Lloyd, general contract agent of the company, read a paper on the subject before the recent electric sales managers' convention at Association Island. This paper was prepared in rather elaborate and very attractive photographic form by Mr. Harold Wright, chief clerk of the contract department, assisted by Mr. A. R. Gerlach, the company's photographer. The data and

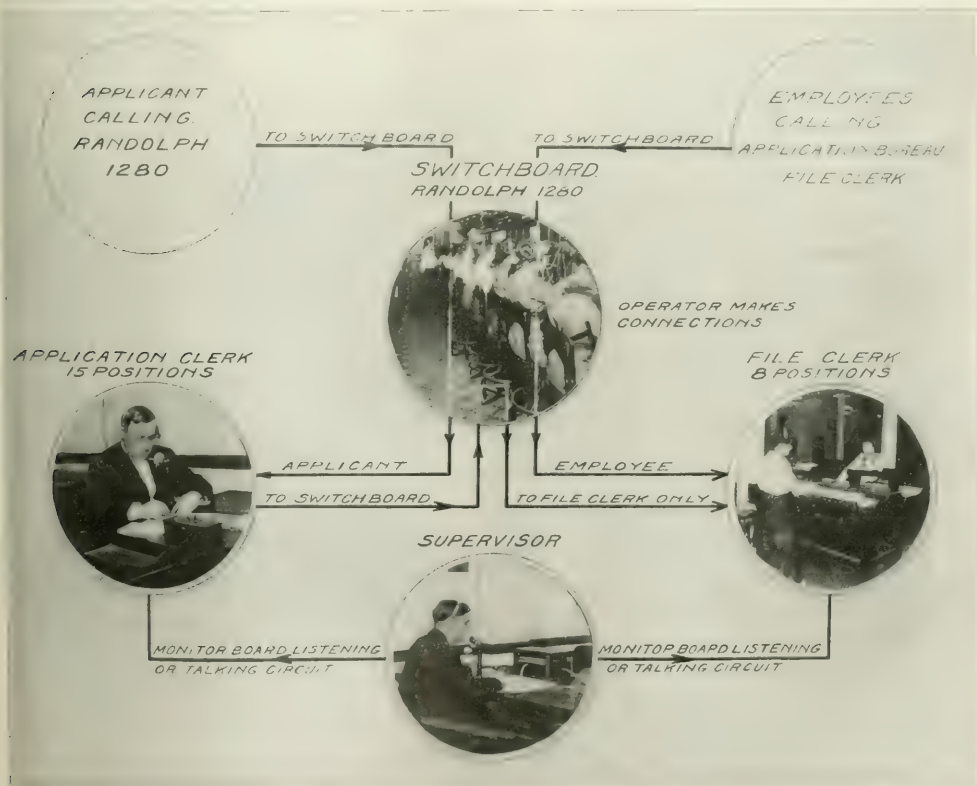


FIG. 1—DIAGRAM SHOWING TELEPHONE ARRANGEMENT OF THE APPLICATION BUREAU OF THE COMMONWEALTH EDISON COMPANY, CHICAGO



pictures given herewith are taken from this interesting paper.

Fig. 1 is a diagram showing the telephone arrangement of the application bureau. The applicant calling is connected through the Commonwealth Edison Company's general telephone switchboard to an application clerk. This man is constantly employed talking to the customers, and he is trained to talk courteously and clearly. If necessary, he obtains the information through the switchboard from a woman file clerk and informs the applicant of the status of the order. Provision is made by which the other employees of the company may communicate with the file clerks, and a supervisor of the telephone order system sits at a monitor board and can listen in to the conversation of any application clerk or any file clerk. There are fifteen positions for application clerks and eight for file clerks.

The application bureau enables the company to supply all applicants with authoritative information relating to pending orders in a courteous manner and in the shortest possible time. It is also equipped to take applications for residence service, to put through disconnect orders and handle cut-off orders, salesmen's calls or suggestions, changes in original orders, and to supply miscellaneous information relating to electric service.

To accommodate the large number of orders which

day, depending on the time received. Orders to cut off meters, to read and disconnect meters and to make changes in the time of connecting service are taken and follow the regular routine of such orders. Miscellaneous information is also cheerfully and courteously given.

If an inquiry is received relative to a pending order, the applicant is requested to give his name, address and telephone number, and to "hold the wire." The application clerk then reverses the two telephone switch keys, in this manner holding the applicant on one line, and then requests the switchboard operator to connect him with the particular file clerk having charge of the division in which the applicant's street number comes. The application clerk then asks, "What is holding — (street number)?" The file clerk answers, "What is the name?" to avoid giving incorrect information. If the name supplied by the application clerk agrees with the street number, the reason or reasons for the delay in making the connection are given.

Information necessary to keep the pending orders up to date is forwarded to the application bureau as soon as possible after the receipt of the orders.

The time required to read and answer an inquiry depends both on the ability of the application clerk to comprehend the applicant's question and upon the appli-

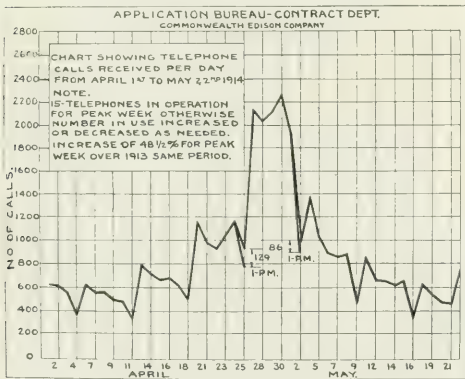


FIG. 2—CHART OF DAILY CALLS

must be handled during the moving seasons, it is necessary at the present time to have the city street numbers divided into eight divisions. The street-numbering system of Chicago lends itself to this classification. A classification by street numbers rather than by customers' names is believed to be more accurate, although the names are used for checking purposes. The file clerk files original orders, reads the reports regarding pending orders and removes completed orders. All the files are constantly checked by each file clerk to prevent errors. In order to provide a further check one clerk is constantly checking all files. The vertical filing system is used, the girls standing at tables with the files before them. The file clerks have head and breast telephones, so that both hands are free to manipulate the files.

The application clerks are men conversant with the policy of the company. They have received special schooling in the methods used in executing orders. Applicants for service are referred to the application clerks. If the applicant wishes service in a residence, the application is taken, the formal order to be signed when the representative calls. Should the applicant be a storekeeper or manufacturer, a salesman is assigned to make a call on the same day, or on the following

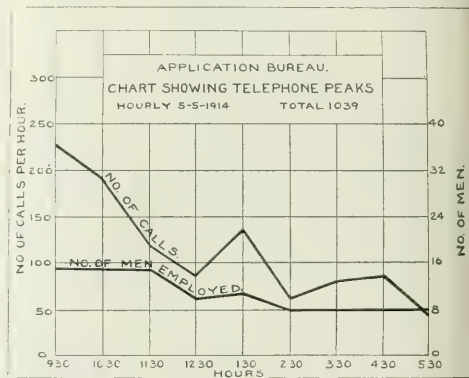


FIG. 3—PEAK-LOAD CHART

cant's ability to talk over the telephone. The file clerk supplies the information required of her in from twenty-five to forty-five seconds, and usually the entire transaction consumes from one to one and one-half minutes. Where the applicant is not fully satisfied he usually asks for the manager. In this case the manager is the supervisor of the application bureau. In all ordinary cases the supervisor is able to satisfy the applicant that the information previously given is correct.

Eleven forms or blanks are used in connection with reports to the application bureau and to other departments of the company in connection with the status of pending orders. Each of the eleven forms is designated by a numeral to aid rapid handling.

Fig. 2 is a chart showing the telephone calls received by the application bureau from April 1 to May 22, 1914. As might be supposed, the peak was reached on April 30, when the number of calls was 2270. Fifteen application clerks were in service during the week of April 25-May 2. At other times the number needed is less.

Fig. 3 is a chart showing the number of calls per hour on May 5, 1914, compared with the number of men employed. It is interesting to note that the number of calls was greatest early in the forenoon, and that the secondary peak came at about 1:30 p.m.

# Illumination and Wiring

## Terminal Insulators and Connectors for Traveling Crane Contact Wires

By C. M. BENTON

For the average electric traveling crane, provided the contact wires are not too large, a No. 26 porcelain insulator can be used as a strain insulator, as indicated in Fig. 1. The galvanized-iron wire used for fasten-

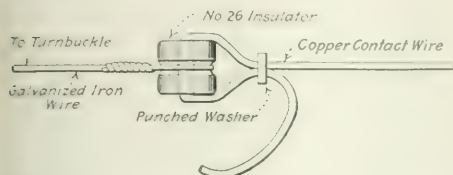


FIG. 1—NO. 26 KNOB USED AS A STRAIN INSULATOR

ing the strain insulator to the termination fixture is passed twice around the groove of the insulator and its free end is made up about the main wire as shown in the illustration. The contact wire is passed once through the No. 26 insulator, after having been inserted through the hole in a punched steel washer, and it is then brought back again through the hole as shown. This arrangement will hold it firmly.

If the voltage impressed on the crane contact wire exceeds 125, two of the No. 26 insulators should be used in series between the contact wires and their terminal fixtures. For voltages higher than 250 three or more of the insulators can be used, but for such voltages it is usually preferable to use the brown glazed porcelain strain insulators that are designed for electric-light and street-railway construction. If the insulators of brown porcelain are not obtainable, those of the composition type can be applied.

Fig. 2 indicates the outline dimensions of the No. 26 insulators. Inasmuch as the hole through the center of this is  $\frac{5}{8}$  in. in diameter, a large contact wire can be inserted through it, but as a general proposition it is not wise to use the porcelain insulator of the type shown for a contact wire having a diameter exceeding  $\frac{1}{4}$  in. If one endeavors to bend a larger wire through the insulator, the probabilities are that the porcelain will be cracked.

A home-made strain insulator can be assembled, as shown in Fig. 2, from materials that are always available. The strain insulator shown is made by clamping

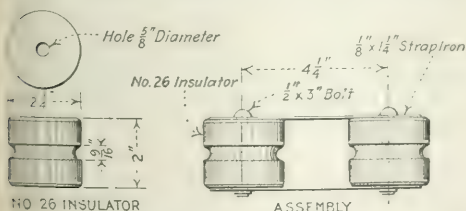


FIG. 2—A HOME-MADE STRAIN INSULATOR

between two strips of  $\frac{1}{8}$ -in. by  $1\frac{1}{4}$ -in. strap iron two No. 26 insulators;  $\frac{1}{2}$ -in. by 3-in. bolts can be utilized to bind the strips to the porcelains. This arrangement has certain advantages over one like that of Fig. 1, for which galvanized-iron wire is used to take the strain. In making up the iron wire there is always a possibility of nicking it with the pliers, which renders

it liable to rupture when a severe strain is imposed. The two strips of the device of Fig. 2 are of such liberal section that there is no possibility of their breaking under any strain that they will ever be called upon to sustain. Furthermore, the arrangement at Fig. 2 has a better appearance. An iron link or one forged from round iron rod can be used to attach the insulator of Fig. 2 to the terminal fitting.

Turnbuckles are frequently inserted between contact wires and the terminal fixture to provide means whereby the contact wires can be tightened. Obviously, strain insulators must also be used to separate electrically the contact wires from ground and from each other. The insulated turnbuckle of Fig. 3 provides both in-

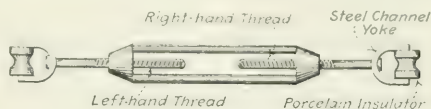


FIG. 3—INSULATED TURNBUCKLE FOR CONTACT WIRES

sulation and a device for tightening the contact wire. Although it has been applied for crane contact wire installations in but a few instances, there is no reason why its application should not be much more general. It is a commercial fitting and can readily be obtained through any large electrical supply house. The metal parts are of forged steel throughout. The absence of

DIMENSIONS OF TUBULAR CONNECTORS FOR CRANE WIRING  
(See Fig. 4 for Illustration)

Number	L, Length in Inches	D, Outside Diameter in Inches	d, Inside Diameter in Inches	LARGEST WIRE ACCOMMODATED	
				Solid	Stranded
1	1 $\frac{1}{2}$	$\frac{1}{2}$	.221	4	5
2	2	$\frac{3}{4}$	$\frac{1}{8}$	2	3
3	2 $\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{8}$	0	2
4	2 $\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{8}$	00	1
5	2 $\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{8}$	000	00
6	2 $\frac{1}{2}$	1	$\frac{1}{2}$	0000	000

castings is a feature that will appeal to the practical construction man. The yokes in which the porcelain insulators fit are bent from channel-section steel and the turnbuckle itself is a drop forging. One of the bolts has a left-hand and the other a right-hand thread, so that when the turnbuckle is rotated in one direction the bolts are drawn together and when turned in the other direction they are forced apart.

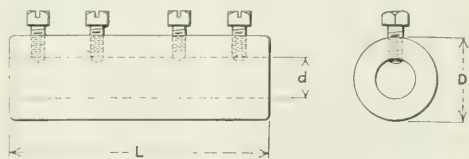


FIG. 4—TUBULAR CONNECTOR FOR CRANE WIRING

Connectors, preferably of the tubular type, should be used for joining crane contact wires to the conductors which bring the energy to the crane runway. Most of the connectors on the market which are used for this purpose are not of sufficiently sturdy construction to withstand the knocks that they receive around the average industrial plant. Fig. 4 shows a detail and



the accompanying table gives the important dimensions for tubular connectors of exceptionally liberal design for crane contact wires. The hollow cylinder forming the body of the connector is a piece of brass or bronze rod having a hole of the diameter indicated in the table drilled through axially. The set screws should be of case-hardened steel and at least  $\frac{1}{4}$  in. in diameter.

Square-headed or hexagonal-headed screws should be used so that they can be turned with a monkey-wrench or a pair of pliers. If screws of this kind that are also slotted across the head, as shown in Fig. 4, can be obtained, they are very convenient, as they can be withdrawn or inserted with either a screwdriver or a monkey-wrench.

## Letter to the Editors

### Street-Lighting Requirements

*To the Editors of the Electrical World:*

SIRS:—The writer has before him the report of the street-lighting committee read before the National Electric Light Association at its convention held in Philadelphia in June, 1914. The perusal of this document has led him to make comparisons between the work of that committee and of the joint committee formed in London in 1910 to "draw up a standard specification for street lighting." As a member of the latter committee, the writer is not surprised to note that in America, as in England, finality was not reached, though from a different cause. In the case of the London committee, consisting as it did of members drawn from the Institution of Electrical Engineers, the Institution of Gas Engineers, the Institution of Municipal and County Engineers and the (British) Illuminating Engineering Society, the whole problem was discussed on a broad basis which would be acceptable to all the interests concerned. A draft specification was eventually prepared and published in a paper read by Mr. A. P. Trotter before the (British) Illuminating Engineering Society on April 15, 1913, when the proposed clauses were fully discussed by the members present and the views of many leading men were communicated.

Both in committee and during the discussion of the above paper considerably divergent views were expressed as to the advisability of using minimum horizontal illumination as the basis of a street-lighting specification. This was recommended by the majority of the London committee.

The fact that this basis has not even been mentioned in the National Electric Light Association's report may be accounted for by the poor support a somewhat similar proposal met with when put forward by the 1907 committee in America. But it is, nevertheless, surprising that, even under the photometric tests of horizontal illumination as suggested by the N. E. L. A., no mention is made of the importance of the minimum illumination test.

The N. E. L. A. committee presented certain general recommendations appertaining to street-lighting contracts, one of which is to "prescribe and provide means of establishing the fact that the lighting equipment and service supplied conform to contract and specification." Provided that the selection of the lighting system installed should result in a minimum illumination the non-attainment of which would *ipso facto* condemn the illuminants, the requirements are more concisely stated by specifying this minimum than by any other means.

It appears that the committee thinks otherwise by its first general recommendation, namely, "the specifying and describing of lamps beyond possibility of misunderstanding." This is where the London committee

completely differs. The specifying of any particular type of lamp leaves several factors uncared for. For example, the best arc lamp or high-pressure gas lamp will not continue to give good illuminating results if not properly attended to. It is, therefore, in the opinion of the writer, more important that the illuminating results should be guaranteed than the particular design of lamp or light source.

This leads to the chief difference of the two reports, namely, that in the case of the London committee the psychological aspect was not touched on, whereas the N. E. L. A. make it the leading feature. The observation tests, for example, are matters of opinion and not measurement, and yet these tests are placed before the photometric tests. Moreover, the results of these observation tests are very contradictory.

In comparing 400-cp units with 100-cp units the general opinion was in favor of the smaller unit, and yet as a psychological expert Dr. Hugo Munsterberg states that "lamps ought to be strong enough to allow rather large distances." Thus a well-trained psychologist gives an opinion quite different from that conveyed to the mind of the average man; but as the lighting of streets is for the benefit of the public and not of the trained psychologist, the vote of the former must be considered. The production of a hypnoid state by uniform illumination can be easily tested by deciding if one feels more sleepy on a brilliantly sunny day or on a dull day.

As Mr. Trotter stated in his paper, the London committee tested the question of the general effect by delegating municipal and county engineers to inspect and classify a large number of streets illuminated in various manners and degrees. This purely qualitative classification was checked by measurements of minimum illumination, and it was found that the classification agreed exactly, though no less than six classes were chosen. As Mr. Trotter pointed out, this agreement is noteworthy as "it shows that judgment by eye by experienced men is in accordance with careful photometric tests," and further "that the surveyor members seem to have been unconsciously influenced by the minimum illumination in each case, for the maximum illumination shows no sort of agreement."

The freshening of the attentive powers by means of illumination is a point which has not been discussed in this country, but from personal experience the writer would suggest that complete darkness freshens the attentive powers more than anything else. Anybody who has attempted to drive a car on a dark night knows that he requires all his wits about him.

The second of the fundamental purposes to be served by street illumination as laid down by the N. E. L. A. is somewhat difficult to comply with as it would necessitate the lowering of the height of street lamps in order to produce the necessary shadows of surface irregularities. This is more effectively done by the head lamps of vehicles, and in the case of sidewalks by preventing such irregularities by maintaining the quality of the paving.

The valuable work and tests now being carried out by the street-lighting committee of the National Electric Light Association cannot fail to be appreciated by all and it is difficult to overestimate the usefulness of the report already published. But it is sincerely to be hoped that a further report and final decision will not be delayed by attempting to tread far in the realms of psychology. To draft a street-lighting specification on contract on psychological lines would indeed require the freshening of the attentive powers, and it is doubtful if Sir Oliver Lodge, or even an angel, would care to undertake the task.

Westminster, London, Eng.

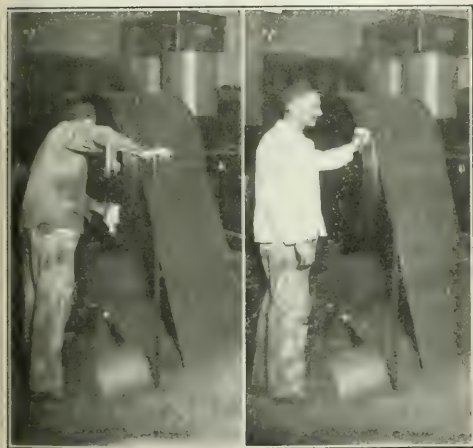
HAYDN HARRISON.

# Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

## Torn Clothing Menace to Life Around Moving Machinery

Illustrated herewith are the dangerous and safe ways of wiping revolving pulleys. Fig. 1 represents the way in which some men endanger their lives by wearing torn clothes around moving machinery. The loose ends of the clothing may be caught by some projecting stud or similar object and the wearer either injured or killed outright by being drawn into the belt or whipped about the floor. By leaning over the pulley in the way shown in the half-tone a man also runs the risk of falling onto the belt or catching his arm in the spokes of the pulley. Fig. 2 shows the correct way in which to wipe the pulley. The man stands erect, applies the waste to the pulley at the point where the belt leaves it, and has no torn clothing which can be caught in the rotating



FIGS. 1 AND 2—THE UNSAFE AND THE SAFE WAY OF WORKING AROUND MOVING BELT

parts. Photographs similar to these are being displayed in conspicuous places by the Rochester (N. Y.) Railway & Light Company to advise its employees of the right way of working around moving machinery in order to insure the greatest degree of safety.

## Necessity of Good Feed Water When Forcing Boilers on Peaks

It is necessary to give greater attention to the condition of the boiler feed water where boilers are to be operated at high steaming rates as injury to the tubes is more liable to occur under this condition, particularly if the water contains scale-making matter. This, of course, is of less importance where surface condensers are used and the percentage of make-up water is small, but in plants where jet condensers are used it may be

necessary to provide for treatment of the feed water. According to Mr. B. F. Wood, the usual method of treatment is by caustic soda or soda ash, added while the water is hot, preferably at about 200 deg. Fahr. This system requires a large tank for sedimentation and reduces the scale-making matter to about three or four grains per gal. After this treatment, and before the water is fed into the boilers, dry soluble tannin extract may be introduced which will keep the scale-making matter in solution. The cost for chemicals for this treatment is about 1 cent to 2 cents per 1000 gal. and gives as good results as can be obtained, except by evaporation.

## Bleeder Turbines in Combined Manufacturing and Generating Plant

An effective method of apportioning the exhaust steam from the high-pressure stages of bleeder turbines to brine evaporators and the low-pressure stages of the same turbines is employed in a combined salt-manufacturing and electrical generating plant at Run-corn, England. Three 725-kw turbine-driven generators having the high-pressure and low-pressure stages separated by a diaphragm are used to supply electricity to plant pumps and to an electric-service system. When the generators are only partially loaded all of the exhaust steam from the high-pressure casings is utilized to heat the brine evaporators. At higher loads an automatic valve in the exhaust pipes allows the excess steam to flow through the low-pressure stages of the same turbines and thence to the condensers. By this arrangement all of the steam is used to the best advantage. The position of each steam-distributing valve is determined by the pressure in the main leading to the evaporators. If steam in excess of the amount required by the brine evaporators is discharged into the main, the pressure will rise, causing the steam-distributing valve to open ports feeding the low-pressure stages of the turbine.

## Two Transformers in Three-Phase Circuit

What effect on the voltage regulation has the operation of two transformers in V-connection in a three-phase system? E. A.

When two transformers are V-connected for carrying a three-phase load the voltage under load must become somewhat unbalanced on account of the impedance of the transformer circuits. If the middle point of both the primary circuit and the secondary circuit of one of the transformers can be reached in one of the transformers, a very much more advantageous arrangement is to T-connect the circuits. Two transformers which can be V-connected to carry a certain load will carry the same load at a higher efficiency and with less voltage distortion when T-connected. It is worthy of note that the prime requisite for T-connection on transformers for three-phase work is met when the two transformers possess the same ratio of primary to secondary turns and a tap is brought out of the central point of one of the transformers.



# Digest of Current Electrical Literature

## Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

### Generators, Motors and Transformers

**Direct-Current Motor and Generator Diagrams.**—R. H. TABER.—Any one change in the operation of a direct-current machine of necessity brings about changes in dependent or related characteristics. Although a first consideration of their relations would indicate a hopeless number of permutations of conditions in the machine circuit, it will be found on closer analysis that they can be reduced to a few simple groups covering practically the complete range of direct-current operation. In this article certain sets of conditions are selected as working standards, and on that basis a thorough study is made of the direct-current machine, the results being given for reference in tabular form, together with the corresponding diagrams of connections. These data are intended to serve in practice exactly the same function as a formula for common use the more or less complicated derivation of which is not necessary in its every application.—*Elec. Journal*, September, 1914.

### Lamps and Lighting

**Tungsten Lamps.**—A note on a recent British patent (No. 18,447, 1913) of the British Thomson-Houston Company and the General Electric Company of this country for a device for increasing the useful life and maintaining the initial efficiency of tungsten-filament lamps. A small quantity of potassium thallium chloride is contained in a small open tube inside the bulb. Before the latter is sealed a small quantity of pure dry nitrogen is admitted at a pressure of from 10 to 50 microns.—*London Elec. Eng'ing*, Sept. 3, 1914.

**Half-Watt Tungsten Lamps.**—H. LUX.—An illustrated English translation in abstract of his recent German paper which has already been noticed in the Digest.—*London Electrician*, Aug. 21, 1914.

### Generation, Transmission and Distribution

**Protection of Electric Installations Against Traveling Waves.**—FRITZ FRÖHLICH.—The trouble of protecting installations against dangerously high voltages produced by traveling waves is not due to a lack of suitable apparatus which can carry the charges off to earth (because such apparatus is available), but to the difficulty of determining the correct point at which to place the apparatus. This problem is solved by Pizzuti and

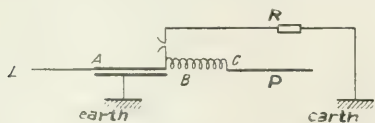


FIG. 1—DIAGRAM OF PROTECTIVE ARRANGEMENT

Ferrari by means of an arrangement which always produces a node (maximum) of the oscillation at a distinct point so that any suitable discharge apparatus (lightning arresters, etc.) connected to that point will surely carry off the charge to earth. The principle of the Pizzuti-Ferrari system is shown in Fig. 1, in which AB represents a condenser, one plate of which is in

series with the line L and is inserted between the line L and the installation P to be protected. The other condenser plate is directly connected with earth. Between the first condenser plate and the installation P an inductance coil BC is inserted. In this way two sections AB and BC are placed between L and P, and for the section AB the value of the square root of the ratio of

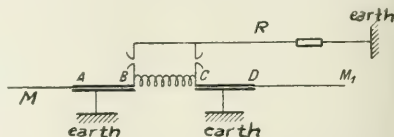


FIG. 2—DIAGRAM OF PROTECTIVE ARRANGEMENT

self-induction to capacity is very low, while it is very high for the other section, BC. Any oscillating wave which comes from the line L will therefore be totally reflected at the point B, and in this point an oscillation node will be produced, so that if a lightning arrester is connected to this point the charge is carried off to earth. The energy of the oscillation wave is not only carried off to earth through the lightning arrester but also through the dielectrics of the condenser AB. The same principle may be used to procure protection against rises of voltages which can occur at both ends of a line, as in long transmission lines, or against rises of voltages which can occur in the installation itself as a result of the melting of fuses, the disconnection of circuit-breakers, etc. In this case the arrangement of Fig. 2 is used. Any oscillation wave coming from L is reflected in B; any oscillation wave coming from B is reflected in C. About 100 Pizzuti-Ferrari machines are in use in various Italian transmission systems.—*Elek. Zeit.*, Aug. 13, 1914.

**Alternator Short-Circuits.**—CASSIUS M. DAVIS.—The author gives a description of the "mechanism" of alternator short-circuits, which is accompanied with diagrams. The phenomena attending the building up of the armature current under a short-circuit are analyzed in detail and the behavior of the armature voltage is described. The attendant changes in both the field current and the field voltage are cited, and Helmholtz's law as applied to the growth and decay of currents when a short-circuit occurs, is stated. Tests of various alternators are given which show that the theoretical calculations correspond closely to the observed facts.—*Gen. Elec. Rev.*, August, 1914.

### Traction

**German Mountain Railway.**—An illustrated description of the mountain railway on the Wendelstein in Bavaria, which is the first direct-current line in Germany many operated at 1500 volts. While it is a small road it is interesting because a storage battery is provided for recuperation of energy.—*Elek. Zeit.*, Aug. 6, 1914.

**Paris.**—T. PAUSERT.—An article on the electrification of the tramway network of the General Omnibus Company, of Paris, with a series of illustrations of the different omnibuses used by this company during the last sixty years.—*La Revue Elec.*, Aug. 7, 1914.

**Train Heating.**—RAY STEARNS.—There are two general types of devices used for train heating, namely, fuel-burning heaters and electric heaters. The author gives an illustrated description of two typical examples of each kind, namely, the flash boiler used by the Pennsylvania Railroad for its New York Terminal electrification and the 30-kw electric hot-air heaters used on the Butte, Anaconda & Pacific Railway for heating its passenger coaches in an all-electric zone.—*Gen. Elec. Rev.*, September, 1914.

#### Installations, Systems and Appliances

**Earthing.**—The Allgemeine Elektrizitäts Gesellschaft has addressed a memoir to the German Association of Electrical Engineers pointing out that there is a great variety in the regulations concerning grounding in force in different plants. It is proposed that the association should bring uniformity into these regulations and should investigate especially the following three points: First, the grounding ("Erdung," "mise à la terre") of the neutral conductor; second, the connection of the metallic portions of the apparatus with the grounded neutral conductor ("Nullung," "mise au neutre"), and third, all other protective devices such as the employment of insulation, etc. In the memoir a summary is given of accidents along these lines and, further, a review of the different regulations in force in numerous German plants. Finally the possibilities are discussed of the protection which can be attained by grounding the neutral conductor, and the liabilities of danger are pointed out. The method of grounding is also discussed with reference to the possibility of a contact between high-tension and low-tension circuits.—*La Revue Elec.*, Aug. 7, 1914.

**Starting Rotary Converters.**—A note on a recent British patent (No. 8711, 1913) of the Siemens Brothers Dynamo Works, Ltd., and the Siemens-Schuckert company. When rotary converters are started up from the alternating-current side the polarity at the moment the machine comes to synchronism is a matter of chance, so that a reversing switch has to be provided in the field circuit. This invention insures correct polarity by the use of an electrical valve in the exciting circuit, which valve allows current to flow in only one direction. It may consist of an iron-aluminum cell and is connected in series with a regulating rheostat and the field winding of the converter. A high resistance should be arranged in parallel with the cell to guard against an excess of pressure.—*London Elec. Eng'ing*, Aug. 27, 1914.

**Protection Against Accidents.**—VOGEL.—Some notes on the experiences had in the Upper Silesian industrial district with respect to electrical accidents. The author deals with the protection against contact with machines, apparatus and measuring instruments, with the use of electric hand machines and hand apparatus, with electric accidents caused by electric locomotives in underground mines, with dangers and protection in connection with high-tension switchboards, with accidents in closed high-tension rooms, and with the space requirements of electrical equipments.—*Elek. Kraft. u. Sinnen*, Aug. 4, 1914.

#### Wires, Wiring and Conduits

**Computation of Composite Alternating-Current Lines.**—A. E. KENNELLY.—A composite line is defined as one consisting of a plurality of successive sections, each having its own uniform electric constants. In the present article the author shows how conveniently and wittily the electrical characteristics of a composite alternating-current line can be computed by means of tables and charts of hyperbolic functions. No familiarity with the mathematical theory of hyperbolic functions

is required but only a moderate acquaintance with the working formulas of ordinary circular trigonometry.—*Journal Franklin Institute*, September, 1914.

#### Electrophysics and Magnetism

**Ratio of Charge to Mass of Electrons.**—SAUL DUSHMAN.—In a recent paper on the effect of space charge and residual gases on thermionic currents in high vacuum, I. Langmuir has shown that the thermionic current from a heated metallic surface in a high vacuum is limited by temperature and space charge. The space charge formula developed by him for the thermionic current from a heated filament to a coaxial cylindrical anode was tested by the present author experimentally over a range of voltages from 35 to 140, for the case of a tungsten filament in a concentric molybdenum cylinder. The results obtained are in good agreement with this formula and indicate that the method ought to prove a very accurate one for the determination of  $e/m$ . The observations obtained on the effect of gases on the thermionic currents are also found to be in accord with Langmuir's surface-film theory and justify the conclusion that there exists a pure electron emission from heated metals which is a function of the temperature only and is not a secondary effect due to presence of gases as assumed by a large number of investigators.—*Phys. Rev.*, August, 1914.

**Spectra.**—A paper by W. M. Watts deals with the spectra given by carbon and some of its compounds, and, in particular, the "Swan" spectrum. A paper by W. M. Hicks deals with high-frequency spectra and the periodic table, and a paper by J. R. Rydberg with the ordinates of the elements and the high-frequency spectra. In a paper by J. W. Nicholson it is pointed out that the crucial test of Bohr's theory of spectra is to be found in its application to the ordinary spectrum of helium. The author's mathematical analysis seems to indicate that Bohr's theory is incapable of further developments in the interpretation of spectra.—*Philos. Mag.*, July, 1914.

**Current Between a Wire and a Coaxial Cylinder.**—JOHN S. TOWNSEND.—An experimental investigation of the potential required to maintain a current between a wire and a large coaxial cylinder when a glow discharge is produced by a high electric force. The author determined the velocities of the positive ions and the negative ions under unit electrostatic force.—*Philos. Mag.*, July, 1914.

**Osmosis.**—F. T. TROUTON.—His address to Section A of the British Association at the recent meeting in Australia on the phenomena of absorption and adsorption and their relations to osmosis.—*London Electrician*, Aug. 28, 1914.

**Large Electromagnets.**—MAURICE LEBLANC, JR.—For laboratory purposes the production of very intense magnetic fields is often important. A simple means is to use electromagnets with an almost closed magnetic field and to make the experiments within the small air-gap. The author discusses the different solutions of the problems which have been proposed by Weiss, Perrin, Deslandres, Fabry, Perrot, Cotton and Piccard.—*La Lumière Elec.*, July 11, 1914.

#### Electrochemistry and Batteries

**Electric Steel.**—IVAR RENNERFELT.—An article on the electric arc furnace and the development of the steel casting industry. The author replies to the recent article of G. Muntz in favor of the Tropenas converter and endeavors to show that this is inferior to the electric-arc furnace for foundry uses.—*Met. and Chem. Eng'ing*, September, 1914.

**Primary Battery.**—In the usual primary batteries soluble salts are formed by solution of the anode, and these salts participate in the electrolysis. For instance,



in the ordinary voltaic cell zinc sulphate is formed and participates in electrolysis and zinc ions gradually travel over toward the copper electrode. The author proposes to use an anode of such a chemical nature that the salt which is formed by the reaction of the anode with the electrolyte is insoluble. He uses as anode a lead amalgam (90 lead to 10 mercury) and a carbon cathode with a solution of sulphuric acid and nitric acid as electrolyte (80 cu. cm sulphuric acid at 66 deg. Baumé and 120 cu. cm nitric acid at 36 deg. Baumé in 1000 cu. cm water). The cell is stated to have a rather constant emf.—*La Lumière Elec.*, July 25, 1914.

#### Telegraphy, Telephony and Signals

*Application of Telephone Relays to Commercial Circuits.*—C. ROBINSON AND R. M. CHAMNEY.—Details are given of a balanced telephone relay system, including a device for automatically cutting out the relay in event of a fault occurring which would upset the balance of the line. Methods employed for signaling are also given.—*London Electrician*, Aug. 14, 1914.

*Wireless Telegraphy.*—H. REIN.—The author discusses whether wireless-telegraph stations should be operated with damped or undamped oscillations. That is, whether they should be operated by a spark system or by high-frequency machines. In favor of the spark system (damped oscillation) there is only one fact, namely, the ease with which the wave-lengths can be varied quickly and continuously over a wide range. As in most large wireless stations it is sufficient to generate one or only a few different wave-lengths, this advantage of the spark system is not decisive. With respect to the efficiency on the sending end, or the energy absorption in the ground and in the atmosphere, or the possibility of using a sound receiver, there is no essential difference between stations using damped or undamped oscillations. With respect to all other important points the comparison is in favor of undamped oscillations (high-frequency machines). With the latter, generation of the largest amounts of oscillation energy is possible without any fundamental difficulty. At the same time the transmitting antenna is utilized to the fullest extent. Moreover, the energy absorption of the receiving indicator is always greater with undamped oscillations than with damped ones. Finally, stations with high-frequency machines do not disturb adjoining installations using spark systems in their mutual intercourse.—*Elek. Zeit.*, July 30, 1914.

## Book Reviews

**HIGH AND LOW TENSION SWITCHGEAR DESIGN.** By A. G. Collis. New York: D. Van Nostrand Company. 220 pages, 94 illus. Price, \$3.50.

The title of this book suggests that it deals exclusively with the design of switchgear; but it actually covers a wide range of subjects, and its interest lies less in its treatment of switchgear details (there are but few cuts or descriptions that might interest the designer) than in its more subtle and elusory qualities which cannot readily be apprehended. Perhaps the preface supplies the key to the choice of title, in suggesting the probable appearance of further publications, presumably by the same author, on the same subject. We are told that "The major portion of this contribution is expressly intended as an introduction to the main elements of design, which will be more abstracted by further publications on the individual subjects involved." The book is divided into two parts—alternating-current switchgear and direct-current switchgear—but the topics touched upon under the two headings are of a miscellaneous nature, and the complete lack of logical se-

quence in the presentation of the material puts serious difficulties in the way of any reader wishing to refer to particular passages. This contingency has obviously not been anticipated by the author, because he has not taken the trouble to provide an index. The best feature of the book is the introduction of oscillograph records of circuit-breakers opening under various load conditions. These are well reproduced, and they speak for themselves. The author's language is peculiar. He appears, not infrequently, to be influenced in his choice of words rather by their sound values than their sense values, as for instance when he tells us that "the expansion of a fuse element to its vaporized form is 2000 times its normal," and that "it is in default of a proper understanding of the effects of power-factor that competition has covered up its technical points." The author appears to be familiar with British practice in the matter of switchboard arrangements, but his book is no evidence of his experience as a designer of switchgear, and it is not entirely clear why he has chosen to write on this particular theme. The most characteristic parts of the book are, perhaps, the preface and the concluding paragraphs. The closing sentence, which is particularly impressive because of its euphonic perfection, is worth quoting: "Every new experience opens up another field of research, until it is found that the more information is acquired the more information is needed, and the conclusion is forced upon one that the human element is by far the most infinite son of the industry with its failure more pronounced." This statement is indisputable; but is it not equally true that the less knowledge one has the greater the reason for imparting it to others, and that the least infinitesimal daughter of the industry is invariably an unpronounceable success?

**SWITCHES AND SWITCHGEAR.** By Prof. R. Edler. Translated by Ph. Laubach. New York: D. Van Nostrand Company. 402 pages, 365 illus. Price, \$4.

It would seem that the subject of switchgear offers fewer attractions to writers of technical books than almost any other phase of electrical engineering, and this book by Professor Edler, ably translated and slightly modified by Mr. Laubach, is, as claimed in the preface, the first English work which "combines a theoretical treatment of the subject with a comprehensive series of practical examples in design." The first book in the English language treating exclusively of switchgear, and laying stress on the heavier designs used in generating stations, was written many years ago by Mr. Leonard Andrews, a prominent British electrical engineer, and it is probable that the gentleman laconically referred to as "Andrews" on page 134 of the book under review is the author of the earlier book. This, however does not invalidate the claim made by Mr. Laubach that no specialized comprehensive literature on the subject of switchgear has up to the present time been available because the book by Mr. Andrews does not pretend to go into details of design or fundamental theories. Professor Edler's book, if not the only one available on the subject, is unquestionably the best and most comprehensive and it deserves to be widely read by those interested in the subject. The very fact that the Continental and British types of switchgear are mainly dealt with should prove of special interest to the American engineer, who cannot afford to neglect the study of foreign engineering practice. One of the best chapters in the book deals with the theory and design of starting and regulating resistors and controllers. Methods of calculating feeder regulators designed on the principle of cutting out resistance as the load increases are explained, but the less wasteful induction type of regulator, connected as a "booster" on alternating-current feeders, is not mentioned.

# New Apparatus and Appliances

An Illustrated Descriptive Record of Recently Developed  
Manufactured Products of Interest to Electrical Readers

## Recording Telephone Conversation

Shortly after his invention of the phonograph in 1878, Mr. Thomas A. Edison predicted that this instrument would help to perfect the telephone. "In writing our agreements," he asserted at that time, "we incorporate in the writing the summing up of our understanding—using entirely new and different phraseology from that which we used to express our understanding of the transaction in its discussion and not infrequently thus begetting perfectly innocent cause of misunderstanding. Now, if the telephone with the phonograph to record its sayings were used in the preliminary discussion, we should not only have the full and correct text but every word of the whole matter capable of throwing light upon the subject." Recently this prediction was verified when Edison himself developed an apparatus, comprising a dictating machine equipped with telephone-recording devices, which he has named the "telescribe."

The dictating machine is equipped with a micro-recorder which swivels into place over the wax cylinder and is wired to a telephone extension operated with its own small batteries. The latter is mounted on the user's desk. A telephone message is recorded in the following manner: The receiver of the regular desk telephone is removed from the hook and placed in the socket provided with the recording apparatus. In this way the acoustic connection to the dictating machine is made without danger of criticism

from the telephone company, as the instrument is neither mechanically nor electrically connected to its lines. The user then takes up a small receiver and gives his call to the exchange, while starting and stopping the dictating machine by means of two small buttons in order to record the conversation between pauses or delays, thus avoiding any waste of the cylinder. In this way both sides of the telephone conversation are recorded, as well as that of the central operator in making the connection. Mr. Edison is shown in the accompanying illustration at his desk using the "telescribe."

## Electrically Operated Clam-Shell Bucket

The clam-shell bucket illustrated herewith is designed for use with almost any hoisting machine with one or more hoisting drums, as it is only necessary for the operating machine to raise and lower the bucket, the digging and discharging of the load being accomplished by means of a motor and drum in the head of the bucket. This bucket is used on cranes in foundries and shops for digging and rehandling materials for which a clam-shell bucket is suited. All movable parts of the motor are inclosed in a heavy casing. Energy is conducted to the bucket by a small waterproof cable. The bucket is operated by means of a rheostat for two to four speeds each way. An automatic cable take-up reel, which may be placed in any



MR. EDISON TESTING HIS NEW INVENTION, THE "TELESCRIBE"





CLAM-SHELL BUCKET WITH MOTOR AND DRUM

convenient position, is provided for varying the tension on the cable.

This bucket is being placed on the market by the Hayward Company, 50 Church Street, New York.

### Portable Electric Tool-Post Grinder

A small motor-driven machine designed for center grinding, cylindrical grinding, close internal work and lapping out dies was recently brought out by the Wisconsin Electric Company, Racine, Wis. A 0.25-hp motor operating on both alternating current and direct current at a speed of 10,000 r.p.m. is used to drive this grinder. Connected to the main spindle by a rubber belt is another spindle which runs at a speed of 30,000 r.p.m. The complete apparatus weighs 17.5 lb.



ONE METHOD OF USING GRINDER

### Socket for High-Candle-Power Lamps

Owing to the advent of nitrogen-filled tungsten lamps, which take 1000 watts or more, the tendency of the illuminating engineer is to replace clusters and other lighting groups with a single unit. As a result of this movement it has been necessary to improve the auxiliary

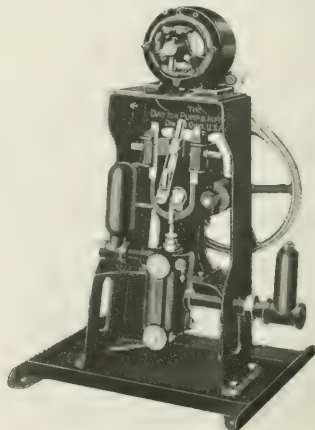


SOCKET FOR NITROGEN-FILLED INCANDESCENT LAMP

equipment. This has been particularly the case with sockets and receptacles. In the accompanying illustration is shown a mogul socket, as it is called, manufactured by the Bryant Electric Company, Bridgeport, Conn., for use with high-candle-power incandescent lamps. It is larger in size and is built for more severe usage than the ordinary sockets. The live parts of this socket are sealed in with a compound, which, the manufacturers declare, will not soften at any temperature to which it may be subjected when in service.

### Electric Pump for Short Lifts

An electric pump for pumping from shallow wells, lakes, cisterns or for any suction lift up to 22 ft. is shown herewith. This pump has a rating of 275 gal. per hour against a pressure of 50 lb. per sq. in. and will pump water to an elevation of 110 ft. The pump is belted to a 0.25-hp motor, which is mounted above the pump on a cast-iron frame. The pump is double-acting and is fitted with an automatic air intake valve for pressure-tank service. The Dayton Pump & Manufacturing Company, Dayton, Ohio, makes this pump.



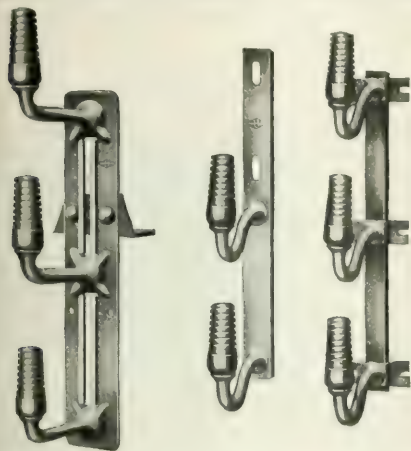
MOTOR-DRIVEN PUMP FOR SHORT LIFTS

### Pole-Line Hardware

A number of devices for use in connection with pole lines have recently been developed by the Barnes & Kobert Manufacturing Company, Milldale, Conn. In Fig. 1 is shown a wide back plate with a center slot for attaching to a wall or cross-arm. In the latter case the

wringer either separately or simultaneously from the jack-shaft through combination shaft and chain drives. The washer complete weighs 225 lb., and when not in use it can be stored in a 22-in. by 22-in. space.

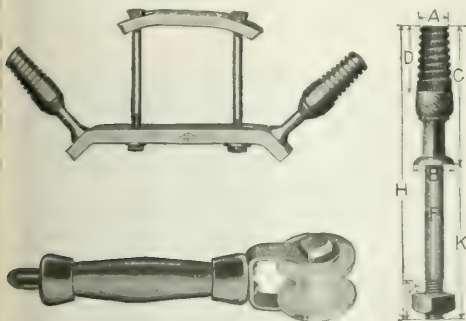
The interior mechanism of the machine has been arranged so that with the motor running the washer



FIGS. 1, 2 AND 3—BACK PLATE, TWO-POINT SERVICE BRACKET AND THREE-POINT WALL BRACKET

plate is clamped to the arm, the ends of the clamp projecting through the center slot. Fig. 2 shows a two-point service bracket and Fig. 3 a three-point wall bracket. The break arm shown in Fig. 4 is used in taking off wires below the cross-arm. The long pin illustrated in Fig. 5 is of the Western Union type and is made either  $\frac{1}{2}$  in. or  $\frac{5}{8}$  in. in diameter. The wood

MOTOR-DRIVEN WASHER WITH SAFETY ATTACHMENTS FOR WOODEN TUBS



FIGS. 4, 5 AND 6—BREAK ARM, LONG PIN AND WOOD STRAIN INSULATOR

strain insulator shown in Fig. 6 is equipped with heavy drawn-steel caps and is made of impregnated second-growth hickory. The spool may be either of porcelain or composition.

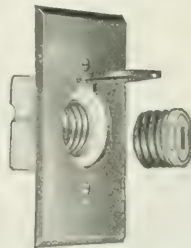
### Electrically Driven Washer with Safety Attachments

An electric washer of the wooden-tub type driven by a  $1\frac{1}{5}$ -hp motor is now being introduced by the Meadows Manufacturing Company, Pontiac, Ill. Power is transmitted from the motor to a jack-shaft through a round belt, and it is possible to operate the washer and the

is placed in operation by lowering the lid, action ceasing when the cover is raised. To start the wringer, pressure must be applied to the foot pedal, and releasing this pedal stops the wringer. This feature, the manufacturer claims, provides greater safety, as a person operating the machine would involuntarily remove the foot from the pedal in an emergency. A hand lever near the wringer makes it easily reversible.

### Device for Adapting Screw Receptacle to Push Plugs

In order to convert screw-base flush receptacles into the more convenient "push-in" type, a device called an "adapter" has been developed. The device is screwed into the receptacle and is then left in. It is small enough so that the lid will close. The device is equipped



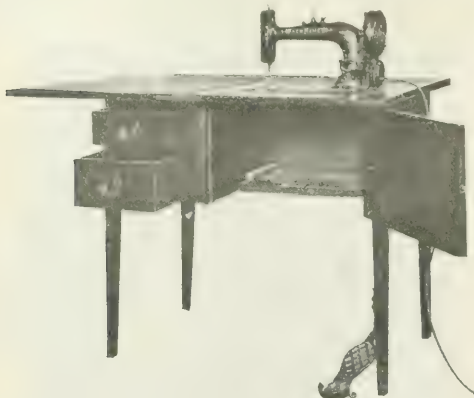
DEVICE FOR CONVERTING SCREW RECEPTACLE TO PUSH-IN RECEPTACLE

with phosphor-bronze contact springs similar to those used in the ordinary base of separable attachment plugs. This device is being made by the H. T. Paiste Company, Philadelphia, Pa., for which the Hart & Hegeman Manufacturing Company, Hartford, Conn., is sole selling agent.



### Table for Electrically Operated Sewing Machines

A convertible table designed for motor-driven sewing machines is shown herewith. When not in operation the machine can be dropped out of sight, and then the table



CONVERTIBLE TABLE FOR ELECTRIC SEWING MACHINE

may serve any of the numerous purposes for which an ordinary small table in the home is employed. The small motor is controlled by the foot pedal shown in the illustration; when not in use it can be placed in the body of the table. The table is made either of oak, birch or mahogany. The motor can be fitted, the manufacturers declare, on any sewing-machine head. The table and the motor used in the operation of the machine are the product of the Bissell Motor Company, Toledo, Ohio.

### Outside Location for Meter

In the accompanying illustration is shown a method of conveniently housing a meter whereby a reading can be taken without annoying the occupants of the house. The meter is set face outward in the exterior wall of the



METER IN EXTERIOR WALL

building. The box is fireproof and is equipped with a glazed window and a door which can be securely locked. This box, the manufacturers claim, covers all the requirements of public-service companies and is provided with all the necessary outlets and connections for wires, etc. This box is the product of the Donley Brothers Company, Cleveland, Ohio.

### Electric Hotel Range

The large-sized electric range shown herewith is equipped with a surface heater, an upright broiler compartment, an oven and a salamander. The heating elements are of the exposed type and are insulated with porcelain. The surface cooking is controlled by two switches, the current with one being 8 amp and the other 10 amp. The salamander heater is similarly controlled, the current being 7 amp and 8 amp. The oven heater takes 12 amp and is controlled by two switches, the current with each being 6 amp. The upright broiler takes 16 amp; it has only one heat, which is maximum. This broiler is so arranged that food can be broiled on both sides simultaneously.

All the switches are of the indicating single-push-button type and are equipped with pilot lamps. Fuses are placed immediately behind the switches. The body of the range is of sheet steel, the facings of Russia iron, the top of semi-cast-steel and the legs of nickel-plated cast iron. The trim is of monel metal and German silver. The top of the range is 42.5 in. by 24.5 in. and the range is 36 in. high. The oven is 14 in. by 16.75 in. by 12 in.; the salamander is 13.75 in. by 16 in. by 7.5 in., and the broiler compartment is 11 in. by 3 in. by 9.5 in. The outside cooking surface is 16 in. by 32 in. The hood may be connected to a ventilating system for removing the cooking fumes. Features in connection with this range are the shelving space above the surface heater and the table attached to the range.

This "Biltmore" range, as it is called, is being manufactured by Wells, Mowbray & Newman, Inc., 125 West Forty-second Street, New York.



ELECTRIC RANGE FOR HOTELS AND RESTAURANTS

### Electric Lantern

An electric lantern operating with standard-sized dry cells has recently been developed by the H. W. Johns-Manville Company, New York. With two dry cells used

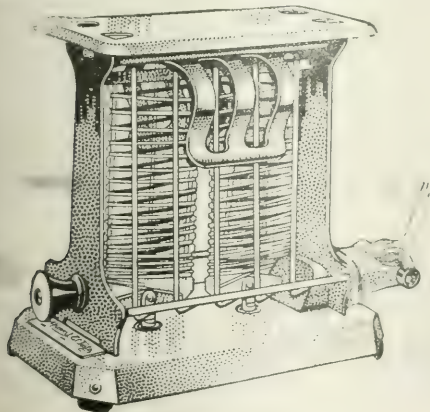


ELECTRIC LANTERN OPERATED WITH STANDARD DRY CELLS

intermittently, the manufacturers claim that the lamp will operate for a total of 150 hours. The lantern is equipped with a small tungsten lamp and a parabolic reflector. With the light produced it is declared that objects 150 ft. away are clearly discernible.

### Vertical-Rack Electric Toaster

The electric toaster shown herewith is equipped with clamps for holding the slices in place. In removing the toast one hand only is necessary as the clamp can be raised with the edge of the slice of bread. This device takes 450 watts, and will, the manufacturers assert, toast two slices of bread on both sides in two and one-

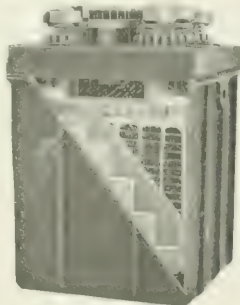


ELECTRIC TOASTER

half minutes or ten slices on both sides in twelve and one-half minutes. Fiber feet are provided which do not scratch the tops of tables. This electric toaster is being made by the Hotpoint Electric Heating Company, Ontario, Cal.

### Battery for Motorcycle Service

A small storage battery with a high capacity per unit of weight and volume designed for motorcycle service is shown in the annexed illustration. The elements are contained in a one-piece, three-compartment vulcanite case with heavy walls reinforced by exterior ribs. The case is provided with recessed bosses to receive the ends of a spring bail handle. The battery is closed at the top by a one-piece cover with an outer flange which incloses the supports and protects the top edge of the case, and by three inner sealing flanges



MOTORCYCLE BATTERY

which effectually seal the individual compartments. The gas vent and filling plug contains an expansion chamber to allow condensation of spray, and it is designed so that in combination with the cover the amount of water which can be put into the cells is limited to that needed to replace the water lost by evaporation.

This "Exide type Z" battery, as it is called, is being manufactured by the Electric Storage Battery Company, Philadelphia, Pa.

### Reverse Motor Plug

A reverse motor plug with strain-relief bushing is being made by Harvey Hubbell, Inc., Bridgeport, Conn. The device is of tough heat-resisting composition and is designed for use on vacuum cleaners, automatic pianos, advertising apparatus, etc. The contact springs and blades are fastened to small square brass bushings molded into the composition, and the blades are held in position by a recess into which the base of the blade is fitted. The strain bushing is threaded and engages



REVERSE MOTOR PLUG

with a threaded portion of the top of the plug. The base is slotted for wiring. Screw holes for attaching the base to the apparatus are spaced on 1 29/32-in. centers. The diameter of the base is 2.25 in., and the height over all is 2.75 in.



Just now the city of Grand Rapids, Mich., is enjoying a building boom, operations occurring principally in the city's downtown district. A large hotel building, a structure for the Young Men's Christian Association, office buildings, buildings for fraternal orders and a hospital are in process of erection, and this activity is in a large measure helping the electrical contractors, who report almost unanimously that sales to the small consumer are not at high tide. A large theater with about 1000 lamp outlets has just been completed, and with so many large jobs at hand the contractors are on the whole doing a profitable business and have no complaint of hard times to make.

# Industrial and Financial News

## Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

**No Shortage in Aluminum.**—The British Aluminium Company, of London, England, is finding no difficulty making shipments of aluminum both to this country and Canada. It is maintaining large stocks of the metal both at New York and at Toronto.

**Orders for Generating Equipment.**—Several noteworthy orders for large generating units were recently received by the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa. These include the following: The Erie County Electric Company, Erie, Pa., a 1000-hp steam turbine; the Union Sulphur Company, Sulphur, La., a 500-hp steam turbine; the Laclede Gas Company, St. Louis, Mo., two 250-hp steam turbines; the Wakefield Iron Company, Wakefield, Mich., a complete stoker equipment for a 1000-hp boiler plant, and the Sarnia Gas & Electric Company, Sarnia, Ont., a complete condenser equipment.

**Tungsten Deposits in the United States.**—According to the United States Geological Survey, the tungsten resources of this country are probably larger than has generally been realized. Many new deposits have been discovered in various parts of the Western States, and should prices advance it is likely that the output could soon be increased to much above that of the record year of 1910, when 1821 tons were marketed. Most of these new discoveries are not sufficiently developed to show how large an output can be expected from them, but it is probable that some will prove to be of considerable extent, and one or two large producers would make a noticeable difference in the American market.

**Removing Scale from Boilers.**—The Perolin Company of America, Chicago, Ill., has introduced a method of removing scale from boilers called the "Pyro-Perolin" process. Certain gases are ignited and the flame is applied to the scale, which has previously been treated with "perolin" boiler compound, as it is called, whereby the scale is said to be disintegrated. After the boilers are cleaned a liquid heat-conducting film is applied which fills the pores of the metal and to which the scale does not adhere. This film is maintained, the manufacturers claim, by a small daily feed of the boiler compound referred to above. This "perolin" compound was originally discovered in Germany. It has an intense affinity for the heated metal and tends to work between the scale and the metal, thus breaking the bond of adhesion between the former and the latter.

**Orders for Turbine-Driven Pumps.**—The De Laval Steam Turbine Company, Trenton, N. J., recently received from the city of Philadelphia an order for two turbine-driven geared centrifugal pumps to operate at 2,000,000 gal. a day against a head of 330 ft. The company has also received an order from the city of Toronto for two 24,000,000-gal. pumps to operate against a head of 268 ft., which will be an addition to the following pumping equipment purchased several months ago: One 15,000,000-gal. pump for a 260-ft. head, one 20,000,000-gal. pump for a 106-ft. head and one 7,500,000-gal. pump for a 266-ft. head. Another order has been obtained by the company from the San Antonio Water Supply Company, San Antonio, Tex., for two 6,500,000-gal. pumps for a 273-ft. head. Installations of this company's pumps have also been made by the city of Cleveland, the city of Omaha and the city of Lynn, Mass.

**Refrigeration Plant for New Washington Market.**—In the new Washington Market on West Street, New York, now nearing completion, there will be over a hundred stalls, and each stall will have a box cooled by a brine supply delivered by rotary pumps having a rating of 300 gal. a minute. The ammonia condensers are of the compression, belt-driven, open-atmosphere type manufactured by the York (Pa.) Manufacturing Company, which is making the

present installation. The pumps and condensers will be belt-driven from four direct-current 220-volt motors having an aggregate rating of 120 hp. The installation is to have a refrigerating capacity of from 20 tons to 30 tons, the actual refrigeration being accomplished in six coils of double-pipe brine coolers, through which the rotary pumps circulate the brine. Approximately 2500 ft. of piping will be used for the brine-supply mains, which are to be covered with compressed cork and white-painted canvas.

**New Company Incorporated.**—For the purpose of building a large central station at Floodwood, in the heart of the Hocking Valley coal field in Ohio, the Ohio Electric Securities Company has been incorporated in Mainz with \$2,500,000 common stock and \$1,500,000 7 per cent preferred stock. No bonds will be issued. The financing was done by Close Brothers, of London, it is said. The plans of the company contemplate a station of 4500-kw rating. Other units may be added as the demand requires. Under the name of the Hocking Power Company this company now controls a number of small plants in the Hocking coal district. The energy will be sold at wholesale to utility companies operating in central Ohio. The company will obtain its fuel from mines situated on its own property and will probably supply energy to many of the sixty mines which are now operating in that section.

**Platinum Production in 1913.**—According to the United States Geological Survey, the high price of platinum encouraged prospecting in this country in 1913, although the expected increase in the production of crude metal was not realized. The total production from California and Oregon, the two sources of platinum ore in this country, amounted to 482.87 crude ounces and was valued at \$18,477. A considerable output of platinum is also obtained in the United States from the refining of gold and copper bullion. A portion of this platinum originates in old scrap, sweepings, etc., sold by jewelers and dentists. About 650 fine ounces, however, was derived in 1913 as new metal from gold and copper bullion from domestic mines. The production of refined platinum in this country in 1913 from domestic sources was 1034 troy ounces, valued at \$46,530, against 1005 troy ounces, valued at \$45,778, in 1912. Russia's output of crude platinum in 1913 was 250,000 troy ounces. The value of platinum imported for consumption in the United States in 1913 was valued at \$5,040,210, against \$4,503,682 in 1912.

**Transmission-Line Calculator.**—A new edition of the transmission-line calculator made by Mr. R. W. Adams, 180 Taber Avenue, Providence, R. I., which was described in the *Electrical World*, July 15, 1911, has been issued. The engineer's edition of this calculator, as the new issue is called, contains separate diagrams for sixty-cycle and twenty-five-cycle work, each having its own revolving transparent disk and each being laid out for four different spacings of conductors. The diagrams have been doubled in size over the first edition, so that the various scales are more open and therefore more easily read, while at the same time covering a wider range of conditions. The new ranges of the scales are as follows: Systems, single-phase, two-phase and three-phase alternating current and direct current; frequency, 25 cycles or 60 cycles; load, 1 kva to 20,000 kva; voltage, 100 volts to 70,000 volts; distance, 100 ft. to 100 miles; power-factor, 1 per cent to 100 per cent lagging or leading; conductor material, copper, aluminum or copper; conductor size, No. 8 B. & S. to 1,000,000 circ. mil; conductor spacing, 6 in., 18 in., 36 in. or 60 in., and line drop or loss, 0 per cent to 40 per cent. Other improvements include provision for determining line loss direct in percentage of delivered power and for calculating regulation or internal drop in transformers. The new edition of the transmission-line calculator is bound in morocco leather.



**Imports and Exports for August.**—The monthly summary of the foreign commerce of the United States issued by the Bureau of Foreign and Domestic Commerce shows the imports in electric lamps to have been valued at \$53,403 in August, 1914, and \$34,296 in August, 1913. This unusual increase may represent the output of foreign manufacturers who hastened shipment in the early days of the war. The principal gain was in metallic-filament lamps, which increased 87 per cent, or from \$28,311 to \$52,948. There were no arc-lamp imports in August and imports of carbon-filament lamps had a value of but \$455. Exports, on the other hand, declined from \$2,279,015 in August, 1913, to \$1,024,010 in August, 1914. The value of batteries decreased from \$45,326 to \$38,722, generators from \$134,136 to \$114,570, fans from \$46,408 to \$5,528, insulated wires and cables from \$219,736 to \$51,236, interior wiring supplies and fixtures from \$66,385 to \$43,511, arc-lamps from \$10,387 to \$1,620, incandescent-lamps from \$69,522 to \$11,930, motors from \$419,280 to \$118,490, static transformers from \$156,727 to \$33,609, telegraph instruments from \$6,425 to \$3,101, telephones from \$189,160 to \$78,403, and "all others" from \$952,705 to \$497,543. The only increase was in meters and measuring apparatus, the value of which was \$23,747 in August, 1914, as compared with nothing in the previous year.

**New Factory Opened.**—A four-story extension of "Factory M," at the Center Street works of the General Electric Company, Lynn, Mass., was thrown open on the evening of Oct. 2. The occasion was signalized by an exhibition of the company's latest products, the entire first floor of the factory being occupied by the exhibits and a hastily assembled "midway." The Lynn Gas & Electric Company maintained an attractive exhibit of electrical household devices, and a number of demonstrators were present to display the equipment to the best advantage. In the exhibit of the turbine department interest centered upon a new development in the form of a 150-watt, 6-volt turbo-generator set designed for locomotive head lamp and cab illumination. This apparatus was equipped with a main parabolic reflector and a 100-watt cone-filament, gas-filled lamp, yielding 600,000 beam candle-power. The reflector was provided with an auxiliary 5-watt lamp which is automatically thrown into service in case the main unit fails and is also useful in yard and terminal operation. The wiring was in heavy conduit. The equipment also included several 5-watt lamps for cab and classification lighting in place of the old-time oil lamps. The turbine was said to be the smallest thus far built, and was of the single-stage type. Tests show that the gas-filled head lamp is effective in penetrating power, and its steadiness is proving of value in a trial installation on the Boston & Maine locomotive No. 3667. The arc-lamp department exhibited a model of various types of street lighting equipped with miniature lamps and different-spaced units, a sectional cabinet for the comparison of the color-matching characteristics of various lighting units with and without color screens, "white way" transparencies of installations at Lynn and New Haven, ornamental luminous-arc lamps, artistic globes, and a shadow booth showing the effects of different lighting schemes with color and directional variations upon a posed subject. Other exhibits included a full display of rectifying apparatus, automobile motors, tools produced by company apprentices, and portable and station meters, the latter display illustrating the evolution of both alternating-current and direct-current instruments from the original designs of nearly thirty years ago to the latest types.

#### NEW YORK METAL MARKET PRICES

Copper:	Sept. 20	Oct. 6
Prime Lake	12.12 1/2 to 12.37 1/2	11.60 to 12.00
Electrolytic	11.80 to 11.90	11.60 to 11.70
Casting	11.70 to 11.80	11.50 to 11.60
Copper wire base	12.25	13.00 to 13.25
Lead	3.75 to 3.80	3.60
Nickel	40.00 to 45.00	40.00 to 45.00
Sheet zinc, f.o.b. smelter	8.50	8.50
Spelter, spot	5.15 to 5.20	4.90 to 5.00
Straits tin	30.87 1/2	31.00
Aluminum, 98 to 99 per cent.	18.25 to 18.75	..... to .....

#### COPPER EXPORTS

Total tons to Oct. 6..... 3,245

†Nominal.

NOTE.—The New York Metal Exchange and the London Metal Exchange have been closed until further notice.

## Corporate and Financial

**Bylesby Properties Declare Dividends.**—H. M. Bylesby & Company recently announced the declaration of the usual dividend of 1.75 per cent upon the preferred stock of the following companies for the quarter ended Sept. 30, payable Oct. 15: Northern States Power Company, Western States Gas & Electric Company, and Ottumwa Railway & Light Company.

**Niagara Company Authorized to Issue Notes.**—The Public Service Commission of the Second District of New York has authorized the issue of \$800,000 two-year secured 6 per cent gold notes by the Niagara, Lockport & Ontario Power Company, to be sold at not less than 95. The proceeds, with \$140,000 from other sources, are to be used to take up the one-year gold notes issued a year ago by the company.

**Annual Report of Eastern Pennsylvania Railways Company.**—The consolidated statement of earnings and expenses of the Eastern Pennsylvania Railways Company and subsidiary companies for the year ended June 30, 1914, shows gross earnings to have been \$826,416. From this is deducted \$503,488 for operating expenses and taxes, leaving \$322,928 as net earnings from operation. A further deduction of \$45,525 for underlying companies' charges leaves \$277,403 as a balance. Interest and rentals are set down as \$178,493, giving a surplus for the year of \$98,910. The earnings of the electric department increased \$43,415 during the year. Mr. John H. Pardee, the president, stated that with the exception of one loan of \$25,000 and its current accounts the company has no floating indebtedness at the present time.

**Annual Report of the Terre Haute, Indianapolis & Eastern Company.**—The annual report of the Terre Haute (Ind.) Indianapolis & Eastern Traction Company for the year ended Dec. 31, 1913, shows gross earnings from operation of \$3,112,382. This, less operating expenses of \$1,719,907, leaves \$1,392,475 as net earnings, which is further reduced to \$1,264,425 by taxes amounting to \$128,050. Income from other sources of \$289,029 and sale of energy from the West Tenth Street station amounting to \$95,368 increased the earnings to \$1,648,822. Deducting \$802,242 for bond interest, \$209,496 for dividends, \$23,932 for interest on notes and \$3,000 for office maintenance and leased lines leaves a surplus of \$610,152. From this is deducted for the sinking fund \$114,873 and \$455,000 for the preferred dividend of the Terre Haute, Indianapolis & Eastern Traction Company, leaving a balance of \$40,279. Mr. Robert I. Todd, president of the company, stated in his report that the company's new power house at West Tenth Street and White River would not only supply energy for the railways but also that it would be a source of revenue to the company from the sale of energy to other lines.

**Eastern Pennsylvania Power Company's Coupons Purchased.**—Lee, Higginson & Company, of Boston, in a letter to holders of the Eastern Pennsylvania Power Company first and refunding 5 per cent bonds, stated that they had been informed by the Commercial Trust Company of Philadelphia, trustee under the first and refunding mortgage of the Eastern Pennsylvania Power Company, that it has not been supplied with funds to pay interest due on Oct. 1. The bankers say: "We are informed that the company's action in deferring this payment is due to the present financial stringency and the consequent inability to sell securities to reimburse its treasury for expenditures heretofore made for additions and extensions to its properties. It is hoped that the company will be able to adjust its affairs so as to cure this default before Jan. 1, 1915. We believe that both the physical value and the earnings of the properties on which these bonds are a first lien afford ample security for these bonds. Since these bonds were sold their position has been decidedly strengthened. No additional bonds of this issue have been sold, so that the amount outstanding remains at \$1,880,000. A large amount of additional property, however, has been acquired and financed by the sale of junior securities. In order that the bondholders may suffer no inconvenience at this time Lee, Higginson & Company, acting entirely independently of the mortgagor company, are prepared to purchase the Oct. 1 1914, coupons from these bonds."

**Annual Report of American Railways Company.**—The fifteenth annual report of the American Railways Company, Philadelphia, Pa., for the year ended June 30, 1914, has been presented to the stockholders by Mr. J. J. Sullivan, the president. The report shows gross income of \$1,036,361, made up of \$981,943 as income from sub-companies and \$54,418 as miscellaneous income. From the gross income was deducted \$442,532 as follows: General expenses, \$18,839; legal expenses, \$375; depreciation of office furniture and engineering instruments, \$1,279; taxes, \$15,000, and interest on funded debt, \$407,039. This left \$593,829 as net income, from which was deducted \$140,000 as dividends paid and accrued on capital preferred stock and \$402,789 as dividends paid on common stock, leaving \$51,010 as surplus for the year. To this was added surplus at the beginning of the year of \$648,436 and additional surplus through the profits from the sale of the Johnstown Passenger Railway of \$548,469, thus making the total surplus \$1,247,945. From this was deducted \$500,000 as contributions to the reserve for depreciation of the subsidiary companies, \$5,485 as amount set aside for United States income tax arising from profits on sale of property, and \$187 as other adjustments within the year, leaving \$742,273 as surplus at close of the year.

**Pennsylvania Water & Power Company Offers Bonds.**—In a letter Mr. J. E. Aldred, president, states that the company offered to stockholders of record Sept. 22 \$500,000 of first mortgage 5 per cent gold bonds at 88 and interest. The time limit is placed at Oct. 30, 1914. The following is quoted from Mr. Aldred's letter: "In view of the unusual conditions prevailing in the financial world brought about by the deplorable European conflict, your directors consider it their duty to acquaint shareholders with the progress made since the last annual report was published, so that at this time, when market quotations are unavailable, holders of this company's shares will have full knowledge of the status of their investment. We are pleased to report that for the eight months ended Aug. 31, 1914, the gross earnings show an increase over the same period last year of \$161,169, or 31 per cent, with a corresponding increase in net of \$147,321, or 34 per cent. The position of your company is particularly strong in the present crisis, in that it owes to banks only \$100,000, whereas it has considerably more than this amount on hand in cash, while the fact that it sells its entire output of energy to public utility companies assures the receipt of its future revenue in cash. The second transmission line to Baltimore has been completed and is in operation, and the eighth generating unit will be in operation in about one month, making the total installed capacity of the plant 111,000 hp. These extensions will at once further materially increase the company's revenue."

**Declares Preferred Dividend, Omits Common.**—In connection with the declaration of the regular dividend on the preferred stock and the omission of the dividend on the common stock the following letter has been sent by directors of the Puget Sound Traction, Light & Power Company, Seattle, Wash., to stockholders: "During the past two years the Puget Sound district has suffered from a general depression in business which has prevailed throughout the Pacific Coast States and British Columbia. This condition has been reflected in the net earnings of this company, which, as appears from the report of the company, have shown a decrease in the balance available for common-stock dividends. It was hoped that the Pacific Coast as a whole would benefit materially by the opening of the Panama Canal and the development of Alaska which was expected to follow the recent action of the federal government. The improvement hoped for has undoubtedly been much retarded by the unprecedented conditions caused by the foreign war. Since Aug. 1 foreign shipments of lumber have shown a marked decrease due to lack of shipping facilities, and the salmon industry has been held back for the same reason. Fortunately, the crops of both Washington and Oregon are very good this year. The company has cut its operating expenses as far as possible without injury to service, and has stopped all new construction, except such as is nearly finished and such as is required by the terms of its franchises. As the company has a substantial cash balance and no floating debt, it is in a strong position financially, but as it is impossible to estimate how long the present business depression will con-

tinue, the directors believe that the company's resources should be conserved. After carefully considering the above circumstances, the directors have decided not to declare the quarterly dividend of 1 per cent on the common stock, which would normally be paid on Oct. 15. As there is, however, an ample margin over the preferred-stock dividend requirements, the directors have declared the regular cumulative quarterly dividend of  $1\frac{1}{2}$  per cent on the preferred stock, payable on Oct. 15."

**Dayton Power & Light Company's Bond Exchange Plan.**—The Dayton (Ohio) Power & Light Company has presented to the holders of the Dayton Lighting Company first and refunding mortgage gold bonds, due 1937, a plan which has been approved by the Public Utilities Commission of Ohio, to exchange their bonds for Dayton Power & Light Company first and refunding mortgage 5 per cent gold bonds, due June 1, 1941. There are now outstanding \$3,684,000 bonds, of which \$2,579,000 are Dayton Lighting Company 5 per cent bonds, due 1937; \$380,000 are Dayton Electric Light Company 5 per cent bonds, due 1921, and \$725,000 are Dayton Power & Light Company 5 per cent bonds, due 1941. The plan is to have the holders of the Dayton Lighting Company bonds present them on or about Sept. 1, 1914, with all the coupons attached falling due on and after March 1, 1915, at the office of the Columbia Trust Company, New York, which will give in exchange Dayton Power & Light Company bonds, par for par, with bond interest coupons for June 1, 1915, and subsequent dates attached, and will also give with each thousand-dollar bond of the Dayton Power & Light Company when the exchange is made, provided that it is made prior to Dec. 1, 1914, a negotiable warrant, good for three months' bond interest, at the rate of 5 per cent per year from Sept. 1, 1914, to Dec. 1, 1914. These warrants have the same rights as the bond coupons have, and it is necessary to issue these warrants for three months' bond interest on the Dayton Power & Light Company bonds because the six months' bond-interest-paying date on the Dayton Lighting Company bonds is Sept. 1, 1914, while the six months' bond-interest-paying date on the Dayton Power & Light Company bonds is Dec. 1, 1914.

**Annual Report of the Mexican Light & Power Company, Ltd.**—The ninth annual report of the Mexican Light & Power Company shows operations of the company for the year ended Dec. 31, 1913. The net revenue from operation for the year 1913 amounted to 6,194,649 pesos, as compared with 5,653,032 pesos for 1912. This revenue, converted into Canadian currency at the average monthly rate of exchange, gave a profit from operation of \$2,614,849 gold. The increase over last year in pesos is 541,617, but when converted into Canadian currency the profit from operation, as compared with last year, shows a decrease of \$211,666 gold, and this fact is accounted for by the heavy fall in the rate of exchange. To the profit from operation has been added the income from securities and other sources of \$177,862, and the credit balance of \$1,184,405 brought forward from last year, making a total credit on profit and loss account for the year of \$3,977,117. Out of this sum have been paid the current expenses and fixed charges, amounting to \$2,289,573, and dividends at the rate of 7 per cent on the preference shares and 4 per cent on the ordinary share capital of the company, leaving a credit balance on the profit and loss account of \$724,142, of which \$405,619 has been transferred to the reserve account and the balance, \$318,523, has been carried forward. The amount standing to the credit of the reserve account at the end of 1912 was \$300,000, which, together with \$405,619 appropriated out of profits, makes a total of \$705,619. This sum has been applied in writing down the value of certain of the company's investments and accounts and providing for the extraordinary expenditures incurred by the company during the year, including the expenses of protecting its properties on account of the disturbed conditions in Mexico. Mr. V. de B. Daly, secretary of the company, stated that since the beginning of the present year the board has considered it advisable, owing to the continued state of political unrest in Mexico and the consequent heavy fall in exchange, to defer for the present the payment of further dividends on the share capital of the company. The policy adopted by the board for the protection of the company's properties during the disturbances of 1912 has remained unchanged, and although considerable extraordinary expenditure has been incurred



in connection therewith, the board is glad to report that the company has been able to continue operation and has not sustained any serious damage to its properties.

## NEW ENGLAND UTILITIES SHOW GAIN

### Central Stations Experience Larger Growth in July than in Either May or June

Comparative figures from 60 per cent of the electric utility industry of New England for the months of May, June and July, 1913 and 1914, show that the central stations in the Northeast are growing rapidly. The rate of income growth, as seen in Table I, was larger in July than in the two previous months, while the rate of output growth was not quite so good as that in June, but far better than that in May. While the war did not have any effect at all on July operations, there were other facts which entered in to weaken materially industrial conditions. Table II shows the figures for 70 per cent of the industry for July, and these figures bear out the comparative figures in Table I.

To show the exact state of affairs, the companies, excepting the holding companies, have been placed in groups first by states and second by the size of the communities in which they operate. The population of the cities was taken as that of 1910. From Massachusetts fifteen companies, representing roughly 80 per cent of the industry of the State, showed an aggregate income from the sale of energy of \$832,026 in July, 1914, as against \$717,774 in the corresponding month of the previous year, or an increase of 23 per cent. The output of the same companies grew from 23,182,816 kw-hr. to 29,416,974 kw-hr., or 26.9 per cent. Four companies, representing 60 per cent of the industry of Maine, showed a total income for July, 1914, of \$244,637 and for July, 1913, of \$235,855—a growth of 3.8 per cent. The output growth was 5 per cent, from 5,716,756 kw-hr. to 5,998,543 kw-hr. Two companies reporting for Rhode Island represent two-thirds of the industry of that State. Their income increased 12 per cent, from \$125,611 to \$140,610, and their output increased 23.6 per cent, from 3,438,960 kw-hr. to 4,246,003 kw-hr. In New Hampshire six companies, representing a little more than one-third of the State, gave an income growth of 5 per cent, from \$89,539 to \$94,059, and an output growth of 4.2 per cent, from 3,879,019 kw-hr. to 4,041,938 kw-hr. In Connecticut the output increased 20.9 per cent, from 5,057,408 kw-hr. to 6,112,122 kw-hr. The income increased 7.5 per cent, from \$172,551 to \$185,456. The returns are from five companies, representing only 50 per cent of the industry. Some of the figures would probably be changed if the reports of holding companies could be segregated, because in the above only the figures from the separate operating companies are combined.

TABLE I—COMPARATIVE RETURNS FOR MAY, JUNE AND JULY, 1913 AND 1914, COVERING 60 PER CENT OF THE CENTRAL-STATION INDUSTRY OF THE NEW ENGLAND STATES

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
May	\$1,704,102	\$1,573,119	8.4	51,519,410	49,752,133	3.6
June	1,467,791	1,356,552	8.3	50,456,031	45,268,312	11.6
July	1,551,797	1,419,597	9.3	50,644,731	45,861,737	10.4

The same companies have been recombined in groups according to the population of the communities which they serve. Five groups have been chosen—the first for communities of over 100,000 population, the second for those communities having a population between 50,000 and 100,000, the third between 25,000 and 50,000, the fourth between 10,000 and 25,000, and the fifth under 10,000 inhabitants.

The first group contains companies operating in Boston, Worcester, Fall River, Cambridge and Providence. The aggregate income was \$742,543 in July, 1913, as against \$663,028 in the previous year, an increase of 12 per cent. In output the growth was 14.9 per cent, from 19,174,623 kw-hr. to 22,053,703 kw-hr. The seven companies in the second group, representing all states but Rhode Island, had a total income of \$481,629 in July, 1914, and \$456,658 in 1913, or a growth of 5.5 per cent. The same companies showed a growth in output of 9.2 per cent, from 12,568,328 kw-hr. in 1913 to 13,711,364 kw-hr. in 1914. Eight companies make up the third group, and all states but Maine are represented. The income grew at the rate of 19.8 per cent, from \$65,786 to \$78,768. The output, however, decreased 1.4 per cent, from 3,921,927 kw-hr. in 1913 to 3,864,900 kw-hr. in 1914. The fourth group, comprising companies in towns of from 10,000 to 25,000 inhabitants, contains twelve companies, representing all states but Rhode Island. The total income from energy sales grew from \$148,059 in July, 1913, to \$240,432 in July, 1914. This

TABLE II—RETURNS FOR APRIL, MAY, JUNE AND JULY FOR ALL NEW ENGLAND COMPANIES REPORTING TO ELECTRICAL WORLD

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
April 52 per cent of industry .	\$1,501,773	\$1,384,255	8.5	43,386,624	39,181,988	10.8
May 61 per cent of industry . . .	1,745,160	1,609,234	8.4	52,752,247	50,779,103	3.9
June 67 per cent of industry . . .	1,560,872	1,442,178	8.3	53,463,013	48,049,756	11.1
July 70 per cent of industry . . .	1,670,919	1,530,410	9.2	54,074,533	49,255,893	9.8

is an increase of 62.4 per cent. The output grew at the rate of 68 per cent, from 6,137,343 kw-hr. to 10,280,947 kw-hr. Only two towns with less than 10,000 people were represented in the group, one in Vermont and the other in New Hampshire. Their total income in July, 1914, was \$15,777 and in 1913 was \$8,883. This is a growth of 77 per cent. Their output increased 21.3 per cent, from 1,456,814 kw-hr. to 1,204,664 kw-hr. Little can really be said of the last group since it contains but two companies. Of the other groups, however, it is evident that the central stations in communities whose population is between 10,000 and 25,000 are growing most rapidly.

### Early Returns for August

Between 30 and 40 per cent of the industry has sent in returns so far for August's operations. While this is but a small part of the whole, nevertheless it contains instances which seem clearly to indicate what is to be expected for the remainder. August was the first month of the war. The stock exchanges were closed and money was tight. Industries were curtailed and conditions generally badly depressed. It was, therefore, to be expected that in certain localities central stations would not do so well as in the previous year. Such was the case in many instances, but the decreases were so small that the totals were not greatly affected and an increase was shown throughout the country. Out of fourteen New England companies, six showed decreases, but they were with one exception small companies and their losses were small indeed. They were not large enough to register a decrease for the entire territory, not even to make a very low increase. The income increase was up to previous months. Three companies out of thirty-three in the Atlantic States showed decreases, one small one medium and one large company. In the Central States three companies out of thirty-eight showed decreases. The only one to show any appreciable failing has been shown a decrease for the past half year. The Mountain States show that out of twelve companies five suffered a decrease

## Business Notes

**The Cutler-Hammer Manufacturing Company, Milwaukee, Wis.,** has changed the address of its Cincinnati office to 812 Gwynne Building.

**Eadie, Freund & Cambell.**—J. G. Eadie, M. Freund and J. K. Cambell have established the firm of Eadie, Freund & Cambell, consulting engineers, with offices at 7 West Forty-fifth Street, New York.

**The Okonite Company.**—W. T. Kyle has joined the sales force of the Okonite Company, 253 Broadway, New York. Mr. Kyle for the past six years has been district sales manager for the Duplex Metals Company.

**The Nungesser Carbon & Battery Company.**—The officers and directors of the Nungesser Carbon & Battery Company, Cleveland, Ohio, recently presented to Philip Nungesser a handsome silver loving cup to commemorate the twenty-fifth anniversary of his connection with the dry-battery business.

**Federal Sign System (Electric).**—E. A. Lambrecht has been appointed manager of the Wisconsin district of the Federal Sign System (Electric), with headquarters in the Public Service Building, Milwaukee. F. D. Sweet has also been appointed manager of the company's Indianapolis office at 115 East Ohio Street. These two offices were formerly under the jurisdiction of the Federal Sign System's main office in Chicago.

**Bijur Motor Lighting Company.**—James Dixon, who for the last four years has been a member of the construction department of the Crocker-Wheeler Company at Amper, N. J., has recently joined the staff of the Bijur Motor Lighting Company, with headquarters at Hoboken, N. J. Mr. Dixon was associated with Mr. Bijur in the past, having been sales manager of the General Storage Battery Company, of Boonton, N. J., of which Mr. Bijur was president.

**Morgan Crucible Company.**—On Oct. 1 D. M. Donnan resigned his position with the Boston sales office of the Westinghouse Electric & Manufacturing Company to become the manager of the Electrical Engineering & Manufacturing Company, with offices in the First National Bank at Pittsburgh, which will represent the Morgan Crucible Company, Ltd., in the Pittsburgh district for the sale of "Morganite" and "Battersea" carbon brushes. For a number of years prior to going to Boston Mr. Donnan was connected with the New York and East Pittsburgh offices of the Westinghouse Electric & Manufacturing Company.

## New Industrial Companies

**The Griser Electric Water Heater Company, of New York, N. Y.,** has been incorporated with a capital stock of \$10,000 by David Horwitz, 719 Eastern Parkway, Brooklyn; D. M. Cohn, of New York, and L. B. Funk, Brooklyn.

**The Truax Electric Company, of Wilmington, Del.,** has been chartered with a capital stock of \$25,000 to do a general contracting and electrical supply business. The incorporators are Humphrey Lynch, John M. Truax and Joseph Lynch.

**The S. W. Fuller Electric Company, of Boston, Mass.,** has been incorporated with a capital stock of \$50,000 by G. C. Willis, of Allston, Mass., and D. F. Cunningham, of Boston, Mass. The company proposes to manufacture and deal in electrical appliances.

**The James Farrant Company, of Paterson, N. J.,** has been incorporated with a capital stock of \$5,000 by James Farrant, E. Farrant, both of 428 Van Houten Street, and Henry H. Smart, 663 Twenty-second Street, Paterson, N. J. The company proposes to do a general electrical contracting business.

**The International Automatic Utilities Company, of Chicago, Ill.,** has been chartered with a capital stock of \$9,000 to manufacture and act as sales agents for electric-light specialties and other electric fixtures. The incorporators are R. F. Van Meter, J. Paul Johnston, John Johnston and Vincent S. Johnston.

## Trade Publications

**Electric Wagon Loaders.**—Motor-driven wagon and truck loaders are the subject of Catalog No. 190 issued by the Link-Belt Company, Chicago, Ill.

**Window Displays.**—A catalog entitled "New Ideas in Window Display" has been brought out by the Westinghouse Lamp Company, 1261 Broadway, New York.

**Boiler Compound.**—The Perolin Company, 1112 West Thirty-seventh Street, Chicago, Ill., has recently published several booklets which describe a boiler compound called "perolin."

**Direct-Current Test Meter.**—The Thomson direct-current test meter is described and illustrated in Bulletin No. 46,390 issued by the General Electric Company, Schenectady, N. Y.

**Electric Insulation.**—The properties of various kinds of electric insulation are described in a twelve-page booklet issued by the Boonton Rubber Manufacturing Company, Boonton, N. J.

**Mine Hoist Equipment.**—Various kinds of electric mine-hoist apparatus are described and illustrated in Bulletin No. 48,041 issued by the General Electric Company, Schenectady, N. Y.

**Controller for Feed of Arc Lamps.**—The Speed Controller Company, 257 William Street, New York, has issued leaflets describing a device for controlling the feed of arc-lamp electrodes.

**Portable Substations.**—"Higher Voltages for Electric Traction" is the title of a booklet issued by the Railway & Industrial Engineering Company, Pittsburgh, Pa., in which portable substations are described.

**Handbook of Electricity.**—The Hotpoint Electric Heating Company has recently issued a thirty-one-page booklet for educating the public in the meaning of electrical terms and the use of electrically operated appliances.

**Small Lighting Generator.**—A generator and auxiliary equipment for lighting automobiles, motorcycles and motor boats is described in Leaflet No. 68 issued by the Carleton Company, 170 Summer Street, Boston, Mass.

**Dishwashing Machines.**—Electric dishwashing machines for hotels and restaurants are described and illustrated in a catalog issued by the Bromley-Merseles Manufacturing Company, Broadway and Thirty-fourth Street, New York.

**Flaming Arc Lamps.**—The Kadem Electric Company, 49 East Twenty-first Street, New York, has issued a booklet entitled "Has the American Business Man Lost His Nerve?" which enumerates some of the advantages of flaming-arc lamps.

**Electric Polishing and Grinding Machines.**—Various types of electric grinding and polishing machines are described and illustrated in Bulletin No. 156 published by Roth Brothers & Company, Adams and Loomis Streets, Chicago, Ill.

**Thermo-Relay.**—A circular describing and illustrating a device for controlling electric circuits by means of the heating effect produced has been issued by the Baruch Electric Controller Corporation, 424 Thirteenth Street, Oakland, Cal.

**Electrical Apparatus.**—The Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has issued a number of bulletins which describe its automatic machine-tool controllers, regulators, magnetic controllers, starting rheostats, crane controllers, hoist controllers and drum-type reverse switches.

**Electrical Apparatus.**—Electric monorail cranes are fully described and illustrated in Bulletin No. 48,700 published by the Sprague Electric Works of the General Electric Company, 527 West Thirty-fourth Street, New York. Electric dynamometers are the subject of Bulletin No. 48,701, and electric hoists of Booklet No. 906, issued by the same company.

**Carbon Brushes.**—The Speer Carbon Company, St. Mary's Pa., has recently prepared a seventy-two page catalog in which it describes its brushes and connectors, giving the prices of various sizes of railway-motor, commercial-motor, slip-ring and metallic-composition brushes with curves showing their characteristics at different current densities.



## Personal Mention

Mr. George W. Anderson, of the Massachusetts Public Service Commission, has been nominated United States attorney for the Massachusetts district by President Wilson.

Mr. A. W. Sumner, for the past ten years assistant superintendent of the Rockingham County Light & Power Company, Portsmouth, N. H., has tendered his resignation, effective Oct. 15.

Mr. Roscoe Conklin has been appointed manager of the Leominster (Mass.) Electric Light & Power Company as successor to Mr. Alfred Montgomery, whose resignation was announced in these columns on Sept. 12, 1914.

Mr. L. B. Lucas, of Toronto, Ont., has been appointed a member of the Hydro-Electric Power Commission of Ontario, replacing Hon. J. S. Hendrie, who has been appointed Lieutenant-Governor of the Province of Ontario.

Mr. Thurston Owens, secretary of the San Diego (Cal.) Gas & Electric Appliance Company, has been elected president of the San Diego Electrical League. Mr. Owens was formerly manager of the La Crosse (Wis.) Gas & Electric Company.

Mr. W. B. Voth, who has been superintendent of light and power for ten years of the Sheboygan (Wis.) Railway & Electric Company, has been appointed chief engineer of the Empire United Railways of New York, with headquarters at Syracuse, N. Y.

Mr. A. B. Marsden, of the Marsden Electric Company, Rutland, Vt., has resigned as secretary and treasurer of the Vermont Electrical Association. He is succeeded by Mr. C. H. West, secretary and treasurer of the Rutland Railway, Light & Power Company.

Hon. J. S. Hendrie, of Hamilton, Ont., and formerly one of the Hydro-Electric power commissioners of Ontario and chairman of the railway committee of the Ontario Legislature, has been appointed Lieutenant-Governor of the Province, succeeding Sir J. M. Gibson.

Mr. N. B. Rhoads, formerly manager of the Waycross (Ga.) Street & Suburban Railway Company, has resigned to accept a position as general superintendent of the Southern Railway & Light Company, Natchez, Miss., which operates the street railway, electric and gas plants.

Mr. W. F. Raber, vice-president and manager of the Arkansas Valley Railway, Light & Power Company, Pueblo, Col., served as president of the Colorado State Fair, held at Pueblo Sept. 14 to 19. Under his guidance exhibits at the fair this year were better than usual and the attendance was greater.

Dr. Arthur E. Kennelly, professor of electrical engineering at Harvard University, has been appointed director of electrical research at the Massachusetts Institute of Technology, Boston, under the new co-operative agreement between the two institutions. Dr. Kennelly will also continue his work as head of his department at Harvard.

Hon. Adam Beck is no longer a member of the Ontario government without portfolio, his retirement as Minister of Power in the Ontario government being at his own request, on the reorganization of the government. Mr. Beck will devote his entire attention to the Hydro-Electric Power Commission of Ontario, of which he still is chairman.

Mr. Frank B. Dunn recently resigned his post of equipment engineer with the Western Electric Company, Hawthorne, Ill., and has taken up graduate work in telegraphy and telephony in the Ohio State University, Columbus, Ohio. Mr. Dunn is a graduate of the electrical engineering department of the Nanyang College, Shanghai, China.

Mr. O. H. Caldwell, who succeeds Mr. W. E. Keily in the Chicago office of the *Electrical World* and will direct editorial work in the central portion of the country, is a graduate of Purdue University. Both before and after graduation he was associated with Mr. Keily in editorial work on the *Western Electrician*. Subsequently he was connected with the publication department of the Westinghouse companies

in Pittsburgh. Mr. Caldwell has been a member of the editorial department of the *Electrical World* since January, 1910. He has been connected with the Chicago and New York editorial staffs of this publication and has traveled in all sections of the country in its interests.

Mr. Orin B. Coldwell, who was recently elected president of the Northwest Electric Light & Power Association, is general superintendent of the light and power department of the Portland (Ore.) Railway, Light & Power Company



O. B. COLDWELL

and one of the best-known operating men in the Northwest. Mr. Coldwell was born in Salem, Ore., Nov. 28, 1875. After completing the regular grammar school course, he attended the Portland High School, and before completing the course entered the employ of the Willamette Falls Electric Company in 1892. This company was one of the pioneer electric transmission companies, having started operations in 1899 with a hydroelectric station at the falls of the Willamette River, Oregon City, and a 14-mile transmission line to Portland. During the five years 1892-1897 Mr. Coldwell was engaged in one capacity or another in practically all of the departments of the Willamette Falls company and its successor, the Portland General Electric Company. In the fall of 1897 Mr. Coldwell entered Stanford University as a special student in electrical engineering. Three years were put in at this university, the summer vacation periods being spent in Portland in the employ of the Portland General Electric Company. Mr. Coldwell was thus enabled to keep in touch with the practical side of the business, at the same time helping himself financially to carry on his college work. At the university, in addition to his regular work, he at times was engaged in house wiring and laboratory work of a remunerative nature. Mr. Coldwell entered Cornell University in the fall of 1900 as a student in the electrical engineering course of Sibley College and was graduated with the class of 1902. Returning to Portland, he again entered the service of the Portland General Electric Company as assistant superintendent, and from that time on he has filled successively a number of positions with the company and its successor, the Portland Railway, Light & Power Company, until at the present time he has charge of all the engineering and operating work of the light and power department. Mr. Coldwell was one of the organizers of the Northwest Electric Light & Power Association and was instrumental in bringing about its affiliation with the National Electric Light Association in 1912. He is a member of both organizations and a fellow of the American Institute of Electrical Engineers.

## Obituary

A. R. Bell, for many years general superintendent of the Athens (Ohio) municipal electric-light plant, died Sept. 27.

Augustus Wilder Sexton, Jr., treasurer of Westinghouse Church, Kerr & Company, died Oct. 1 at his home in Montclair, N. J.

H. M. Raphael, a member of the Raphael Electric Company of Pittsburgh, Pa., died at the Passavant Hospital in that city, Sept. 30.

Gardiner M. Lane, of Lee, Higginson & Company, Boston, Mass., and a director in many industrial, railroad and public service corporations, among them the Interborough Rapid Transit Company, New York; Massachusetts Electric Company, Boston, Mass.; Pennsylvania Water & Power Company, Holtwood, Pa.; Puget Sound Electric Railway, Seattle, Wash.; Puget Sound Traction, Light & Power Company, Seattle, Wash.; Rapid Transit Subway Construction Company, New York, and the Seattle (Wash.) Electric Company, is dead.

## Construction

### New England

**DINFIELD, MAINE.**—The local electric light plant, owned by N. S. Stowell, has been purchased by the Rumford Falls L. & Wtr. Co. The system, it is expected, will soon be connected with the Rumford plant.

**MECHANIC FALLS, MAINE.**—The Mechanic Falls El. L. Co. expects to make improvements to its plant, including the installation of a new pair of waterwheels and penstock. A. C. Parker is superintendent.

**GREENLAND, N. H.**—The Rockingham County L. & Pwr. Co., of Portsmouth, has been granted permission by the Public Service Commission to extend its transmission lines into the town of Greenland, a distance of about 3 1/4 miles. The company has been granted a franchise to furnish electricity in the town and has secured a contract for street-lighting.

**LACONIA, N. H.**—Plans are being considered by the City Council for improvements to the street-lighting system on Main Street.

**BARTON, VT.**—The Independent Telephone Exchange, recently organized, with a capital stock of \$200,000, to take over the rights and properties of the former independent association, will enlarge and extend the lines and install a new exchange.

**LYNDONVILLE, VT.**—A petition is being circulated in Lyndonville asking that a special village meeting be called to consider the advisability of rebuilding the municipal electric light and power plant. The cost is estimated at from \$22,000 to \$25,000.

**MONTPELIER, VT.**—Plans are being considered by the Board of Trade for the installation of an ornamental street-lighting system in the business district.

**VERGENNES, VT.**—The Vergennes El. Co. has applied to the City Council for permission to replace the arc lamps on Main Street from the city hall to the railroad station with incandescent lamps.

**HAVERHILL, MASS.**—Bids will be received by the city clerk, City Hall, Haverhill, until Oct. 15, for construction of kitchen building, ward buildings, nurses' residence and all outside corridors of the General Stephen Henry Duffell Hospital, erected by the city of Haverhill on Main Street between Marshland and Hamilton avenues. Separate bids will be received as follows: Carpenter and joiner, painting, plumbing and electrical work and painting. Plans and specifications may be obtained at the office of James A. Perkins, architect, 47 North Main Street, Haverhill, upon deposit of \$10, of which \$5 will be refunded upon return of same. James W. Harris is head of department of public property.

**LUDLOW, MASS.**—The electric plant of the Ludlow Mfg. Associates has been purchased by the Ludlow El. L. Co., which is owned and controlled by the same interests as the Turners Falls Co., the Amherst Pwr. Co. and the Agawam El. Co., of Amherst. Philip C. Smith, 11 Devonshire Street, Boston, is president.

**NORTHAMPTON, MASS.**—The City Council has authorized the installation of two nitrogen lamps of 250 cp. to be erected on the No. 13 trolley poles on Main Street, to replace the arc-lighting system now in use. The lamps will be installed by the Northampton El. L. Co.

**PEABODY, MASS.**—A permit has been granted to the B. E. Cox Leather Co. to erect a concrete trolley house, 45 ft. by 50 ft., in the rear of its plant at Wallis and Lady Streets, to cost about \$10,000. The B. E. Porter Co. has the contract.

**MANCHESTER, CONN.**—The Bon Ami Co. reports that it has purchased a large tract of land near its present plant, to be used for future developments. One of the proposed improvements, it is said, will be the erection of a large power plant.

**MILDALE, CONN.**—Work has begun on the construction of the new subsection of the United El. & Wtr. Co. in Mildale. The station will supply electricity in Southbury, which now secures electrical service from the New Britain El. Co. The contracts are being made to light the villages of Mildale and Marion with electricity.

**NEW HAVEN, CONN.**—At the annual meeting of the United El. Co. of New Haven, the proposed \$500,000 capital stock will be submitted to the stockholders.

### Middle Atlantic

**AMSTERDAM, N. Y.**—The capital stock of the Edison El. L. & Pwr. Co., of Amsterdam, has been increased from \$500,000 to \$700,000.

**AUBURN, N. Y.**—The Empire Gas & El.

Co. of Geneva, of Auburn, has been granted a franchise to extend its high-tension transmission line through the town of Aurelius. The company is planning to erect a high-tension line between Auburn and Seneca Falls.

**BINGHAMTON, N. Y.**—The Blanding El. Supply Co., of Binghamton, has secured the contracts to install electrical equipment in the new high schools in Endicott and Lestershire.

**BUFFALO, N. Y.**—Bids will be received by Thomas E. Finegan, assistant commissioner for elementary education, Education Building, Albany, until Oct. 19, for construction of a rear porch on the principal's residence, interior telephones, program bells and fire alarm system for the State Normal School at Buffalo. Drawings and specifications may be consulted at the New York office of the Department of Architecture, Woolworth Building, New York; office of the Department of Architecture, Capitol, Albany, and at the Buffalo State Normal School, Buffalo.

**BUFFALO, N. Y.**—Bids will be received by Chief Clerk W. Ward, secretary of the State Board of Armory Commissioners, 174 State Street, Albany, until Oct. 23, for construction, heating, plumbing and electric work for addition to and alterations to Troop "I," First Cavalry, National Guard, New York. Drawings and specifications may be consulted at headquarters Fourth Brigade, 451 Main Street, Buffalo, and at Troop Headquarters, First Cavalry, 426 Humboldt Parkway, Buffalo, and blank forms of proposals may be obtained at the Department of Architecture, Room 1224, Woolworth Building, New York. J. Lewis F. Pilcher, Capitol, Albany, is state architect.

**ITHACA, N. Y.**—The contract for electrical work in connection with the construction of the New York State Drill Hall at Cornell University at Ithaca has been awarded to Isador Fajans, New York, N. Y., at \$9,698.

**WEEDSPORT, N. Y.**—The Public Service Commission has refused to grant the village of Weedsport authority to install and operate a local incandescent lighting plant.

**ELYSBURG, PA.**—Plans are being considered for the installation in the throw-out plant recently erected by the Board of Trade of a 100-kw generator to supply electricity for lighting the town.

**LANSFORD, PA.**—The present plant of the Lehigh Coal & Navigation Co., at Lansford is about to be shut down, and energy for this place will be supplied by the Lehigh Navigation El. Co. from its Hauto station.

**PITTSBURGH, PA.**—Owing to the Board of Education having been unable to secure a reduction in the price of electricity from the Allegheny County L. Co. for the public school buildings, it is having estimates prepared of the cost of installing electric lighting at the largest of the public school buildings. Most of the 152 school buildings are lighted by electricity, and energy is used in many of the schools for operating shop machinery. The Board is submitting estimates of buildings of the board of education.

**WILLIAMSPORT, PA.**—Bids will be received by Samuel Stabler, superintendent of public affairs of the city of Williamsport, until Oct. 26 for lighting the streets, parks and other public places of the city with magnetite-arc lamps and street incandescent lamps for periods of three, five and ten years from Dec. 1, 1914. Bids will also be received for furnishing electric lighting for the city hall and several fire engine houses for like periods. For details see proposal columns.

**NEWARK, N. J.**—To replace the gantry crane which was blown down last July at the Edison power station, the Pub. Ser. El. Co. is installing a similar apparatus of much greater capacity. The last of the contracts for the work has been awarded to the Robbins Company, El. Co. of New York, N. Y., which will construct an electrically operated and magnetically controlled gantry bridge, at a cost exceeding \$50,000. The new span will be 200 ft. long, the old one having been 150 ft. The crane will have a capacity of 200 tons of coal an hour.

**PERTH AMBOY, N. J.**—The Board of Aldermen is reported to be negotiating with the Pub. Ser. El. Co. for the installation of 600-cp nitrogen tungsten lamps in the business district.

**RAHWAY, N. J.**—The Council is planning to install new 400-cp arc lamps in the business district.

**WILMINGTON, DEL.**—Bids will be received by the Newcastle County Building Commission and the Wilmington Building Commission, the office of the commissions, Church Building, Market and Tent Streets, Wilmington, until Oct. 20, for electric elevators, etc., for the new county building and the new municipal building. Separate proposals are to be submitted for each building.

Drawings and specifications, form of contract and blank form for proposals may be obtained at the office of the commission, Thomas F. Gormley is secretary of the commissions.

**PRINCESS ANNE, MD.**—Preparations, it is reported, are being made by E. H. Crane to install an electric-light plant here, to be equipped with a 50-hp gas producer plant and a 50-kw alternator, which have already been purchased. The company will also install a 35-hp gas producer plant and a small alternator. The town has made a contract with Mr. Crane for street lighting, under which 88 tungsten lamps aggregating 6000 sp will be installed.

**LYNCHBURG, VA.**—Plans, it is reported, have been prepared and submitted by E. C. Wiley for the installation of a municipal electric-light plant, to cost \$150,000.

**WASHINGTON, D. C.**—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Oct. 13, for furnishing at the various navy yards and naval stations the following supplies: Washington, D. C., Schedule 7342—eight motor-driven steel baskets; Schedule 7343—7100 rubber gaskets. Philadelphia, Pa., Schedule 7352—15 fireroom clocks, 80 20-volt water-tight buzzers. Brooklyn, N. Y., Schedule 7352—2500 ft. of 1/2-in. cable, 95,000 ft. of 1/2-in. double-conductor wire, miscellaneous magnet wire, miscellaneous brass pipe fittings. Schedule 7340—600 steel boiler tubes. Schenectady, N. Y., miscellaneous weatherproof sockets, to be delivered at all yards. Newport, R. I., Schedule 7343—3000 ft. brass tubing; Schedule 7344—miscellaneous bronze torpede tubing; Schedule 7342—600 lb. steel tubing. Bids will also be received until Oct. 20, as follows: Annapolis, Md., Schedule 7357—one shearing machine. Mare Island, Cal., Schedule 7357—two oil engines, 100 hp. New York, N. Y., Schedule 7358—three electrically operated hoists. Bids will also be received until Oct. 27, as follows: Chelsea, Mass., Schedule 7400—one ambulance. Annapolis, Md., Schedule 7400—two wall-type galvanometers, one contactor, five field rheostats and one current transformer, one alternating-current generator set and direct-current motor. Boston, Mass., Schedule 7404—10 pneumatic jacks, suitable for use on Hilles & Jones plate planer No. 7, eight pneumatic jacks, suitable for use on Hilles Ford Ways planer. Norfolk, Va., Schedule 7406—eight simplex vertical pumps (4-in. by 2 1/2-in. by 4-in.) and spare parts for boiler feed. Schedule 7405—900 sq. ft. copper clad wire, 1/2-in. wire. Newport, R. I., Schedule 7403—6000 lb. steel shaft tubing (1 1/2 in. inside diameter, 2 in. outside diameter, cold-drawn and heat-treated). Schedule 7403—Schedule 7361—three marine water-tube boilers; Schedule 7361—miscellaneous air pumps. Bids will also be received until Nov. 3 as follows: Philadelphia, Pa., Schedule 7403—one universal double-arc bench saw, with 19-in. saws and complete equipment, one 24-in. hand jointer and planer, complete with equipment. Washington, D. C., Schedule 7407—five 48-in. cast-iron heads, complete with face plates and motor drivers for head and center screws. Brooklyn, N. Y., Schedule 7408—two motor-driven, cold-metal sawing machines. Appliances for the same should give the schedule desired by number.

### North Central

**BAY CITY, MICH.**—The contract for electric wiring in the new Young Women's Christian Association Building is reported to have been awarded to the Affleck El. Co., of Bay City.

**BEAR LAKE, MICH.**—The Benzie County Pwr. Co., of Frankfort, has applied for a franchise to furnish electricity in Bear Lake.

**DETROIT, MICH.**—Bids will be received by R. F. Bowler, secretary of public lighting commission, until Oct. 13, for laying iron pipe, bar iron and flanges, busbar supports and disconnecting switches.

**JACKSON, MICH.**—Application has been made to the State Railroad Commission by John J. Carr, of Farmington, Mich., to authorize bond issues for the following companies: The Saginaw Pwr. Co., \$10,000; Bay City Pwr. Co., \$9,000; Consumers' Pwr. Co., \$10,000; Detroit Pwr. Co., \$10,000; Economy Pwr. Co., \$6,000; Ausable Pwr. Co., \$272,000; Commonwealth Pwr. Co., \$131,000; Grand Rapids-Muskegon Pwr. Co., \$81,000; and the Flint El. Co., \$9,000.

**MARQUETTE, MICH.**—The department of Light and Power expects to purchase within the next six months electrical appliances and supplies, including heating and working apparatus, vacuum cleaners, washing machines, and Stirling engines, amounting to about \$25,000. C. Retalic is manager.

**NEWAGOW, MICH.**—The Board of Supervisors has granted the Grand Rapids-



Muskegon Pwr. Co., of Grand Rapids, permit to construct four dams in Newaygo County, the first to be completed in seven years, the other three within 13, 15 and 22 years, respectively.

VANDERBILT, MICH.—Plans, it is reported, or being considered by John Yuill, of Vanderbilt, to develop a water-power to generate electricity to be distributed in Gaylord and Vanderbilt.

WYANDOTTE, MICH.—Improvements to the new municipal plant for which the sum of \$40,000 was to be voted will be expected, be completed within four months.

BELLEVUE, OHIO.—The Commissioners of Seneca County have granted the Bellevue Ill. & Pwr. Co. a franchise to erect transmission lines over certain roads in Thompson Township. The company is planning to extend its lines from the Sandusky County lines to Flat Rock to furnish electrical service there.

BUTLER, OHIO.—Bonds to the amount of \$4,000 have been voted for the purchase of a gas engine for the municipal electric-light plant. Other improvements will also be made to the system.

CALEDONIA, OHIO.—At the regular election held Nov. 10, a proposal to install a municipal electric-light system, to cost \$4,000, will be submitted to the voters.

CINCINNATI, OHIO.—Electrical equipments, it is reported, will be required in connection with the construction of water plants to be installed at Dayton, Middletown and Xenia, which, it is estimated, will cost respectively \$750,000, \$150,000 and \$70,000. Pollard & Ellms, Union Central Buildings, Cincinnati, are engineers in charge.

CLEVELAND, OHIO.—The Continental Gas & El. Corp., of Cleveland, it is reported, will proceed with its proposed plan of extension and development outlined before the war. The construction budget for the next six months is \$250,000.

COSHOCTON, OHIO.—The State Public Utilities Commission has authorized the Ohio Service Co. to issue \$630,000 in capital stock, the proceeds to be used to acquire the electric railways and lighting properties at Coshocton, Cambridge, Canal Dover, New Philadelphia, Uhrichsville and Dennison.

DEFIANCE, OHIO.—Investigations are being made by the civic committee of the Chamber of Commerce relative to the installation of a cluster-lamp street-lighting system in the business district.

LONDON, OHIO.—The City Council has authorized the city solicitor to prepare a form for bids for lamp standards, globes, etc., for a cluster-lamp street-lighting system.

ORRVILLE, OHIO.—The Ohio courts have held invalid the bonds issued by the municipality of Orrville for the installation of a municipal electric-light plant. Bonds aggregating \$42,000 have been issued by the municipality, but it was held by the courts that the Ohio laws in regard to issue of bonds and the manner of selling the electric plant were not carried out. Bonds have been sold and proceeds also paid out on contracts. The court held this to be an attempt to defraud the state and the city officials. The case will be carried to the Supreme Court.

SPENCERVILLE, OHIO.—Contracts for construction of the proposed municipal electric-lighting plant will be awarded as soon as bonds, recently authorized, have been sold.

TOLEDO, OHIO.—Bids will be received by the Board of County Commissioners of Lucas County, at the office of the county auditor, Court House, Toledo, until Nov. 16, for construction of power house and furnishing equipment for the new heating, lighting and power plant at the Lucas County Children's Home, in accordance with specifications on file at the office of the county auditor and at the office of E. Bayer, engineer, Nicholas Building, Toledo. Charles J. Sanzenbacher is auditor.

UPPER SANDUSKY, OHIO.—The Hardin-Wyandotte L. Co. has submitted a proposal to the City Council offering a reduction for commercial lighting. The company also offers to sell its property to the city for \$20,000. The Council, it is understood, has rejected the proposal to purchase the plant.

WELLSVILLE, OHIO.—The decision handed down by the Supreme Court of Ohio on Sept. 29 upholds the validity of the \$60,000 bonds issued by the city for the construction of a municipal electric-light plant in Wellsville.

ZANESVILLE, OHIO.—The Southeastern Ohio Ry. Lt. & Pwr. Co. is reported to have applied to the City Council for a franchise to supply electricity in Zanesville.

LOUISA, KY.—Negotiations are under way, it is reported, between the city officials and the Eastern Kentucky Coal Co. to fur-

nish electricity for lighting the town of Louisville and the plant at Torchlight.

WINCHESTER, KY.—Arrangements are being made to extend the ornamental street-lighting system two blocks further to the north, and to the south to the end of the business district.

GOSHEN, IND.—Arrangements are being made by the Hawks El. Co., of Goshen, for the erection of three transmission lines, one to Wekarusa, the second to New Paris via Bainton, and the third to Benton. At Benton, the Hawks El. Co. will connect with the L. & Pwr. Co., which has a plant at Benton and will furnish electricity for lamps and motors in Syracuse and Milford.

MONON, IND.—W. T. McCaskey & Co. were recently granted a franchise to build an electric road from Monon to Reynolds.

CANTON, ILL.—The State Public Utilities Commission has granted the Canton Gas & El. Co. permission to erect a transmission line from Bryant to the southeast corner of Fulton County.

CANTON, ILL.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Nov. 10, for construction, including electrical equipment, lighting and other approaches, of the United States post office at Canton, Ill. Drawings and specifications may be obtained from the above office, from the custodian of the site. O. Wenderoth is supervising architect.

CARBONDALE, ILL.—Bids submitted for the power plant, equipment, etc., of the Southern Illinois State Normal University, it is reported, have been rejected by the trustees. James B. Dill, 29 South La Salle Street, Chicago, is state architect.

COLLINSVILLE, ILL.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Nov. 10, for the construction complete, including mechanical and interior lighting fixtures and approaches, of the United States post office at Collinsville, Ill. Drawings and specifications may be obtained from the above office. The custodian of site at Collinsville. O. Wenderoth is supervising architect.

GALVA, ILL.—The Galva El. Lt. Co. has been granted a certificate of convenience and necessity to erect a transmission line from Galva to Cambridge, Onondaga and Lafayette for the purpose of furnishing electricity in those places.

HILLSBORO, ILL.—Plans are being considered by the City Council and the Hillsboro Commercial Club for the installation of an ornamental street-lighting system.

JOLIET, ILL.—Work on rebuilding the street-lighting system in Joliet, it is understood, will soon be begun by the Public Ser. Co. of Southern Illinois.

SPRINGFIELD, ILL.—Bids will be received by the State Board of Administration, Capitol Building, Springfield, until Oct. 19 for construction of the following buildings: One cottage for male tubercular patients at the Watertown State Hospital, Watertown; Tuberculosis Hospital at the Anna State Hospital, Anna; cottages for tubercular patients at Kankakee State Hospital and at the Lincoln State Hospital for tubercular patients at Kankakee State Hospital, Kankakee; one cow barn at the Anna State Hospital, Anna; one blacksmith's shop at Kankakee State Hospital, Kankakee. Separate bids will be received for the general work, heating, plumbing, including sewerage and electric wiring.

EAU CLAIRE, WIS.—Plans are being considered by the Eau Claire Civic and Commercial Association for the installation of an ornamental street lighting system in the business district.

MILWAUKEE, WIS.—Contracts have been placed by the Twelfth Street Advance-ment Co. to purchase about 24 permanent street arches on Twelfth Street, equipped with Federal steel reflectors and incandescent lamps, 15 ft. high, each. Each lamp is to hang vertically, supported by guy wire. Emil J. Zingen is secretary of the association.

REEDSBURG, WIS.—The distribution lines of the municipal electric-light plant are being rebuilt. O. W. Burkett is superintendent.

DULUTH, MINN.—The City Council has passed an ordinance appropriating \$85,800 for the construction and the equipment of the first unit for the proposed municipal electric-light plant.

FARMINGTON, MINN.—Within the next three months the Farmington El. Lt. & Pwr. Co. expects to purchase about 100 units of single-phase and three-phase motors, sizes from ¼ hp to 15 hp. The company is now erecting about 3 miles of 2300-volt primary transmission transformers at 3300-volt rating. The Farmington company has closed a contract with the Consumers' Pwr. Co. for energy, 2300 volts, three-phase, alternating

current. As soon as the current is delivered the present plant (which is direct current) of the Farmington company will be removed to a new location and put into operation. F. H. Eddy is manager.

KASSON, MINN.—Within the next 30 days the village of Kasson expects to purchase 44 ornamental lamp standards.

WINNEBAGO CITY, MINN.—The Village Council is considering a proposal submitted by H. Merrifield, formerly connected with the Mankato branch of the Consumers' Pwr. Co., for E. E. Barton, of Omaha, Neb., to lease the municipal electric plant and furnish electrical service here. Under the proposed arrangements a 24-hour service could be furnished.

CORNING, IA.—The City Council is considering the question of calling an election to submit the proposal to establish a municipal electric-light plant in Corning to the voters.

LARCHWOOD, IA.—Bids to the amount of \$7,000 have been voted for the installation of a municipal electric-light plant.

LE MARS, IA.—The city of Le Mars, we are informed, does not contemplate the installation of a municipal electric-light plant at this time, as reported in the issue of Sept. 5.

LUVERNE, IA.—Bonds to the amount of \$20,000 have been voted for construction of an electric-light plant and pumping station.

MANSON, IA.—The Manson El. Lt. & Pwr. Co. it is reported, contemplates the installation of new machinery in its plant. H. R. Healey is manager.

MOUNT PLEASANT, IA.—The City Council is contemplating the installation of an ornamental street-lighting system on the public square and on North Jefferson and North Main Streets.

OELWEIN, IA.—The Oelwein Lt. Ht. & Pwr. Co. is reported to have engaged George H. Rowe, of the Utility Development Co., of Chicago, Ill., to take charge of rebuilding its plant recently burned down. The company, it is understood, will install one 250-kw and two 150-kw generating units, and erect a smokestack.

REASOR, IA.—The installation of an electric-light plant at Reasor is under consideration. J. B. Van Baren is reported interested in the project.

ROCKWELL CITY, IA.—The property of the Calhoun County Pub. Ser. Co. at Rockwell City, Ia., is reported to have been purchased by the Central Iowa Lt. & Pwr. Co. This includes the franchise at Churdan and Lohrville.

SERGEANT BLUFFS, IA.—Bids will be received until Oct. 17 by the village of Sergeant Bluffs for an engine, generator, storage battery and switchboard; also for erection of power house and pole line. Plans are on file in the office of the clerk of the Village Board, and at the office of the engineer of the Ryan El. Co., 312 Pierce Street, Sioux City.

TROY MILLS, IA.—A company has been organized with a capital stock of \$40,000, to develop the water of the Wisconsin River and install an electric generating plant to furnish electricity in Troy Mills and surrounding towns. W. R. Furman is president, W. F. Stauffer, secretary and treasurer, and G. F. Furman general manager.

CARROLLTON, MO.—The Wtr., Lt. & Transit Co., it is reported, is contemplating the installation of a 300-hp water-turbine.

JOPLIN, MO.—The city of Joplin, it is reported, will soon call for bids for installing lamps on the Broadway Viaduct.

KING CITY, MO.—Within the next six months the City Council of King City expects to purchase material for ten additional street lamps. By next spring the company will probably establish a 24-hour service. Harry V. Forest is secretary and manager.

SMITHVILLE, MO.—At an election held Sept. 29 the proposal to install a municipal electric-lighting system in Smithville was carried.

SPRINGFIELD, MO.—Plans for extensions to the present ornamental street lighting system on Commercial Street are under consideration by the Commercial Club.

HECLA, S. D.—The town of Hecla is installing a municipal electric-light plant. Contract has been placed with the Murra Iron Works, of Burlington, Ia., for engine and boiler for same.

FALLS CITY, NEB.—The city of Falls City expects to purchase within the next three months 1500 ft. of three-wire cable 5000 ft. of two-wire cable and 5000 ft. of standard. G. E. Johnson is city engineer.

MADISON, NEB.—The power station of the municipal electric-light plant has

cently been enlarged and a Bates Corliss engine installed. A. E. Kernick is general manager.

**NORFOLK, NEB.**—The Norfolk El. Lt. & Pwr. Co. has submitted a proposal to the City Council offering to install a new street-lighting system in the business and residential districts, to cost about \$10,000. W. C. Boss is general manager.

**HOSINGTON, KAN.**—Within the next two months the Hosington El. & Ice Co. expects to purchase material for an ornamental lighting system (three blocks), including lamp standards, glassware, conduit, cable, etc., also within the next three months some electric meters, washing machines and vacuum cleaners. J. R. Murphy is manager.

**KANSAS CITY, KAN.**—Bids, it is reported, will soon be called for by L. H. Chapman, commissioner of water and light department, for equipment for the municipal electric-light plant, including a 2500-kw. turbo-generator set with condenser equipment, switchboard, etc.

## Southern States

**MULLINS, S. C.**—Bids will be received by the Board of Public Works until Oct. 15 for the construction of water-works and sewerage system. The work will include an existing pumping station, reservoir, tower and about 5 miles of watermain and 6 miles of sewerage. Gilbert C. White, of Charlotte, is engineer.

**WESTMINSTER, S. C.**—At an election on recently the proposal to issue \$10,000 bonds for the installation of a municipal electric-light plant was carried.

**ATLANTA, GA.**—At a cost of approximately \$60,000, the Georgia Ry. & Pwr. Co. has agreed to install a system of cable-operated routes to lessen the damage to city streets by streetcar, trolley and fire-alarm cars. P. S. Arkwright is president of the company.

**BULLOCKVILLE, GA.**—Application has been made for a charter for the Bullockville El. Ltg. Co. with a capital stock of \$20,000, for the purpose of generating electricity for lighting purpose and also to deal with street fixtures. W. B. Butts and E. A. Adams are reported interested in the company.

**HELENA, GA.**—At an election to be held on Oct. 17 the proposal to issue \$13,000 in bonds to construct a municipal electric-light plant will be submitted to the voters.

**LEESBURG, FLA.**—Plans are being prepared, it is reported, by J. B. McCrary of Atlanta, for the installation of a municipal electric-light plant in Leesburg, to cost about \$80,000.

**APOLKA, FLA.**—The Town Council has voted M. T. Anderson franchise to construct and operate an electric-light plant and water-works system in Apolka.

**MELBOURNE, FLA.**—The contract for the construction of a municipal electric-light system has been awarded to J. B. McCrary Co., of Atlanta, Ga.

**MERIDIAN, MISS.**—The commissioners of the Tuberculosis Hospital have awarded a contract for the installation of an electric-light and power plant in the hospital to Dalton El. Co., of Meridian.

**RANDFIELD, OKLA.**—Arrangements have been made by J. S. Green, manager of Bradford & Devoil. Tel. Co., and O. E. Hays, for rebuilding the electric-light plant, which was destroyed by fire last spring. Plans for the plant, it is understood, have been purchased.

**BROWNVILLE, TEX.**—Plans are being prepared by James A. Browne, owner of the street-railway system (operated by steam engines), for the construction of an electric power plant and to equip the street-lighting system for electrical operation. The Grande Prairie, which runs from Dallas to Point Isabel, a distance of 100 miles, (which is also owned by Browne), it is reported, will be rebuilt and connected with the city system.

**MAGNOLIA PARK, TEX.**—The portion of the Harrisburg El. & Pwr. Co. which is to be lighted with 23 electric lamps. The Magnolia Park Land Co. has for the past year, Magnolia Park a lot a post office.

## Pacific States

**SEATTLE, WASH.**—The City Council has passed an ordinance granting the Light & Power Department an appropriation of \$40,000 to be used for the purchase of material for the proposed construction, preliminary to the removal of poles on Yesler

Way and water-front districts. An additional boiler will be installed in the Lake Union plant.

**SEATTLE, WASH.**—It is reported that an effort is being made to establish two electric light and power plants in China and that the project is being promoted by parties familiar with American electrical machinery. Others, it is understood, will be tried equipment, etc. For further information address W. H. Henderson, Bureau of Buildings, Seattle, Wash.

**TACOMA, WASH.**—Property owners along D Street from the intersection of St. Helena Street and Jefferson Avenue have petitioned the City Council for the installation of street lights. The Council has authorized the city engineer to prepare an estimate of cost of same.

**TACOMA, WASH.**—Investigations have been made by Power Fawcett and the City River above Buckley, owned by L. H. Webb, which has been offered to the city for \$10,000. B. W. Collins, city superintendent of electric works, has recently recommended that something be done at once to furnish plant for at least 10 days in the year and further, that steps be taken to acquire more power plants.

**BAKER CITY, ORE.**—The Dry Ditch & El. Pwr. Co., successor to the Dry Ditch Co. of Baker, is reported to be contemplating the construction of a hydroelectric plant on Eagle Creek, where a fall of 300 ft. can be obtained.

**THE DALLES, ORE.**—Bids will be received at the office of the supervising architect, T. C. Trout, Department, Washington, D. C., until Nov. 13 for construction complete, including mechanical equipment, interior lighting fixtures and approach, etc. The United States post office at The Dalles, Oregon, and other locations may be obtained from the above office and from the custodian of site at The Dalles. O. Wendroth is supervising architect.

**FRISCO, AL.**—Specifications, it is reported, have been adopted for an electric-lighting system which provide for cast-iron and copper standards, instead of cast-iron and copper as in the previous specifications.

**LOMPOC, CAL.**—A new transmission line is being erected by the Millard Counties Pub. Ser. Corp., from Santa Barbara, Lompoc, a distance of 12 miles. The line when completed will furnish energy to the Lompoc El. & Pwr. Co. for general service. The chief object of the extension, it is said, is to supply electricity to the manufacturing works.

**SAN FRANCISCO, CAL.**—The Board of Supervisors has passed an ordinance providing for the installation of an electric conduit system throughout the civic center.

**SAN FRANCISCO, CAL.**—The report of the city engineer submitted to the Board of Supervisors estimates the cost of the construction of the 28 municipal street-lighting system, which applications have been filed lately, \$9 miles.

**VISALIA, CAL.**—The substitution of the Mount Whitney Pwr. & El. Co. at Tipton was recently destroyed by fire.

**COEUR D'ALENE, IDAHO.**—A petition has been filed with the city clerk by property owners on Fourth Street for additional street lamps and a change in the present lamps from 40 watts to 60 watts. The property owners on Riverside and Smilie streets have also asked for the installation of electric lamps.

**MANTUA, UTAH.**—Preparations are being made by the town of Mantua to install an electric-lighting system, to cost about \$10,000. Electricity for maintaining same will be purchased from the municipal electric-light plant in Brigham City.

**MOAB, UTAH.**—Arrangements are being made by J. W. Christensen, of Fairview, and A. Hammond, of Moab, for the installation of a street-light plant in Moab, for which a franchise was recently granted. Contracts for equipment of plant and installation of system have been placed with the Inter-Mountain El. Co., of Salt Lake City. It is also proposed to erect flour mill and ice plant in connection with the power plant.

**TOOELE, UTAH.**—The Clark El. Pwr. Co., of Tooele, expects to reconstruct 2 miles of 6000-volt distribution line and to purchase considerable motor equipment for three plants within the next three months. With the aid of the Federal Government, plans to develop demand for electrical appliances. C. S. Anderson is superintendent.

**THERMOPOLIS, WYO.**—Within the next eight months the Hot Springs El. & Pwr.

Co., of Thermopolis, expects to erect 50 miles of telephone lines; also to purchase within the next 12 months one 100-kw., three-phase, gas-engine, 2400-volt steam turbine and to purchase material for distribution and lighting systems to meet regular requirements. The company uses about \$100,000 worth of electrical supplies and appliances per year. M. W. Thompson is manager.

**SILVER CITY, N. M.**—The Empire Zinc Pwr. Co. is reported to be considering the construction of a tramway from its Cleveland group of mines in the Pecos district to Silver City, a distance of 10 miles. The proposed road will be operated by mules, pending the construction of an electric power plant.

## Canada

**EDMONTON, ALTA.**—The Wabamun Pwr. & Coal Co. is reported to have submitted a proposal to the City Council to supply electrical energy to the city, to be delivered at any point within the city limits at 1 cent per kilowatt-hour.

**EDMONTON, ALTA.**—The Electric Light Department has recently completed the installation of an ornamental lighting system in both North and South Side business sections of the city, also the illumination of the traffic deck on the new high-level bridge which spans the Saskatchewan River, connecting the North and South Sides of the city. Other improvements have been planned to the street-lighting system this year, but are held pending the adjustment of financial conditions.

**MEDICINE HAT, ALTA.**—Within the next 30 days the city of Medicine Hat expects to install one 1500-kw. Westinghouse turbo-generator (three-phase, 69 cycles, 2300 volts), also one 325-hp turbine (Westinghouse), connected to a centrifugal pump, having a capacity of 3,000,000 gal. per day. G. R. Taylor is city electrical engineer.

**REVELSTOKE, B. C.**—The Electric Light Department expects to install within the next six months one 1400-hp hydraulic turbine and one 750-hp and accessories. C. North is superintendent.

**ST. CATHARINES, ONT.**—The City Council has decided to replace many of the gas lamps now in use with 50-cp incandescent lamps.

**TORONTO, ONT.**—Tenders will be received by the city of Toronto until Oct. 13 for supplies for the Fire Department, including copper-clad wire, new circuit wheels for fire-alarm boxes, etc. Plans and specifications may be obtained from the Fire Department, Adelaide Street Fire Hall, Toronto.

## Miscellaneous

**PANAMA.**—Bids will be received at the office of the general purchasing officer, Panama Canal, Washington, D. C., until Oct. 18 for furnishing material for underground cable work at Ancon, Balboa and Gatun, bracing rods, angle and sheet steel and soft steel, checkered steel plates, natural black slate, paint mills and paint mixers. For further information address Major F. C. Boggs, purchasing agent.

## New Incorporations

**DOVER, DEL.**—The Tunky Trans. & Pwr. Co. has been chartered under the laws of the State of Delaware to operate power plants and railroad in Nicaragua. The company is capitalized at \$50,000. The incorporators are Joseph A. Austin, of Ardmore, Pa.; Clinton C. High of Philadelphia, Pa.; and J. Harry Whiteman, of Wilmington, Del.

**EMPHIS, ILL.**—The Emmon El. & Pwr. Co. has been incorporated with a capital stock of \$2,100 by Cyrus J. McCormick, E. L. McCormick, H. W. Alberts, C. E. Ringer. The company proposes to generate and distribute electric and also to operate water-works system.

**BANGOR, MAINE.**—The Wabdo-Penobscot El. & Pwr. Co. has been incorporated with a capital stock of \$200,000 for the purpose of generating and distributing electricity for lamps, heaters and motors. The officers are Nelson H. Hydrum, president, and T. B. Towle, treasurer, both of Bangor.

**EDGEMONT, MO.**—The McCosmas Hydro-Electric El. Co. has been incorporated with Joseph M. McCosmas, George W. Johnson, William T. Mausey, John T. Jackson and others. The company is capitalized at \$50,000 and proposes to construct a dam across Platte River, near Edgemoor, and a power plant to supply electricity in nearby towns.



# Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED  
SEPT. 29, 1914.

[Prepared by Robert Starr Allen, 16 Exchange Place, New York, N. Y.]

1,111,733. TRANSMITTING APPARATUS FOR USE IN ELECTRIC SIGNALING ON RAILWAYS; G. H. Brown (deceased), Belfast, Ireland. App. filed Aug. 31, 1909. For intercommunication between a signalman and train officials.

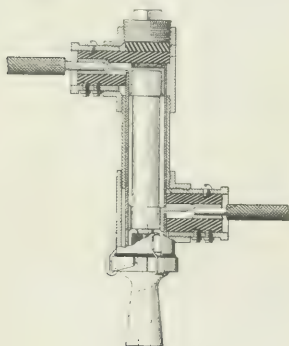
1,111,742. AUTOMATIC TOLL RECORDER FOR TELEPHONE SYSTEMS; E. G. Godfree, Melbourne, Victoria, Australia. App. filed March 18, 1912. Consequent pole electromagnet closes registering circuit only when calling and answering subscribers are in communication.

1,111,748. SPEED-CONTROLLING DEVICE; K. L. Harter and H. T. Reynolds, Tampa, Fla. App. filed July 24, 1913. Short-circuits ignition circuit of automobile upon predetermined speed being reached.

1,111,752. CONNECTOR; W. C. Banks, New York, N. Y. App. filed Dec. 23, 1913. Clamps for taking current from third-rail.

1,111,783. GROUND CONNECTION; W. C. Banks, New York, N. Y. App. filed Sept. 5, 1912. Perforated receptacles of gradually increasing size containing charcoal.

1,111,789. THERMAL RELAY; T. B. Freas, East Orange, N. J. App. filed Dec. 4, 1911. Provides certainty of operation of the main switch.



1,112,156—Fuse Switch

1,111,790. ELECTRIC HEATER; W. H. Fulton, New York, N. Y. App. filed Aug. 26, 1908. Car heater which can be readily assembled and disassembled.

1,111,792. SELECTIVE SIGNALING SYSTEM; E. R. Gill, Yonkers, N. Y. App. filed March 23, 1910. For train-dispatching work; telephone and telegraph apparatus can be simultaneously operated.

1,111,798. ELECTRIC SWITCH; C. J. Klein, Milwaukee, Wis. App. filed Oct. 5, 1911. Push-button lamp socket.

1,111,851. SIGNALING SYSTEM FOR HIGH-VOLTAGE RAILWAYS; C. P. Nachod, Philadelphia, Pa. App. filed July 23, 1912. Uses lower voltage than that used for propulsion.

1,111,864. ELECTRIC-LIGHTING APPARATUS FOR VELOCIPEDES; A. Saniaderer, Vilhoften, Germany. App. filed July 23, 1912. Dynamo placed within the hub of the velocipede wheel.

1,111,866. PULSATION-PRODUCING DEVICE FOR ELECTRICAL MUSICAL INSTRUMENTS; M. L. Severy, Arlington Heights, Mass., and G. B. Sinclair, Boston, Mass. App. filed July 25, 1907. Has rotative pulsation-producing members.

1,111,876. TELEPHONE SYSTEM; C. S. Winston, Chicago, Ill. App. filed Nov. 1, 1912. Interconnecting magneto line.

1,111,898. ELECTRODE FOR ELECTROLYTIC MEASURING INSTRUMENTS; H. S. Hatfield, Brunswick, Germany. App. filed June 28, 1913. Electrolytic chamber has a gas space in the side thereof.

1,111,912. THERMOMETRIC FIRE DETECTOR; K. Matsudaira, Washington, D. C. App. filed May 1, 1912. Thermometer tube with wires inserted in the ends thereof.

1,111,930. RAILWAY-SIGNAL AND SWITCH-OPERATING MEANS; P. G. Ten Eyck, Albany, N. Y. App. filed Aug. 24, 1909. Tower control system.

1,111,956. ELECTRIC LAMP; T. P. Driver, Melrose, Mass. App. filed May 15, 1914. Adapted to be clamped to terminals of ordinary dry cell.

1,111,962. SPARK-GAP; G. F. Knorr, Des Moines, Ia. App. filed Oct. 6, 1913. Adapted for attachment direct to a spark plug.

1,111,977. ELECTROLYTIC CELL; C. C. Titus, Helena, Mont. App. filed Dec. 14, 1910. For production of chlorine and caustic soda.

1,112,022. CONCATENATED CONTROL OF ALTERNATING-CURRENT MOTORS; R. D. Mershon, New York, N. Y. App. filed June 11, 1906. Condensers connected across the connections of two motors of the concatenated system.

1,112,028. TROLLEY-POLE HEAD; J. Paradawish, Brockton, Mass. App. filed June 5, 1914. Pivoted jaws slidingly engage the wire.

1,112,047. CIRCUIT-WIRE TERMINAL; A. A. Ziegler, Boston, Mass. App. filed Aug. 11, 1913. Made of sheet metal doubled over upon itself.

1,112,087. METHOD OF HARDENING AND TEMPERING; J. Patten, Baltimore, Md. App. filed Aug. 15, 1912. For gun barrels and engine cylinders; traverses surface with an electric arc and immediately cools.

1,112,140. TELEPHONE SYSTEM; D. S. Hulsh, Toronto, Ontario, Canada. App. filed Nov. 26, 1910. Uses a call-answering plug, a ringing plug and a ringing key with special contacts.

1,112,143. LOCKING DEVICE FOR ELECTRICALLY OPERATED PIANOS; J. F. Kelly, Pittsfield, Mass. App. filed May 31, 1912. Key-locking device.

1,112,156. FUSE SWITCH; T. E. Murray, New York, N. Y. App. filed Nov. 28, 1913. Cartridge fuse with insulating handle by which it can be inserted into its casing.

1,112,161. SNAP SWITCH; C. Roth, Brooklyn, N. Y. App. filed Oct. 28, 1913. Has special detent mechanism.

1,112,165. FLUID RHEOSTAT; A. Simon, Milwaukee, Wis. App. filed March 10, 1913. Circulates the fluid through the rheostat tank.

1,112,167. TELEPHONE TRANSMITTER; J. L. New York, N. Y. App. filed June 6, 1913. Resilient mounting for the diaphragm.

1,112,169. RHEOSTAT; L. L. Tatum, Milwaukee, Wis. App. filed Dec. 7, 1908. Grid resistance with raised contact surfaces engaged by a switch lever.

1,112,170. RHEOSTAT; L. L. Tatum, Milwaukee, Wis. App. filed Feb. 10, 1913. Thermostatic dimmer.

1,112,177. ELECTRIC SYSTEM; R. Varley, Englewood, N. J. App. filed March 21, 1914. Produces a prolonged bridging of the spark-gap, for ignition.

1,112,191. CARBON BRUSH AND PIGTAIL; W. L. Bliss, Milwaukee, Wis. App. filed May 2, 1910. Conducting member is riveted to brush and screws maintain contact with the rivets.

1,112,196. ELECTRIC REGULATION; J. L. Creveling, New York, N. Y. App. filed Nov. 5, 1910. Car-lighting system.

1,112,208. COMBINED CIGAR LIGHTER AND CUTTER; L. B. Grasberger, Richmond, Va. App. filed June 22, 1912. Cutter and lighter operate simultaneously.

1,112,265. CURRENT-RECTIFYING APPARATUS; F. Conrad, Swissvale, Pa. App. filed Jan. 10, 1912. Prevents short-circuits in a vapor-like rectifier.

1,112,266. RECTIFIER SYSTEM; F. Conrad, Swissvale, Pa. App. filed June 21, 1912. Limits short-circuits to a harmless value.

1,112,278. AUTOMOBILE SIGNAL; R. G. Falconer, Washington, D. C. App. filed Sept. 14, 1912. Gear shift and steering gear automatically set the rear signals.

1,112,281. COOKING UTENSIL; M. J. Flynn, Portsmouth, Va. App. filed March 7, 1914. For use on shipboard.

1,112,282. RECTIFIER SYSTEM; C. Le G. Fortescue, Pittsburgh, Pa. App. filed June 21, 1912. For preventing short-circuiting in vapor apparatus.

1,112,283. SYSTEM OF ELECTRICAL DISTRIBUTION; J. J. Frank, Fitchburg, Mass. App. filed Sept. 5, 1912. Vapor rectifier in unitary structure.

1,112,291. SANITARY MOUTHPIECE; E. M. Jenkins, Italy, Tex. App. filed March 7, 1913. For telephones.

1,112,310. AUTOMATIC ELECTRICAL ANNOUNCER; A. J. W. Munster and J. M. Muir, Dunedin, New Zealand. App. filed June 19, 1912. Route-indicating apparatus.

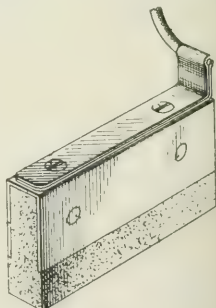
1,112,313. FUSE CAPSULE; H. T. Paiste, Philadelphia, Pa. App. filed June 5, 1913. Prevents discoloration of the mica cover.

1,112,316. ALARM LOCK; L. Percival, Tacoma, Wash. App. filed May 8, 1909. Sounds alarm when attempt is made to open lock.

1,112,346. MAIL BOX; J. F. Wilcox, Earlsboro, Okla. App. filed April 13, 1912. Rural service; signals to the house the presence of mail in the box.

1,112,361. ARC-LIGHT ELECTRODE; C. W. Dake, Chicago, Ill. App. filed Dec. 5, 1912. Has longitudinal, notched cooling ribs.

1,112,365. ELECTROMECHANICAL WARP STOP MOTION; G. J. Dusen, Plymouth, Mass. App. filed Dec. 23, 1911. Harness frame has terminals which can be engaged by the heddles only when they are in abnormal position.



1,112,191—Carbon Brush and Pigtail

1,112,378. SWITCHING APPARATUS; H. I. Newbury, New York, N. Y. App. filed Jan. 28, 1905. For signals of elevator system.

1,112,379. ELEVATOR SIGNAL SYSTEM OR APPARATUS; H. F. Newbury, New York, N. Y. App. filed Oct. 14, 1911. Indicates to attending passenger the cars approaching in the right direction.

1,112,385. SIGNAL SYSTEM; J. J. Ruddie, West Newton, Mass. App. filed Oct. 1911. For railways; rails have insulating sections.

1,112,391. THERMOSTATIC CIRCUIT-CO TROLER; G. E. Spear, Amesbury, Mass. App. filed April 11, 1913. To give alarm in greenhouses.

1,112,392. TELEPHONE RECEIVER; J. Spence, New York, N. Y. App. filed June 6, 1913. Yielding mounting for relatively inflexible diaphragm.

1,112,397. CONDENSER; P. Thomas, W. Kinsburg, Pa. App. filed Dec. 4, 1912. Dielectric of fibrous material impregnated with chlorinated stearic acid.

1,112,411. WAVE DETECTOR; R. T. Aekel, Cortland, Ohio. App. filed Dec. 17, 1913. Loosely engaging disks acted on by magnets.

1,112,415. LINE CONNECTOR; D. W. Kneis, Dayton, Ohio. App. filed Jan. 5, 1913. For telephone work.

1,112,426. WALL BOX; H. A. Stodda, Philadelphia, Pa. App. filed Dec. 4, 1913. Sectional and extensible construction.

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## Influence of Trust Legislation

That the trust legislation of Congress has received so little public attention and comment is due, of course, to the more absorbing subject of war and its influence. For the time being trust legislation is the lesser influence and is relegated, if not to obscurity, at least to an inconspicuous place in the business outlook. The war is terrible and destructive, but it can have only a temporary influence on domestic business in a country removed from the conflict by the width of the ocean. Trust legislation, however, means virtually permanent change in business practices of the kind which it aims to correct. It is, therefore, highly important that it should receive the keenest analysis and fullest explanation, to the end that, so far as possible, its effects may be constructive of greater trade and not merely destructive of the practices on which the great business of the nation has been built. A few months ago many business men felt that the government was engaged in a crusade against business which would lead to demoralizing results. With the more serious worldwide financial crisis which has developed since then the government policy has undergone reassuring changes. The railroad-security regulation bill has been deferred, and the Washington authorities, through several of the main agencies affecting business interests, have not hesitated to take steps which, wherever they may lead, are now on the constructive side. In the initial enforcement of the new trust legislation the government can help business by forbearance in the use of autocratic power in harmful directions and by abstinent aggression in all ways which promote foreign and domestic trade.

## Co-operation from City Officials

If because of the war a public utility is unable to meet obligations toward the city, requiring large investment or expansion, as fully and as finely as its ordinary policy requires, its first duty is to tell public officials. We think that in almost all cases public officials will recognize the undeniable facts and will not hesitate to support the companies in a fair course. Our attention has been called to conspicuous instances of willingness on the part of city officials to do their share in this direction. If they do not act in that spirit, it will be because they cannot resist the temptation to play politics. In many ways, in their ideas of service, rates, taxes and the multitude of other questions which arise continually in the conduct of a great utility, company and city officials have been far apart in the past. These differences are something like the differences between

any negotiating buyer and seller, which, if a bargain is to be made, must involve a compromise by one or the other. In times of easy money and confident or reckless expansion these differences are usually surmountable. But in times like the present city officials will serve their people if they will avoid hampering the utilities in their problem of meeting conditions produced by the banking situation. The signs of reduced markets for securities are spread plainly in all sections of the country and are beyond dispute. Public utilities, like other forms of trading, private, municipal and corporate of all kinds, are bound firmly by the inexorable facts which prevail. In that condition there is no excuse or justification for either the city or the company official who seeks undue advantage; there is, however, a virtual necessity which compels a co-operation and patience until the common rules of business are again in safe and free play.

## Economy in Central Station Service

This is a time when economy is the logical argument of the new-business solicitor. He can go to the factory and talk convincingly on the economy of electric drive. If he is not welcomed with arms opened wide, it will be well for him to polish up his argument and try again. It would be tiresome to try to count the many factories that have not yet been initiated into the advantages of using reliable and cheap electrical energy for motor service. Just why it is best to hustle for business now is tolerably plain to every one. The central station is not exempt from the ordinary rules that apply to general trade and commerce. The business that it gets without trying is not so large in amount or so profitable to hold as the business that is brought in by hard work. The reasons why this is an opportune time to promote the use of central service lie in the varied effects of the European war upon different branches of American industry. Where the war temporarily closes a factory the central station will point out the wisdom of equipping the plant for electric drive when this can be done without interference with workmen. The opportunities for economy in such an installation are forceful, logical and compelling reasons why contracts should be closed. Although many factories are working overtime to meet the demand arising from war-time conditions, others are introducing every possible economy in production to overcome the handicaps imposed by the events of the last two months. In all plants of all kinds the advantages of central-station energy find in the war a new basis for persuasive argument.



### The Electric Furnace and the Central Station

The article in this issue by Mr. Woolsey McA. Johnson on the electric furnace as an off-the-peak load for central stations brings forward some very striking possibilities. Every central-station manager desires to improve the economy of operation by long-hour off-peak loads, which can be furnished by electric-heating and electrochemical works. Neither kind of industry is ready with any considerable demand, so that to acquire such a load demands close attention to the needs of the community as well as an expert and active selling force.

From time to time we have discussed the electrochemical plant. The electric furnace stands in much the same relation to the central station. So far as actual calories are concerned, central-station energy seems very expensive for heating purposes. In fact, an electrical horse-power-year has substantially the total heating value of one short ton of coal. However, electrical heat energy can be delivered at the spot where it is needed and utilized at a very high efficiency, while the thermal energy of the coal is usually for the most part wasted. On this account electrical cooking becomes an economic possibility at a moderate price for energy. A cook-stove is probably about the most inefficient apparatus for the utilization of heat that could well be designed. It is the needless lack of efficiency of utilization of heat from fuel that gives electrical heating a chance.

What has been found true with the cook-stove is in less measure true of nearly every other device for utilizing the heat of fuel. In large boilers the actual utilization of the thermal value of the coal may reach 75 per cent. In melting and smelting operations the efficiency is less—on the whole, much less—and consequently there is a greater opportunity for the use of electrically produced heat in such work. Mr. Johnson well shows that there are many industrial melting processes in which the incidental wastes of the methods now in vogue are large by reason of the loss of material, severe oxidation, breaking of crucibles and general slovenliness. These disadvantageous factors in operation can be eliminated in the electric furnace. At a low cost of electric energy the actual work of melting can be accomplished at a very reasonable commercial figure by electrical energy with the great additional advantage of working under conditions extremely favorable to the production of a considerably higher percentage of perfect castings than is now the case, especially in working ordinary brass and even in the making of high-grade steel castings. Most of these metallurgical processes require large amounts of heat for considerable periods, so that from the standpoint of the central station the electric furnace is a long-hour energy user.

In the ordinary course of events the electric furnace load would naturally extend over the peak, but as a rule it is feasible to keep the load off the peak if by so doing there is an opportunity for a material saving in the cost of energy. In this event the furnace load becomes

of a very highly desirable character with respect to the general load curve of a central station. It is clear that the possible furnace load is a large one. There is great need for systematic missionary work all along this line, and we hope that Mr. Johnson's article may lead to a new central-station business campaign which will be productive of good to all parties concerned.

### Radiations from an X-Ray Tube

The Roentgen radiation emitted by an X-ray tube in excitation is generally admitted to possess two characteristics, namely, the hardness and the quantity. The hardness refers to the penetrating power of the radiation, so that hard rays can pass through relatively thick layers of metal before ceasing to be able to manifest their effects, while soft rays become absorbed by such layers. The quantity of the radiation refers to the magnitude of the total time-flux of radiation emitted. To use a rough analogy, the quantity of the radiation emitted by a tube would correspond to the total quantity of the light emitted by a lamp, or the product of light-flux and time, while the hardness of the radiator would correspond to the color or wave-length of the light. In general, the hardness of the rays emitted from an X-ray tube increases with the voltage impressed upon the tube, so that, when the operating voltage has to be increased by reason of changes in the residual gaseous density, the hardness also increases. On the other hand, there has been some discussion as to the factors which enter into the quantity of radiation

A reinvestigation of this matter has recently been published in the *Physical Review* by Mr. Wheeler P. Davey. The quantity of radiation produced by an X-ray tube under different conditions of electrical excitation was measured by means of a special form of gold-leaf ionization detector.

The results reported go to show that the Cardini rule holds; that is, that the quantity of Roentgen radiation given off in a certain time is proportional to the electrical energy consumed in that time. Any change in the state of vacuum may involve a change in the voltage necessary to operate the tube, but the quantity per joule absorbed appears to remain constant. This means that the rate of omitting radiation from a tube will vary directly with the watts consumed, or that, with constant impressed voltage, the rate of emission will vary directly with the current.

Consequently, the rate of delivering X-rays at a distance from an active tube, considered as a point source will be proportional directly to the watts consumption and inversely to the square of the distance from the cathode, so that the duration of time necessary for delivering a given quantity of radiation at a surface should, for any particular tube, be directly as the square of the distance and inversely as the watts at a tube terminals.

In order then to calibrate a given tube for Roentgen ray projection, it should only be necessary to measur

the quantity radiated once for all at a given distance, with a given electrical energy input, by means of Kienböck photographic paper or other suitable measurer of total ionization. Thereafter, that tube, excited in the same electrical way, should give proportional results on the scale thus determined, no matter what the degree of vacuum in the tube might be, within the ordinary working range.

### Electro-Percussive Welding

It is well known that the metallic substance aluminum has a very marked affinity for oxygen. So great is this tendency to oxidation that a piece of aluminum would speedily burn up in atmospheric air, if the resulting product—aluminum oxide—did not form an adhesive layer which arrested further action, a thin film of the oxide being sufficient for this purpose. It has been ascertained, indeed, that if a knife is applied to an aluminum sheet so as to scrape a fresh metallic surface, the oxygen from the air runs in behind the advancing blade; so that by the time the knife is lifted from the sheet a new film of adhesive oxide has formed over the furrow. The protecting film is so thin as to be transparent, and through it we see the luster of the pure metal beneath.

When attempts are made to weld or solder together two pieces of aluminum, the operation is likely to be thwarted by the intervening films of oxide, which prevent the metallic contact and interfusion of the aluminum at the junction. The higher the temperature at which the union is attempted, the worse is the difficulty. Other metals also give trouble in welding, owing to the formation of a scale or superficial oxide at the surface of contact, but aluminum is one of the most difficult of the metals to deal with in this respect.

At the recent convention of the American Electrochemical Society a paper was presented by Messrs. C. E. Skinner and L. W. Chubb on an interesting modification of the welding process as applied to small wires, especially of aluminum. This process is called electro-percussive welding. It consists essentially in impacting the wires end on, while a condenser is allowed to discharge through the impacting contact. A very appreciable resistance is presented at the contacting surfaces, so that a considerable amount of heat is developed electrically, very suddenly, at these surfaces. This heat raises the ends of the wires to a temperature above the melting point. The impact drives the molten ends into each other's arms before they have time to oxidize, and the air is vehemently expelled from between them. By the time the impact is over the electrical discharge is complete and the weld is finished, the heat which was confined to the opposed surfaces being rapidly absorbed into the mass of the wires. The weld is all made in a millisecond of time before the surrounding oxygen has a chance to enter a protest.

It would seem that this electro-percussive welding should be capable of being applied with great swiftness and convenience in many metal-working trades,

like jewelry, where numerous small welds have to be effected. The right amounts of impact and of electric discharge are stated to be readily determinable by the artisan in each particular case. It is said that, except between rare pairs of metals, the welds are permanent and show no disintegration after many months.

### Electrolytic Insulation of Aluminum

Without being constrained to believe that this world of ours is the best possible world, we may yet freely admit that it is a world of many compensations, so that qualities which seem at first sight to be wholly obnoxious not infrequently develop countervailing advantages on closer investigation. An instance of this sweetness wrested from asperity is furnished in a paper by Messrs. C. E. Skinner and L. W. Chubb, on the electrolytic insulation of aluminum wire, read at the Niagara Falls convention of the American Electrochemical Society.

The difficulty ordinarily encountered in making good joints and permanent contacts between aluminum wires is well known and is attributed to the film of oxide which covers any surface of metallic aluminum. It has been known that coils of bare aluminum wire develop a very appreciable degree of insulation between successive spires, owing to this oxide; so that, under favorable conditions, such coils can be used devoid of internal insulation. The same property exists with wires of any metal, although usually to a much less degree than with aluminum wire. Thus, cables of stranded copper appear to maintain ordinarily substantial insulation between adjacent strands against the feeble potential differences that are set up between them. By passing the aluminum wire through a special electrolytic bath before coiling it Messrs. Skinner and Chubb increase the thickness of the insulating film on the wire to such an extent as to enable it to withstand relatively high voltages between the turns, thus rendering silk, cotton or enamel insulation unnecessary in such coils. It is well known that the expense of cotton or silk insulation for wire increases rapidly per kilogram as the size of the wire is reduced, while at the same time the ratio of metal to coiling space constantly diminishes, owing to the relatively large amount of room occupied by the cotton when the wire is small. If the cotton can be eliminated entirely, coils of fine aluminum wire can be cheapened considerably.

In the larger sizes of wire wrapped copper would ordinarily be preferable to aluminum, except in regard to weight, owing to its greater volume conductivity, but in the smaller sizes the conditions might readily become inverted and bare electrized aluminum become preferable to wrapped copper, aside from cost, owing to the loss of effective space in the copper winding occupied by the textile insulation. Enamelled copper wire would naturally retain the superiority in coil effectiveness down to smaller sizes. The aluminum wire is able to make its enamel out of its own substance in the electrolytic tank.



# The News of the Week

## Activities and Events in the Electrical Field— Reports of Meetings—Commission Findings, Etc.

### Postponement of Electrical Congress

At the meeting of the American Institute of Electrical Engineers held in New York on Oct. 9 Secretary Hutchinson announced that, acting upon the recommendation of the executive committee of the International Electrical Congress committee on organization, the board of directors of the A. I. E. E. has declared the congress to be postponed until such time as it may be found practicable to hold an international electrical congress in the United States. All subscriptions to the congress will be refunded in full. It is probable that a meeting of the Institute will be held in San Francisco in June or September, 1915.

### American Electric Railway Association Convention

The annual convention of the American Electric Railway Association and allied and affiliated associations was held this week at Atlantic City, N. J. Mr. Charles N. Black, in his address as president of the association, emphasized the fact that the industry is passing through a most crucial and critical period, not so much by reason of changes in the art as because of the general public attitude toward public utilities as well as from the problems arising through governmental regulation. In speaking of the plan to hold the 1915 convention in San Francisco, Mr. Black said that it is due member companies in the Pacific Coast section that the association make every effort to secure a full attendance from the East. In speaking of present conditions, Mr. Black said that the money centers of Europe, which in the past have absorbed vast quantities of our public service securities, have now been cut off absolutely and it is hardly probable that they will be available again for a long time to come.

### Last of Trust Legislation

The House of Representatives has now adopted the conference report on the Clayton anti-trust bill, following similar action by the Senate. The enactment of the Clayton bill into law ends the administrative program in respect to trust legislation, at least for the present.

Representative Mann, minority leader of the House, spoke in opposition to the adoption of the report, although he was not supported by all the other Republicans on the vote. Twenty-two Republicans stood with the solid Democratic majority as in favor of the legislation, and six Progressives also voted with the Democrats. The vote was 244 for and fifty-four against.

In attacking the Clayton bill report, Representative Mann pleaded for a cessation of legislation affecting business, saying:

"We have the opportunity now by wise legislation to encourage our people to build manufacturing institutions, to make America independent practically of foreign aid in commerce, and to give us an inlet into every foreign commerce with our manufactured articles. We ought to be encouraging the production in our own

country of many articles for which we are now wholly dependent upon foreign lands. Instead of rising to this occasion, instead of understanding the situation, instead of giving encouragement to those who are willing to invest money in these enterprises, we are doing every thing we can to threaten and demoralize trade, to hold the penitentiary over men who invest capital and to make men fear. The country to-day is in a condition of fear. We have more currency in circulation than ever before and less credit. With more money in the land it is harder to get. It comes through fear largely due to threats of legislation."

### Criticism of Adamson Water-Power Bill

At the request of Senator Jones, Mr. M. O. Leighton, consulting engineer of Washington, D. C., has made a statement criticising in detail the Adamson water-power bill. Mr. Leighton says that it is entirely true that the public interest in water-powers surpasses that in any other natural resource, but the fact does not justify the assumption that those who engage in that business must do so at the peril of their investments. The sovereign power of this government has proved and is proving amply sufficient for the control of social and business conduct. Nothing but stagnation or disaster can result from a legislative measure which, like the bill discussed, seeks to reinforce supreme sovereignty by depreciating the value of an invested dollar and by loosening the foundations of the financial structure.

### Annual Jovian Congress

Delegates from the Eastern and Western seaboard, from the Gulf States and from Canada assembled for the twelfth congress of the Jovian Order at the Planters' Hotel, St. Louis, Mo., Oct. 14 to 16. On the opening day the registered attendance reached 700. Evidence of the lively interest in the affairs of the order was shown by the excellent attendance at the informal reception to past-Jupiters held the evening before the convention had been officially opened.

Mr. Henry W. Kiel, Mayor of St. Louis, opened the first business session with an address of hearty welcome, presenting the order with a mammoth gilded key to the city. The key was received by Past-Jupiter Oscar C. Turner, Birmingham, Ala. Following this amusing ceremony, Mr. James A. Casey, acting for the B. F. Stief Jewelry Company, presented the Past-Jupiters' Association with a jeweled historic gavel made from the roots of a mesquite bush in Waco, Tex., where the first rejuvenation was held. On the silver-plated sides of the gavel room has been provided for the names of 100 Jupiters.

Before reading his annual report, Mercury Ell C. Bennett, St. Louis, announced the appointments of the following committees: Resolutions committee, chairman, Mr. Oscar C. Turner, Birmingham, Ala.; nominating committee, chairman, R. L. Jaynes, Pittsburgh, Pa.; degree team competition committee, chairman, Mr.

A. C. Beattie, Cincinnati, Ohio; electric show committee, chairman, Mr. B. M. Downs, Covington, Ky.; committee on Mercury report, chairman, Mr. Sam A. Hobson, Chicago, Ill.; committee on commercial division, chairman, Mr. W. E. Robertson, Buffalo.

The report of Mr. Bennett dealt with things the order has accomplished during the past year, dwelling particularly upon the record-breaking membership increase, social activity, finances, and the central offices. The report also included proposed changes in the constitution and by-laws and outlined some of the future plans of the commercial division.

Dinner for approximately 2300 people was served at the Sunset Inn on Oct. 14. It is estimated that 680 automobiles were used to transport the merry-makers to that delightful country club.

### Progress in Cincinnati Appraisal

Mr. A. C. King, of Chicago, who is making an inventory and appraisal of the property of the Union Gas & Electric Company of Cincinnati, Ohio, at the request of the City Council, has made a report of progress. The items of the inventory, he said, have been checked and a detailed inventory of the underground work and the transformers has been made from outside information for comparison with the lists submitted by the company. An inventory had also been made of the station, substations, electrical apparatus of all kinds, office furniture and fixtures and all other articles. The value of some of the materials may have been affected by the abnormal financial conditions of the past few months, Mr. King said. The underground system, together with the street-lighting equipment, has been listed and appraised. Real-estate experts must be secured to make a valuation of the ground and buildings owned by the company. The income and expense items are being estimated at the present time, he said.

### War Tax on Telephone and Telegraph

Telephone and telegraph companies of the country will be put to considerable trouble by the "war revenue tax bill" which the government has found necessary because of the falling off in customs receipts.

Under this bill these companies will be obliged to collect a tax on each telephone and telegraph message for which they charge the sender 15 cents or more. The bill as it left the House of Representatives provided that the companies should make within the first fifteen days of each month a sworn statement showing the number of all dispatches, messages or conversations over their lines during the preceding month for which there was a charge of 15 cents or more, the collector of internal revenue in each district to collect a tax of 1 cent a message from each "person, firm or corporation." The Senate committee amended the bill to remove any ambiguity.

### Pacific Coast Jobbers' Meeting

The regular quarterly meeting of the Pacific Coast electrical jobbers was held at Del Monte, Cal., Sept. 24, 25 and 26. An open session was held on Sept. 26 at which Judge T. M. Debevoise, counsel for the Electrical Supply Jobbers' Association, outlined the work of the jobbers' association as a national body. Judge Debevoise's talk was much the same as that given at the Niagara Falls (Ontario) meeting of the Electrical Supply Jobbers' Association, his remarks at that time being recorded in these columns on Sept. 12. Mr. Franklin

Overbagh, the secretary of the Electrical Supply Jobbers' Association, was also present.

In a paper by Mr. T. E. Burger, manager of the Western Electric Company at Los Angeles, on "Creative Sales Work by Jobbers," the author maintained that a jobber should do his utmost to create business on lines of goods having genuine merit and which can be marketed at fair profits. The burden of Mr. Burger's argument was that specialization in sales effort makes the jobber a more successful distributor than one who is willing to accept orders for any make of article called for by the whims of his customers. If the jobber wants to augment the importance of his position in the great electrical industry and if he wants to increase his profits, he and not others, said Mr. Burger, should create a demand for the goods he has to sell.

### Dr. Steinmetz Speaks to Pittsfield A.I.E.E. Section

At a dinner in his honor held by the Pittsfield (Mass.) Section of the American Institute of Electrical Engineers on Oct. 7 Dr. C. P. Steinmetz, chief consulting engineer of the General Electric Company, discussed "Everyday Tendencies of Electrical Development," pointing out the steady elimination of small and inefficient central stations by large plants with numerous substations and distribution systems of wide area. Increasing perfection in distribution and improved efficiency of production, the possibilities of handling diversified peak loads economically in large generating plants, and the ability of large systems to command the services of high-salaried experts, led the speaker to his conclusions. In the speaker's opinion, the municipal lighting plant is doomed except in the larger installations. During his address, which was attentively listened to by all present, Dr. Steinmetz referred briefly to the European war, stating that it affords the United States a remarkable opportunity to become an independent nation economically and industrially.

### Convention Program of the Kansas Gas, Water, Electric Light and Street Railway Association

The seventeenth annual convention of the Kansas Gas, Water, Electric Light and Street Railway Association will be held at the Fifth Avenue Hotel, Arkansas City, Kan., Oct. 22, 23 and 24. The delegates will be welcomed by Mayor J. W. Reed of Arkansas City, and Mr. L. O. Ripley, of Wichita, will respond. The program is as follows: Presidential address by Mr. A. L. Newmann, Arkansas City; "Co-operation," by Mr. H. W. McGruder, president of the Liberal Light, Ice & Power Company; "The New High-Efficiency Incandescent Lamp," by Mr. R. D. Obermyer, General Electric Company; "Cost of Distribution and Overhead Charges," by Mr. E. A. Wright, manager of the Manhattan Light, Ice & Power Company; "Supplying the Farmer with Electricity from the Central Station," by Mr. C. L. Brown, manager of the Riverside Light & Power Company, Abilene; "Regulation and Control of Public Utilities," by Mr. T. J. Strickler, engineer of the State Utilities Commission, Topeka; "Office Records," by Mr. M. T. Flynn, manager of the Standard Electric Light Company, Kansas City; "Has Business a Humorous Side?" by Mr. L. O. Ripley, vice-president of the Kansas City Gas & Electric Company, Wichita; "Safety First," by Mr. A. M. Patton, assistant general manager of the Western Railways & Light Company, Topeka; "Internal-Combustion Motors Versus Internal Combustion Motors," by Mr. Lewis Bendit, Kansas City; "Rates,"



by Mr. J. R. Murphy, manager of the Great Bend Water & Electric Company, Great Bend; "Rate Making," by Prof. George Shadd, Kansas University, Lawrence; "When Bonds Come Due," by Mr. H. P. Wright, President of the H. P. Wright Investment Company, Kansas City; "Local Conditions to Be Considered in Deciding the Question of Producing Power for Railroad Shops," by Mr. L. M. Gazan, chief electrician of the Atchison, Topeka & Santa Fé Railway Company, Topeka; "Information of Value to the Central Station as Distributed by the Manufacturer," by Mr. C. L. Draper, engineer of the General Electric Company; "The Electrical Supply Jobber—Is He a Nuisance or a Necessity?" by Mr. F. B. Uhrig, manager of the Western Electric Company, Kansas City; "Individual Benefits Received Through Co-operation in Association Work," by Mr. J. E. Marsh, district manager of the Salina Light, Power & Gas Company; "What One Horse-Power Means to the Industries," by Prof. B. F. Walker, University of Kansas, Lawrence; "An Explanation of the Society for Electrical Development," by Mr. F. B. Uhrig, district manager of the Western Electric Company, Kansas City; "Manufacture of Steel Wire," by Mr. W. A. LaPierre, American Steel & Wire Company, Chicago.

In addition, there are scheduled papers by Prof. A. A. Potter, Kansas State Agricultural College, Manhattan; Mr. W. L. Murrow, manager of the Kansas Gas & Electric Company, Independence; Prof. Clarence Reid, Kansas State Agricultural College, Manhattan, and Mr. Wagner, Salina Light, Power & Gas Company. There will be a dinner at the Fifth Avenue Hotel on the evening of Oct. 23, followed by a rejuvenation of the Sons of Jove. In addition to sightseeing trips, the entertainment program makes provision for motion pictures of interest to the industry, which will be shown at the Rex Theater, Oct. 24. Mr. W. H. Fellows, Leavenworth, is secretary-treasurer of the association.

## GAS-FILLED LAMPS FOR NEW YORK

### Street-Lighting Commissioner Proposes to Replace Arc Lamps with Incandescent Lamps for Street Lighting

Commissioner William Williams, of the Department of Water Supply, Gas and Electricity, New York City, is attempting to reduce the cost of street lighting by eliminating lamps where he considers them useless. He also proposes replacing the city's street arc lamps with gas-filled lamps if the test units which have been installed prove satisfactory as to the illumination produced and the expense of operating and maintaining. In this experiment the commissioner has received the assistance of the electric-service companies. About 500 nitrogen-filled lamps rated at 400, 500 and 750 watts have been installed on some of the principal thoroughfares in Manhattan for the purpose of comparing their illumination with that of the arc lamps which are now in general use.

For operating the test lamps the New York Edison Company has submitted the following tentative prices: 750-watt nitrogen-filled lamps at \$107 a year to replace flame-arc lamps now operated at \$120 per annum; 500-watt lamps at \$85 to replace arc lamps at \$90, and 400-watt lamps at \$77 to replace arc lamps at \$90 per annum. These prices have been based on the condition that a unit be renewed four times a year, but up to the present time tests have shown that more renewals will have to be made; therefore the unit prices will have to be raised. The tests will continue until the end of the year, when the results will probably be used in drawing up new specifications for bids for the 1915 street-lighting contracts.

One-year contracts are held with the electric-service companies, and if gas-filled lamps are adopted instead of arc lamps, these companies will be required to scrap the entire lot of lamps now in use. Some of these are only a year old, and as it was expected that gas-filled lamps would not be adopted until they had received more extensive tests for street-lighting service, the companies have not provided for the rapid amortization of the arc lamps, which are by no means obsolete as regards light distribution and color of illumination, nor are they relatively expensive to operate.

## C. L. EDGAR ON BOSTON LIGHTING RATES

### Seventy-five per Cent of Edison Company's Street-Lighting Investment Useless for Any Other Purpose

An interesting discussion of street-lighting rates was contributed by President Charles L. Edgar of the Edison Electric Illuminating Company of Boston, Mass., to the proceedings of the Boston City Council. Speaking of the desirability of the proposed ten-year agreement, Mr. Edgar said that it is founded upon the point that 75 per cent of the company's street-lighting investment applies to equipment which is of no use for other purposes. The Boston proper street-lighting investment of the Edison company is \$572 per arc lamp of the 6.6-amp magnetite type. Six per cent on a round \$600 gives the basic or fixed charge of \$36 per lamp a year in the company's regular rate schedule. The speaker thought that a year's notice in regard to a proposed termination of contract is fair to both city and company on account of the time needed to prepare for any change.

Answering an inquiry, Mr. Edgar said that the company would not admit for a moment that because it is doing business with the city it should not expect to obtain as good a return as from its so-called commercial customers. He contended that the determination of a reasonable price has nothing to do with the prices prevailing in other cities. Prices must be determined upon a self-contained basis. Although Boston is the company's largest street-lighting customer, Mr. Edgar said that size should have nothing to do with the price for such service. The price for one lamp is the same as the price for ten thousand because there is a common investment. Nearly \$3,000,000 is invested in street lighting in Boston proper. The poles have all been rebuilt in ten years because of the statute requiring wooden poles in Massachusetts; the arc lamps have to be rebuilt every six or seven years, and the ducts and conduits are the only parts of the equipment which are virtually indestructible. Boston pays \$500,000 for street lighting and from \$120,000 to \$150,000 for building lighting yearly.

The theory of rates in the State, as laid down by the Gas and Electric Light Commission, is that wholesale rates are not justified unless there is a reduction in the cost of supplying service. The lighting service is consumed by the city in 500 different buildings. The company's best customer from the standpoint of return is the Hood Rubber Company, of Watertown, which earns a rate of about 1.5 cents per kw-hr. The average price per kilowatt-hour received last year from city buildings was 7.4 cents, the energy consumption being 133,000 kw-hr. The two most favorable points of energy consumption on city service are the Northern Avenue bridge, where a rate of 2.83 cents is earned, and the Consumptives' Hospital, Dorchester, which earns 2.85 cents on account of long-hour service. Mr. Edgar said that there had been little decrease in the cost of operating arc lamps in the five years preceding the hearing.

Steam turbo-generators are more efficient from the labor and space standpoints than are reciprocating engines, but the former cost more initially.

## SAMUEL INSULL ON LIGHTING MONOPOLY

**He Discusses Causes Contributing to Greater Outputs and Lower Costs to Consumers of Electricity**

Mr. Samuel Insull, president of the Commonwealth Edison Company of Chicago, was the speaker at the first of the monthly meetings to be held this fall and winter at the Engineers' Club at Dayton, Ohio, on Oct. 6.

Mr. Insull's address on "Some of the Advantages of Monopoly in Connection with the Manufacture and Distribution of Electric Energy" was illustrated with exterior and interior views of some of the plants of the Commonwealth Edison Company, but mainly with charts which brought out very clearly the point he wished to make in his address, that monopolistic operation of central stations properly supervised and regulated by a commission in any territory was the proper one from an economic standpoint.

During his address Mr. Insull stated that the Commonwealth Edison Company generated 929,000,000 kw-hr. in 1913, and as every thousandth of a cent difference in the cost of production meant \$10,000 a year to his company, he drew attention to the importance of the utmost economy in production and distribution of energy where one organization, one system of management, one system of production and one system of distribution prevail.

Mr. Insull stated that monopoly in connection with any industry was an engineering question, a manufacturing question. It was a question of how to get the largest possible amount of earning capacity out of the dollars of wealth that this country possesses. He pointed out in a very striking and graphical manner that one of the chief reasons why the Commonwealth Edison Company has endeavored to secure all the available electric load within reach of its circuits is that by reason of diversity-factor the company is able to increase its load-factor greatly, which in turn enables it to decrease production cost, and this makes it possible from time to time to reduce rates.

At the close of his address, President F. M. Tait of the Dayton Power & Light Company thanked Mr. Insull, and through him the officers and men of his organization, for the help given by the experts of the Commonwealth Edison Company during the rehabilitation of the Dayton plant following the flood of March, 1913.

## NEW YORK A. I. E. E. MEETING

**Two Papers Dealing with the Uses and Limitations of Reactors Are Read and Discussed**

The regular monthly meeting of the American Institute of Electrical Engineers, held in New York on Oct. 9, was devoted to the presentation and discussion of two papers relating to the common subject of reactors for protecting alternating-current circuits.

### Effectiveness of Feeder and Busbar Reactors

The uses and limitations of feeder and busbar reactors were discussed in a paper on "Protective Reactances for Feeder Circuits of Large City Power Systems," by Messrs. James Lyman, Leslie L. Perry and A. M. Rossman. At times of light load with few generators running each is required to carry a very large por-

portion of any short-circuit current which may occur, whereas with more machines operating the current per generator would be lower. Curves were shown indicating that the kva in a short-circuit varies inversely as the feeder reactance is practically independent of the generator reactance and increases more rapidly per kva of station rating in large systems than in small ones. Where 12 per cent (of 25,000-kva) bus reactors and 3 per cent (of 5000-kva) feeder reactors are employed the equivalent kva in short-circuit under the worst conditions becomes practically constant with 125,000 kva in generating equipment. Any further increase in the station rating has no appreciable effect on the short-circuit kva. Where no busbar reactors are employed but 3 per cent feeder reactors are used the short-circuit kva increases with the generator rating until under the worst condition with infinite generator rating the kva delivered will be 167,000. Interpreted in another way the busbar voltage will be lowered during a short-circuit if busbar reactors are employed, while the other feeders will hardly be affected if only feeder reactors are used. Other curves were shown from which to approximate the short-circuit kva delivered to a fault on or near the busbars of a station or substation when busbar and feeder reactors are used and where several feeders are operated in parallel. When the ratio of the generator reactance and feeder reactance is one to three the short-circuit current will be practically maximum on any section if the generators on the same and adjacent sections are operating. With a ratio of one to one the maximum current will exist when five generators are running on sections symmetrically located with respect to the faulty section.

It was also pointed out that while feeder and busbar reactors are beneficial in minimizing short-circuit effects a fault in one of several feeders connected in parallel will usually trip the overload breakers in the other circuits.

### Reactors for Protecting Synchronous Converters

In a paper on the "Use of Reactance with Synchronous Converters," Mr. J. L. McK. Yardley discussed three conditions—where it is of prime importance to keep the lines energized at all times; where overloads are frequent but where the voltage must be allowed to drop off to protect apparatus, and where high momentary overloads are frequent but brief and comparatively frequent interruptions are not objectionable. In a system of the first character short-circuits are generally allowed to burn themselves free, but during this period the supply apparatus should be protected. It was suggested that since the alternating current delivered to a synchronous converter is always approximately proportional to the direct current produced, sudden increases in the instantaneous direct current can be prevented by inserting air-core or unsaturated reactance in the alternating-current leads. Some tests were described in which reactors were employed to limit the short-circuit current in a 280-volt, 1000-kw, two-phase, sixty-cycle commutating-pole booster generator. With 30 per cent reactance in the supply leads and two and two-fifths normal load on the converter, the direct-current voltage was reduced 50 per cent. Owing to the poor damper used and a shift in phase angle of the voltage impressed across the collector rings, marked hunting occurred at eighty alternations per minute when the load was first thrown on. Sparking occurred during hunting periods but was not so severe that the load could not have been increased or the reactance decreased.

In systems of the second class, such as a large or medium-sized interurban railway, the converters should be designed to allow a drop in voltage before the critical safe overload is reached. The excess load will then be



distributed among other converters elsewhere on the system. In small interurban systems or where brief interruptions are not objectionable reactors should be employed to introduce a time element in the rise of the current, which after attaining a predetermined value should be immediately interrupted by a quick-acting circuit-breaker. A short-circuit should be allowed to clear itself before the current has reached a value which the converter cannot safely commutate. Air-core reactors should be employed. A circuit-breaker designed especially for this service was described. Opening of the circuit-breaker is accelerated by a heavy spring and the momentum of the moving part is gradually absorbed by a dash-pot. The tripping device consists of a magnet coil in series with a condenser shunted across the supply circuit.

#### Discussion

The two papers were discussed simultaneously. Among those taking part in the discussion were Messrs. D. B. Rushmore, Schenectady, N. Y.; Philip Torchio, New York; Harold W. Buck, New York; J. J. Frank, Schenectady; N. W. Storer, Pittsburgh; H. Goodwin, Jr., Philadelphia; George T. Hanchett, New York; Carl J. Fechheimer, Ampere, N. J.; Selby Haar, New York, and A. S. McAllister, New York.

Mr. Rushmore called attention to the present-day recognition of the necessity for considering an electrical system as a whole rather than treating each part separately. Formerly the demand was for transformers of low reactance, while now special effort is made to render the reactance of transformers as high as possible. Mr. Torchio claimed that insulated rather than bare wire should be used in reactors. Mr. Buck stated that long-distance transmission lines possess inherently so much reactance and resistance that protective reactors are not needed so far as the delivery end of the line is concerned. Mr. Frank expressed the opinion that since it has no moving parts the reactor is the most satisfactory and reliable protective device thus far developed. Mr. Storer said that the protective reactor should be equipped with a quick-opening short-circuiting device to insert the reactor when the reactance is needed and keep it short-circuited at all other times.

### PHILADELPHIA MEETING, A. I. E. E.

#### Submarine Signaling, Electrical Equipment of Battleships and Hydroelectric Development by the United States Reclamation Service Are the Topics Considered

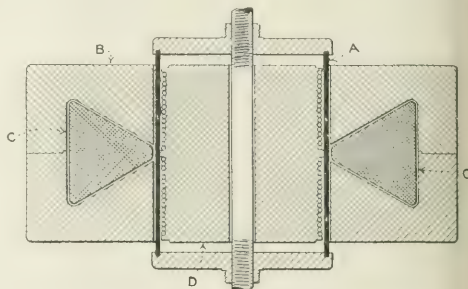
In opening the three hundredth meeting of the American Institute of Electrical Engineers, held at the University of Pennsylvania, Philadelphia, on Oct. 12, President Paul M. Lincoln called attention to the fact that the meeting marked the thirtieth anniversary of the first technical session of the Institute, which was also held in Philadelphia.

#### Oscillator for Submarine Signaling

In a paper by Mr. R. F. Blake, "Submarine Signaling," the Fessenden submarine oscillator was described. This apparatus can be used to take soundings, determine the proximity of icebergs and transmit or receive telephonic or telegraphic messages. The device is about 20.5 in. in diameter by 15 in. thick and weighs 850 lb. Its construction is shown in the cut. *B* is a ring-shaped electromagnet excited by coil *C*, which causes an intense flux to pass across the gaps and through the solid-iron core *D*. Sliding in the gap between core *D* and magnet *B* is a copper cylinder attached to end disks which are clamped together by a threaded steel rod also free to move longitudinally. In grooves on both ends of core *D*

are oppositely wound coils through which 500-cycle alternating current is allowed to flow, inducing large currents in the copper shell, which is thereby caused to jump to and fro at the same frequency. The rod at the ends of the copper end disks is fastened to a large diaphragm about 1 in. thick which is employed to impart the vibration to the water, the transmitting medium.

The operating current can be controlled by an ordinary telegraph key without excessive sparking at the contacts, as the circuit is practically non-inductive. By using one of these oscillators for sending and a microphone for receiving, it was reported that telegraphic messages have been sent 31 miles. If the oscillator is used as a receiver, much longer transmission becomes



FESSENDEN OSCILLATOR

possible. Telephonic communication can be carried on with water as the transmitting medium if the current and frequency in the oscillator circuit are controlled by a transmitter. With six dry cells and an ordinary transmitter in series with the oscillator it was declared that conversation could be carried on between stations more than 400 yd. apart. This apparatus can be employed to ascertain the proximity of icebergs by transmitting a signal and counting the time for the echo to return. The depth of water can be determined in a similar manner.

#### Discussion

The paper was discussed by Messrs. W. S. Franklin, South Bethlehem, Pa.; E. A. Sperry, Brooklyn, N. Y.; G. A. Hoadley, Swarthmore, Pa.; H. A. Hornor, Philadelphia; G. Breed, Philadelphia; J. B. Taylor, Schenectady; V. Karapetoff, Ithaca, N. Y., and H. J. W. Fay, Boston.

Mr. Sperry stated that the immense size of the diaphragm, which with the copper tube and attachments weighs over 100 lb., is dictated by the necessity of having it possess a natural vibratory period corresponding to 500 cycles per second, the frequency at which the oscillator is operated. Professor Karapetoff explained the action of the secondary alternating current in the copper tube upon the unidirectional flux produced in the core by direct current, and expressed great admiration for the ingenuity displayed in developing the oscillator to its present form.

In answer to questions by Messrs. Franklin, Hoadley, Hornor, Breed and Taylor, Mr. Day, who presented the paper for the author, stated that only one diaphragm of each oscillator acts upon the water. The amplitude of each oscillation of the diaphragm is about 0.01 in. Several signals may be sent and received simultaneously in the same neighborhood by using a different frequency for each message.

#### Extensive Electrical Applications on Shipboard

Electrical applications on the new Argentine super-dreadnaught *Moreno*, which has a more extensive elec-

trical equipment than any other ship built in this country, were described in a paper by Mr. H. A. Hornor entitled "Electrical Equipment of the Argentine Battleship *Moreno*." On board this ship are 3000 electric lamps, motors having an aggregate rating of 4000 hp and approximately 76 miles of cable. A noteworthy departure from American practice was made by using lead-covered, steel-armored conductors and 220-volt tungsten lamps. Electricity is employed for steering and operating the anchor windlass.

The generating equipment consists of four 375-kw turbo-generators, two installed forward and two aft on the lower platform deck below armor. For supply electricity in the harbor when fires are drawn there are two Diesel oil-engine-driven generators rated at 75 kw each. The main switchboards and distribution boards are also separated from each other but interconnected electrically so that destruction of one part of the ship will not interrupt the entire service.

Three methods of distribution are employed—running feeders direct to motor-starting panels, feeding branch distribution boards, and supplying energy through main feeders and branch circuits. The lighting feeders are divided into two classes, (1) general illumination under cruising conditions, (2) white light for battle purposes, and (3) blue light for battle purposes when operations must be concealed. Operated from balancer sets are twelve 110-volt, 43.3-in. projector lamps the relative positions of whose electrodes are controlled by motors. For signaling purposes each lamp is equipped with a shutter over its lens. On one of the lamps the shutter is controlled remotely by electricity.

The electric steering apparatus is used as an auxiliary to the steam steering engine, utilizing the same telemotor gear on a follow-up system. Forty seconds is required to shift the rudder from hardover to hardover with electricity. The anchor windlass is controlled semi-automatically; that is, the first three speeds are controlled by the master controller and beyond that automatic contactors are closed by current-limiting relays. Facilities for extensive signaling are provided, every precaution being taken to avert failure of operation by providing for the supply of energy from either of two separate stations. Roentgen-ray outfits for the sick wards and motion-picture machines for entertaining those on board are also installed, in addition to radio-communicating apparatus, an electric anemometer and wind vane, engine-revolution counters, a direction indicator, a gyroscopic compass, and pyrometers for measuring the temperature in smoke uptakes.

#### Discussion

Mr. Hornor's paper was discussed by Messrs. H. B. Hibbard, Milwaukee, Wis.; E. A. Sperry, Brooklyn; M. W. Day, Schenectady, N. Y.; G. A. Pierce, Jr., Philadelphia; C. S. McDowell, New York, and L. C. Porter, Harrison, N. J.

Mr. Day remarked that the electrical equipment of the ship followed German practice more largely than American. He indorsed the use of high voltage with motor-generator sets for producing constant current for the search-lanterns. Mr. Hibbard claimed that the use of asbestos board for switch panels instead of slate or metal is a step in the right direction. Mr. Pierce advocated the employment of alkaline storage batteries in each turret and throughout the ship in order to insure continuity of operation in case any part of the generating plant should be disabled.

Mr. Sperry demonstrated a model of a gyroscopic compass arranged to show a method recently developed for damping the pendulum action of the gyro. The point of support of a damping pendulum associated with the gyro is not stationary but is free to move in an arc

of a circle at a speed which is kept low by means of dash-pots.

Mr. Porter stated that the modern tungsten lamps designed for 220 volts are equally strong with lamps of the same construction designed for 110 volts, but the specific power consumption is somewhat higher and the life shorter.

#### Hydroelectric Development by Reclamation Service

The chief purpose in the development of electricity by the Reclamation Service, said Mr. F. H. Newell in a paper on "The United States Reclamation Service," is the production of inexpensive power for raising water to land which is too high to be irrigated by the gravity method. It was pointed out that the Reclamation Service has demonstrated that it is possible for the government to build and operate electric plants at a cost comparable to the outlay of corporations, but the Reclamation Service is relieved of certain obligations to its consumers which must be met by corporations. Including operating and maintenance expenses and overhead charges, energy has been developed in some hydroelectric stations at as low as 0.126 cent per kw-hr. The author pointed out, however, that it is not uncommon for hydroelectric equipment to cost as much as \$250 to \$300 per kw as compared with \$45, \$60, or at the most \$75 per kw for steam equipment. On the other hand, depreciation on the latter is higher than it is on the former.

In 1913 about 9225 hp in permanent pumping plants and numerous small drainage installations were served from the government plants, at a cost, including overhead charges and depreciation, of about 1 cent per acre-foot raised 1 ft. The lowest cost of 0.3 cent per acre-foot was for plants operating from the Minidoka station on the Snake River, Idaho. Energy generated by the Reclamation Service which is not supplied for irrigation purposes is sold as a by-product at about cost, sometimes as low as 0.5 cent for commercial purposes with a guaranteed annual consumption. The rates for heating vary widely, depending on the excess energy available. Electricity is able to compete with coal in some cases. Several tables were presented giving the equipment of plants operated by the Reclamation Service, rates offered for different purposes, and proposed and possible power which can be developed at these stations. Descriptions of the more important stations completed the paper.

#### Discussion

The paper was discussed by Messrs. G. A. Hoadley, Swarthmore, Pa.; P. M. Lincoln, Pittsburgh; Paul Spencer, Philadelphia; R. W. Pope, Elizabeth, N. J.; J. E. Kershner, Lancaster, Pa.; H. A. Hornor, Philadelphia; V. Karapetoff, Ithaca, N. Y.; Carl Hering, Philadelphia, and H. Goodwin, Jr., Philadelphia.

In commenting upon the low rate for electric heating to which President Lincoln had called attention, Dr. Hering said that extremely low rates can be offered for off-peak loads such as certain discontinuous electrochemical processes. Professor Karapetoff expressed the opinion that the results obtained by the United States Reclamation Service show that the government should own and operate public utilities. Mr. Hornor stated that a very large item in distribution cost is the continuous iron loss in transformers whether or not they are actually delivering load. Professor Hoadley, who read the paper for Mr. Newell, remarked that the value of irrigation to a community can easily be appreciated by any one who has seen the remarkable transformation that took place in southern California when unfruitful land was converted into orange groves by means of artificial irrigation. What has been done in California can be done elsewhere.



# Foreign and Domestic Trade Conditions

Changes and Opportunities Arising in the Commercial Outlook for Manufacturers as a Result of the European War

## FOREIGN TRADE MEETING IN NEW YORK

Merchants Told What to Do and What Not to Do in South America

Foreign trade was discussed at the lunch of the members' council of the Merchants' Association of New York at the Hotel Astor on Oct. 14. Nearly 1000 people were present. The speakers were Messrs. W. S. Kies, foreign trade department of the National City Bank of New York; John F. Fowler, vice-president W. R. Grace & Company, New York, and Charles M. Pepper, former foreign trade adviser of the Department of State.

Mr. Kies explained in detail the plans of the National City Bank for the opening of two branch banks in South America. The decision to open these branches, which was reached in June, before the commencement of the European war, was made possible by the new federal reserve law. Mr. Kies said that it is mainly through the assistance of German and British banks in South America that the trade of Germany and Great Britain with South American consumers has been built up to large proportions. It is well understood, he said, that a regular provision in the loan arrangements between those banks and South American borrowers is that the proceeds shall be spent with manufacturers in the countries which advance the funds. When the new banking act was passed many inquiries as to the possibilities of foreign business were received. As a result of these, 6000 letters were sent by the bank to exporters and importers, and the responses showed that American and manufacturing interests have suffered from lack of banking facilities in South America. Mr. Kies predicted that within a few years the development of trade with South America will lead to surprising and satisfactory results.

Mr. Fowler, whose company has had long and successful experience in foreign trade, said that there is no mystery about South American commerce, but that it requires care and means large and long responsibilities. Long before the European war was started there was general business distress in South American countries. Each South American country will have to learn, one by one and each in its own way, how to face the present problem and how to get on its feet again.

It cannot be expected that this country, under the conditions that have prevailed in the past, will take as large a share of South American trade as will Europe with its population of 450,000,000, comprising both producers and consumers. That population is to be compared with the 100,000,000 of this country, most of whom are pretty well contented with what they get at home. The new tariff law, however, is a sign that this country is prepared to buy more from the rest of the world than it has done before.

The present is an opportune time, Mr. Fowler said, but the prospects must be considered earnestly and sensibly, not hysterically. Much of what has been preached lacks common sense. It always has been European capital that stimulated South American countries. If capital from this country can be sent to the assistance of South American countries, it will help greatly to develop future trade. Referring to the frequent reproaches against exporters here on the score of niggardly credits, Mr. Grace said that the fact is that our exporters have been very liberal and much more so than they would be in home trade. Whether

he buys in Europe or here, the worthy South American trader gets about the same credit facilities. Wherever situated, it is the unworthy customer who howls the loudest when merchants refuse him dangerous terms.

In conclusion, Mr. Fowler mentioned some "don'ts," which briefly are as follows: Don't use second-hand packages. Don't use boxes carrying old ship marks. Don't advertise contents on the outside of packages. Don't forget that freight is frequently discharged on rough seas. Don't forget that the customer wants to receive goods on time. Don't forget to give good service with reasonable charges.

Mr. Pepper declared that South America is one of the great and growing markets of the world and should be studied in that attitude. He advised manufacturers to establish permanent exhibits of products in large South American centers. This country is reaching the period when a great many more manufacturers must have foreign markets.

## WAR OPENS NEW OUTLET FOR ENERGY

Mr. M. A. Viele Says that Appalachian Power Company Benefits from Increased Coal Demand

Mr. M. A. Viele, of Viele, Blackwell & Buck, in discussing business conditions with a representative of the *Electrical World*, spoke of the new business obtained recently by the Appalachian Power Company, of which he is vice-president.

The Appalachian Power Company began to deliver energy on Aug. 1, 1912. It has a large potential market in the southwestern part of Virginia and the adjoining section of West Virginia, and its organization has been engaged steadily in the development of business. In the last few weeks fifteen contracts have been closed with coal-mining companies. They had been pending for some time, and their final execution was made possible by the increased output of coal resulting from the new markets opened by the European war. The power company was not delivering energy to any of the coal-mining companies in this list on Sept. 1, but it will be delivering to all but one of them on Jan. 1, 1915. It is estimated by Mr. Viele that the gross revenue from these companies for the first year will be from \$55,000 to \$60,000, and that in 1916 it will be between \$85,000 and \$90,000. Total gross revenues of the company thus far in 1914 are about 15 per cent greater than in the corresponding period of the previous year.

The demand for coal which led the mining companies to close contracts for energy has come from South American and European centers. Part of it is from the Panama Canal ports, which the coal shippers in the Pocahontas district believe will become two of the principal coaling stations of the world.

The company is prepared to finance its construction requirements. Its securities were underwritten on a basis providing for completion of the construction necessary for the use of the entire estimated output. A construction program was arranged which covers the period to June 30, 1916. The capital provided for construction purposes has been divided into regular amounts, and these have been expended in accordance with the program. The company, however, is ready to hasten its work and open more developments if the market for energy warrants this change in plan.

## AS MANUFACTURERS SEE THE OUTLOOK

### Conditions of Business in Different Branches of the Electrical Industry

Manufacturers have written the *Electrical World* as follows in regard to business conditions:

#### Conditions for Good Business in South America

Mr. Kurt R. Sternberg, treasurer and general manager Dickinson Manufacturing Company, Springfield, Mass.: "The writer believes that if manufacturers of electrical apparatus will send to South America first-class salesmen who know the Spanish language, and if they will study carefully the conditions, a good business can be done. The writer visited Latin America this year and was particularly impressed when in Costa Rica by a conversation with the German consul in which this gentleman stated that the Americans do not get the trade because they do not study carefully enough the conditions under which they can do business. I then went to study some of these conditions, and found it to be the fact that we answer letters written in English in English instead of being polite enough to answer them in Spanish, and I further found that if the buyers in Latin America state that packing cases of certain sizes must be sent we send any kind of packing cases, thinking them good enough for that trade and not taking into consideration that the roads are poor and therefore packing in certain sizes of cases is absolutely necessary, as the moving power generally used is oxen and the wagons have to be packed 'just so,' in order to prevent the boxes from falling from the wagon and breaking. The people in Latin America are very polite and try to use English and feel it a slight if we are not just as polite and do not use Spanish when answering inquiries. The war has stopped some of the European countries like Germany and Austria-Hungary from sending goods to South America, and if we here are quick and alert and consider the advice given in this letter as somewhat important, we can get a large business in South America, and therefore may be indirectly benefited by the unfortunate war in Europe."

#### Too Early to Tell Results

Mr. Joseph S. Thompson, manager Pacific Electric Manufacturing Company, San Francisco, Cal.: "It is too early to describe the possible results on our business of the European war. It would seem as though there might, perhaps, be a South American demand, and it would seem as though the regular American vessels plying to the canal might be equal to coping with it. We do not depend on any European countries for raw materials, nor do we ship our product to any European countries. We expect in due time to pay our proportion of the cost of this European insanity."

#### Thinks Domestic Business Should Increase

Mr. William H. Taylor, assistant sales manager Diamond State Fibre Company, Bridgeport, Pa.: "The only way in which the export of our product could increase would be as the export trade of electrical manufacturers who use our products increases. Our export of raw material to Belgium, France, Germany and Russia has ceased. The South American business is quite negligible in quantity, and we do not think that during the next year there will be much increase in general exports which are manufactured from our product to Latin America, owing to the bad conditions in South American business and to the fact that South American countries are dependent on Europe for their banking and capital. Business in this country has been just about the same. We think it should increase considerably, owing to the fact that the large crops will meet

many of our obligations in Europe at the high prices which they will bring, and in time this must affect the manufacturing industry, owing to the increased purchasing power of the farmers. We have reduced our organization owing to the falling off of our export trade, which was almost a third of our general business. The raw material for vulcanized fiber is made from cotton-rag paper, and as over one-half of the rags are imported into this country, prices have gone up materially. If there shall be a severe winter in this country, it looks as if there might be an absolute scarcity of raw material. As our paper mill consumes over 250,000 lb. of rags a day, a large stock cannot be carried, and no substitutes could be introduced which would not noticeably increase our cost of production."

## ELECTRICAL NEWS IN FOREIGN PAPERS

### Information on Industrial Conditions Published in Recent English Journals

The British Electrical and Allied Manufacturers' Association has submitted to its members resolutions bearing on the proclamation of the government in regard to "trading with the enemy." Since earlier resolutions were drafted a supplementary letter has been issued by the association. It says that without attempting to define the legal effect of the proclamation of the government or the act of Parliament passed in support of it, the council of the association states "that the practical difference between companies which largely manufacture in England and those which are merely branches (whether incorporated in Great Britain or not) of concerns domiciled in an enemy country justifies the council in modifying, in favor of the former companies, the proposed resolutions and thus gives effect to the dominant feeling of members that this decision should govern their patriotic business policy."

The *Engineer*, of London, says that the war has shown the extent to which England has depended upon Austria and Germany for its supply of arc lamps and carbons. Before the war began there was only one firm in Great Britain regularly engaged in this business. That firm built its carbon factory twelve years ago and "owing to persistent price cutting on the part of foreign competitors it has had on its own acknowledgment to face a loss of over £70,000." Since the war commenced the demand on the English factory has been enormous. In less than a week the firm could have sold, if it had been prepared to meet the sudden demand, a full year's output.

A recent issue of the *Electrical Review*, London, gives the total value of British export trade in electrical goods in August as £238,621, compared with £564,291 in July. The principal markets for the August electrical exports were: Canada and Newfoundland, £14,960; Argentina, £37,269; India, £40,215; Victoria, £13,778; New South Wales, £14,155, and New Zealand and Fiji Islands, £11,309. The United States, Philippines and Cuba received £1,476 from Great Britain during August, and Germany received £5,768. The principal item of export was machinery, which had a value of £86,789 or, roughly, 37 per cent of the total. The registered electrical imports into Great Britain amounted to £86,734, having fallen from £291,244 in July. The principal countries supplying this trade were the United States, £39,426, and Germany, £24,953. The corresponding German figure in July was £168,000. The principal item of import was machinery. It was valued at £29,152, or, roughly, 34 per cent of the total. During the month the British re-exports amounted to £10,001.



## PUBLIC SERVICE COMMISSION NEWS

## California Commission

The Railroad Commission has issued a supplemental order authorizing the Midland Counties Public Service Corporation to renew a note of \$10,000 at a rate of interest not to exceed 8 per cent per annum.

The commission has rendered a decision authorizing the Pacific Light & Power Corporation to issue 19,430 shares of first preferred 6 per cent cumulative stock at not less than 85, and \$4,382,000 of first and refunding mortgage bonds at not less than 85 and interest, with the provision that the bond issue shall be made subsequent to the stock issue.

## Maryland Commission

Mr. Osborne I. Yellott, people's counsel to the Public Service Commission, is preparing forms providing for inventories and appraisals of the property of public utilities.

## New York Commissions

The question of rates of the New York Edison Company and the United Electric Light & Power Company is before the New York Public Service Commission, First District. At the regular meeting of the commission on Oct. 6 the New York Edison Company asked for an extension of time in which to file briefs. An extension of two weeks was given by the commission.

Commissioner Milo R. Maltbie has held hearings in regard to the prevailing rates of the two companies and is prepared to make a report on the subject.

All cases pending since before the present personnel of the New York Public Service Commission of the Second District assumed office have now been assigned for determination, and current cases are disposed of, in addition, as rapidly as may be. During the last month fifty-nine new formal cases were filed with the commission, but as final orders were issued in sixty-six cases the pending total has been reduced from 287 to 280. This makes a total of 363 new cases filed since March 16 of this year, and a total of 473 finally disposed of, reducing the number of cases pending from 390 on March 16 to 280 on Oct. 1. The disposition of informal complaints has kept pace with those of formal character.

## Ohio Commission

The Union Gas & Electric Company of Cincinnati asked on Sept. 23 for an extension of six months in the time for completion and filing of its inventory and appraisal. The commission, however, refused this request and instead granted the company two months' additional time. The expense of making the inventory and appraisal, representatives of the company told the commission, is \$4,000 per month and about 90 per cent of the work is completed, but the depreciation, appreciation, salvage and reproduction cost data are yet to be made up. The company was told that engineers representing the commission were far ahead of the work of the company's men, that they had found items not included in the company's lists and that they had collected data for depreciation as they went along, thus saving much time.

Mr. Paul Martin, of Springfield, conferred with the commission on the question of fixing a minimum rate for service by the Springfield Gas Company. Patrons have objected to this and urge that the bills be made for the exact amount used. In his argument Mr. Martin stated that the Springfield Light, Heat & Power Company has been allowed to fix a minimum payment and that the city of Springfield follows this policy in water service.

## Current News Notes

**INSPECTION SERVICE FOR CANTON, OHIO.**—More stringent wiring regulations than have heretofore been in force in Canton, Ohio, are to be incorporated in the new building code of the city, according to the Mayor, the lack of such regulations having resulted in criticism from fire-prevention experts. The new code provides for a city building inspector, who will have supervision over the city's electrical department.

\* \* \*

**PERMANENT JOVIAN QUARTERS IN CLEVELAND.**—Members of the Electrical League of Cleveland, Jovian Chapter, have completed plans for securing four commodious rooms in the Hollenden Hotel, Cleveland, to be given over to the exclusive use of Jovians. It is expected that the problem of financing the permanent club will be met by funds derived from the sale of exhibit and advertising space in the club rooms and by fees from the sale of non-resident memberships at \$10 each. To create further interest in the league an electric-vehicle section, a contractors' section and an advertising men's section have been formed.

\* \* \*

## SOCIETY MEETINGS

**CONFERENCE OF OHIO METER MEN.**—A conference of members of the Ohio Electric Light Association interested in meters and meter practice will be held at Dayton, Ohio, Oct. 23. Representatives of all Ohio companies are invited to be present.

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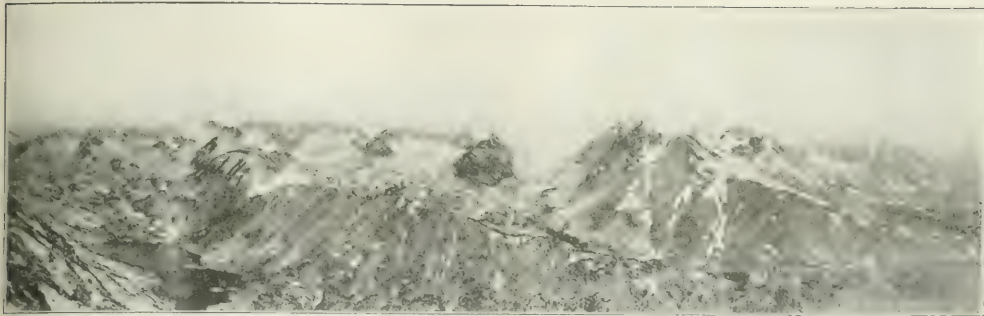
**ELECTRICAL MANUFACTURERS' CLUB.**—The next meeting of the Electrical Manufacturers' Club is scheduled for Hot Springs, Va., Wednesday, Nov. 4, the sessions continuing until Sunday, Nov. 8. No program has yet been arranged. Mr. S. O. Richardson, Jr., Libby Glass Company, Toledo, Ohio, is president of the club.

\* \* \*

**PUBLICITY A CURE TO CENTRAL STATION ILLS.**—Speaking before the Duquesne Light Section of the National Electric Light Association in Pittsburgh recently, Professor Knowles said: "The death struggle of competition, instead of bettering service to the public, only prevents better conditions and puts added burdens on the shoulders of the consumer. Corporations to-day realize that public opinion is but the combined opinion of individuals, and they are therefore straining every effort to put their case before the public as a jury which will give final judgment on the matter. Publicity is the keynote of modern business, and in this lies the opportunity for a better understanding between the corporation and the public."

\* \* \*

**ELECTRICITY IN WARFARE.**—The New York Electrical Society held its Oct. 9 meeting at the Electrical Exposition in the Grand Central Palace, New York City. An unusually large number of persons were present to hear Capt. Samuel S. Robison's lecture on "Electricity in War." Starting with the Civil War, when electric signaling was used for the first time on the battlefield, he reviewed the extensive applications which have since been made of electricity in this country and abroad. Before the meeting a dinner was given at the Engineers Club in honor of Captain Robison and Lieutenant McDowell, of the Brooklyn Navy Yard, by Mr. Frank W. Smith, one of the directors of the exposition. The lamp committee of the National Electric Light Association, which had been in session during the afternoon preceding the meetings, attended the lecture in a body. After the lecture, an inspection was made of the comprehensive exhibit made by the army and navy.



WATERSHED AND RESERVOIRS OF BISHOP CREEK DEVELOPMENTS IN SNOW-CAPPED SIERRAS

## Hydroelectric Development on Bishop Creek, Cal.—I

**Complete utilization of water for power and irrigation purposes—  
Electricity from seven stations in tandem transmitted over 400  
miles—Lines designed for 140,000 volts. By C. O. Poole**

**A**N excellent example of conservation is found in the hydroelectric development of the Nevada-California Power Company and the Southern Sierras Power Company on Bishop Creek, Inyo County, Cal. This work was begun in a modest way in 1904, following the discovery of gold in the Goldfield-Tonopah mining districts, with an investment of approximately \$300,000, and involved the erection of a reservoir and generating station with transmission lines complete in their day but small compared with the present system. The installation served its purpose of providing the cheapest possible electricity for those and contiguous Nevada mining districts. With the development of the mines and mills, however, the demand for electricity rapidly increased, and the company kept pace with developments, adding to its generating equipment at all points.

In the year 1911 the Southern Sierras Power Com-

pany was organized for the purpose of reaching out into the rich agricultural territory of southern California, supplying electricity for pumping water for irrigation and thus providing a heavier demand for electricity during the irrigation season, which is also the flood-water season of Bishop Creek and the time of heavy demand for water from the creek for irrigation ditches. Thus another link was connected in the chain of complete conservation.

The system now reaches and serves, besides the mines of southern Nevada, a variety of interests in California, such as the soda works on Owens Lake, the gold mines of the Randsburg district, cement works and other industries on the way south as well as the agricultural operation in Riverside, San Bernardino and Imperial Counties, where the energy developed on Bishop Creek is used and even transmitted across the Mexican border. From the initial investment of some \$300,000 the



FIG. 1—MIDDLE FORK DAM SITE DURING CONSTRUCTION



enterprise has grown to a property investment in excess of \$10,000,000, and the growth of the business seems yet in its infancy. At this time, besides the lighting load, the combined system supplies electrical energy to motors of an aggregate rating of over 35,000 hp distributed as follows:

	Hp
Mines and mills .....	18,800
Industrial load .....	7,100
Irrigation load (14,000 acres) .....	9,200
Total .....	35,400

What might be considered a good example of the complete development of a mountain stream for hydroelectric purposes is described in some detail in what follows. The full development of Bishop Creek will yield an equated flow of approximately 126 cu. ft. per second. The water is taken directly from the storage reservoirs at an elevation of 9700 ft. by means of pipes, the head

the drainage area of the North Fork and of the Middle Fork is shown, the South Fork of the stream being to the left of the picture. The system of generating stations upon this stream is owned jointly by the Nevada-California Power Company and the Southern Sierras Power Company, the latter company being a subsidiary company to the former. The development on the stream is described as of one system.

There are three principal reservoir sites on the stream—one on the North Fork, at an elevation of 9300 ft., one on the Middle Fork at an elevation of 9100 ft., and one on the South Fork at a 9700-ft. elevation. The last two sites have been partly developed, provision having been made for increasing the height of the dams at some future time.

The site on North Fork has been prepared for the erection of the dam and the preliminary work done. This dam when completed will impound 6000 acre-ft. of water, at a height of 75 ft. The drainage area above

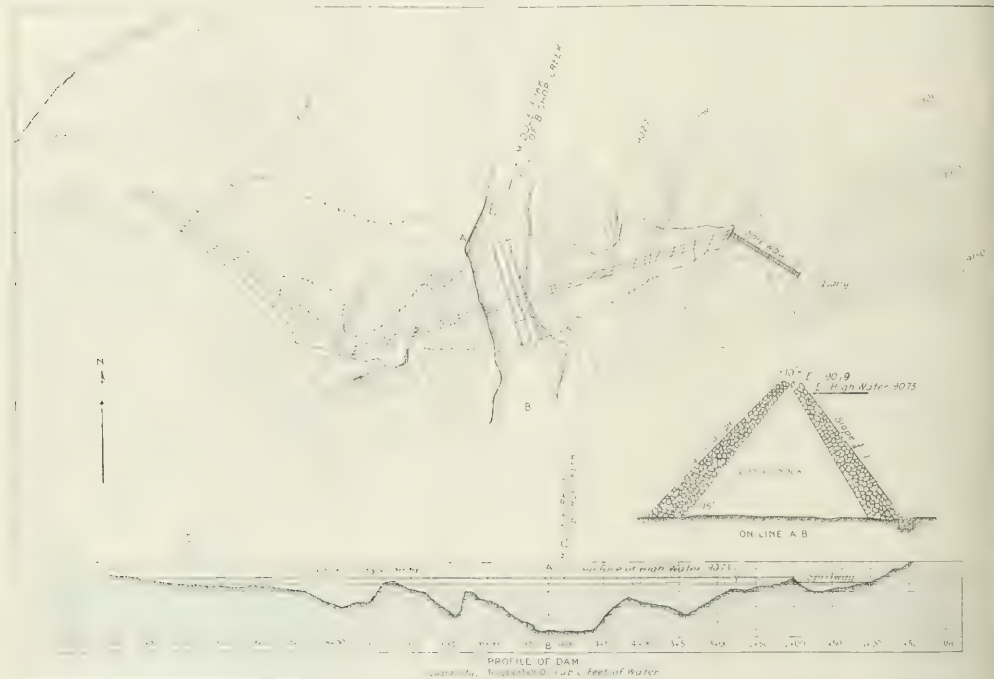


FIG. 2—PLAN OF DAM ON MIDDLE FORK OF BISHOP CREEK

of the water in the reservoirs being also utilized, and passed through seven stations in tandem. For a distance of 15 miles the water is virtually taken away from the stream bed, and in that distance it drops through an effective head of 4200 ft., developing an aggregate of 32,000 kw. After passing through the stations all the water is used for irrigation purposes. The electricity developed is distributed to valleys and towns situated at far-distant points and over high mountain ranges by means of transmission lines more than 1200 miles in extent, and to a distance in one case of more than 400 miles, where it is used for pumping water for irrigating large orange groves.

The illustration at the top of page 757 shows a part of the watershed of Bishop Creek, Inyo County, Cal., on the eastern slopes of the Sierra Nevada Mountains, about opposite Santa Cruz on the coast line. Part of

the dam is 10 sq. miles, with elevations ranging from 9300 ft. to nearly 14,000 ft.

The watershed above the reservoir on the Middle Fork is 15 sq. miles, and the area above the South Fork dam in 13 sq. miles. The reason for placing the dams at these extreme elevations lies in the natural sites found at these particular points. The sites are all natural lakes formed by glacial action, the basins being ground out of solid granite to a depth of over 200 ft., leaving only narrow canyons cut through the granite formation.

Fig. 1 is a view of the Middle Fork dam site during construction. Fig. 2 is a profile and plan of the same site. The type of dam erected was chosen because good granite quarries were capable of being developed close at hand, and because cement and other building materials were excessively high, cement costing \$8 per

barrel laid down at the site. The dam is, therefore, a loose rock fill with timber face, the slope on the water side being 0.75 to 1 and the slope on the down-stream side 1.125 to 1. It contains 50,000 cu. yd. of random-size rock and 400,000 ft. (board measure) of timber and lumber. The water seal was made by blasting a trench in the bedrock foundation from 3 ft. to 4 ft. deep and of about the same width. In this trench the ends of the facing timbers (trees from 14 in. to 18 in. in diameter, hewn flat on one face) were placed 6 ft. apart and the timbers slanted back to the proper angle to form the upstream face of the dam. Three courses of 4-in. by 12-in. pine planks were then spiked onto the bot-

6 ft. on the slope of the timbers and extending back into the rock fill 6 ft. The bolts had eyes in their ends through which a piece of 8-lb. T-rail 4 ft. long was passed at right angles. These rails and bolts were firmly embedded in the rock fill, forming a secure anchorage for the facing timbers. Three courses of 4-in. planking were used for the face for one-fourth the distance from the bottom up, then two 4-in. and one 3-in. plank for the next one-fourth distance, then three 3-in. planks for the next one-fourth distance, then one course of 3-in. planks and one course of 2-in. planks to finish. In each case the outer course was calked with oakum. Three 24-in.-diameter  $\frac{3}{8}$ -in. steel draw-off



FIG. 3—UPSTREAM FACE OF DAM AFTER TWO YEARS' SERVICE

tom of these facing timbers, the planks breaking joints with one another vertically and the bottom course breaking joints on the facing timbers. The rock trench was then filled with a one-two-four concrete mixture, the concrete being carefully tamped around the timbers and facing planks. Rock was then hand-placed back of the plank facing, with the main fill backing it up, after the first few courses of facing planks were in place. The first 6 ft. or 8 ft. of the rock fill from the upstream side of the facing timber was hand-placed, flush with the facing timbers, a straight edge being used to bring the rock facing true with the timbers. When the planking was put on, therefore, it had a firm, even bed to rest upon, the facing timbers being fully embedded in the rock fill and secured therein by 1-in. bolts passing through the facing timbers every



FIG. 4—METHOD OF CONCRETING TOE IN HILLSIDE RESERVOIR

pipes were placed in the lowest part of the dam directly on bedrock and on the same level, spaced 15 ft. apart and extending clear through the rock fill. The pipes were protected from the crushing weight of the rock fill by heavy concrete arches. The upstream end of each pipe extends into a concrete screen box, and the downstream end is provided with a 24-in. cast-iron-gear gate valve. There is a rubble concrete spillway on one of the extreme ends of the dam, having a width of 40 ft. and a depth of 6 ft. The wasted water is carried away from the main fill and enters the stream several hundred feet below the dam. The dam cost \$235,000, or \$33 per acre-foot, the unit price being as given on page 760. The cost of equipment was \$20,000.

Fig. 3 is a view of the upstream face of the dam, after two years' service.



## Hillside Reservoir

The dam of the Hillside reservoir, situated on the South Fork of Bishop Creek, like the one first described, is of the rock-fill type, the length of the dam being 650 ft. and the height in the main fill 85 ft. Fig. 5 is a profile plan and cross-section of the dam. The fill contains 87,000 cu. yd. of random-size granite, varying in size from spawls to boulders of 3 cu. yd. The upstream face has a slope of 0.75 to 1 and the downstream side one of 1.25 to 1. The storage capacity of this reservoir, including the water obtained by tapping the lake with a tunnel (which will be described later), is 14,000 acre-ft. The footings for the water seal of this dam were obtained in the same manner as those on the

## UNIT PRICES IN CONSTRUCTION OF DAM

Excavating rock, per cubic yard in trench.....	\$2.50
Excavating earth below water, per cubic yard.....	1.00
Excavating earth above water, per cubic yard.....	0.50
Concrete in trench, per cubic yard.....	20.00
Rubble concrete, per cubic yard.....	12.50
Rock fill in place, per cubic yard.....	1.50
Placing pipes, etc., per foot.....	1.00
Lumber, per 1000 ft. delivered.....	50.00
Placing lumber, per 1000 ft.....	12.50
Facing timbers, per lineal foot.....	0.30
Placing facing timbers, per lineal foot.....	0.20

placed flush with the outer face of the facing timbers, thus furnishing a firm backing for the plank facing.



FIG. 5—PLAN OF DAM ON SOUTH FORK OF BISHOP CREEK

Middle Fork dam—by blasting a trench in the solid granite bedrock, from 3 ft. to 4 ft. deep by 4 ft. wide, and embedding the facing timbers and planking therein with a strong mixture of concrete. Fig. 4 shows the method of concreting the toe in, the timber facing at the bottom consisting of two layers of 4-in. plank and one layer of 3-in. plank. The second course of planking was calked with oakum and then covered with a heavy sail cloth, which was in turn covered with hot pitch. The third course of planking was then spiked on over the sail cloth.

Fig. 6 is a view of the face showing the planking and sail cloth being placed in position. For the first 10 ft. next to the plank facing the rock fill was carefully hand-

Fig. 7 gives a good idea of the facing timbers and the hand-placed walls, and also shows the method of breaking joints on the facing timbers with the planking. Fig. 8 is a view of the completed dam. There are two 24-in. steel outlet pipes placed through the main fill of the dam. These pipes are partly in a rock trench and partly covered with heavy concrete arches to protect them from crushing. The inlet to one of the pipes is situated at the toe of the dam in the low point, and the inlet of the other pipe is carried through a rock tunnel 200 ft. into the lake, thus lessening the chance of both outlets becoming clogged with debris at the same time. Both inlets are protected by heavy steel grizzlies. The draw-off valves are placed at the heel of the dam and

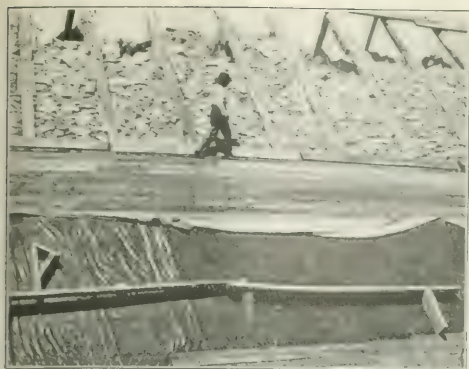


FIG. 6—PLANKING AND SAIL CLOTH BEING PLACED ON FACE OF DAM

protected by a heavy concrete gatehouse which is packed to prevent the pipes from freezing. It is the practice, however, to allow about 0.5 second-ft. of water to flow through these pipes in cold weather to prevent freezing. The quantity of lumber used in the dam was 400,000 ft.

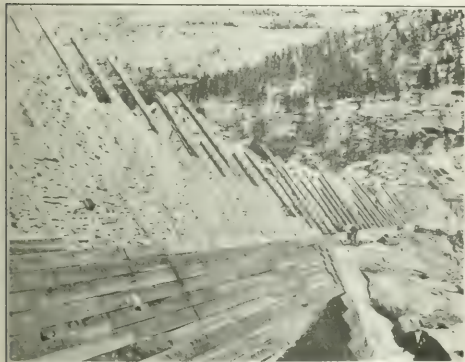


FIG. 7—METHOD OF BREAKING JOINTS ON FACING TIMBERS

(board measure), and 17,000 lineal ft. of facing timbers were required. There was a very good forest of lodge pole and yellow pine near by, and a sawmill was installed to cut the lumber required for the dam and the camp buildings. The lumber cost, including stumpage, cut-



FIG. 8—HILLSIDE DAM COMPLETED

ting, hauling, etc., \$34 per 1000 ft. (board measure) and the facing timbers, 20 cents per lineal foot. The unit costs were as follows:

Routes, camps and equipment.....	\$50,000.00
Excavating rock trench, per cubic yard.....	2.50
Excavating loose rock, per cubic yard.....	1.00
Excavating earth, per cubic yard.....	0.50
Concrete, per cubic yard.....	20.00
Rock fill, per cubic yard.....	1.50
Laying outlet pipes, per lineal foot.....	1.00
Facing timbers, per lineal foot in place.....	0.40
Lumber in place, per 1000 feet (board measure).....	50.00
Sail cloth, per square yard, in place.....	0.70

The spillway of the dam was blasted out of solid granite at one end of the dam and the rock used in the main fill. The spillway is 50 ft. in width, the wasted water, as at the Middle Fork dam, being led around to the creek bed several hundred feet below the dam. The principal quarry for the fill of this dam was an exceptionally good one, the granite being in horizontal strata and the powder in every case doing splendid work. Air drills were used to depths of from 10 ft. to 14 ft. A great deal of the quarrying was done by springing natural seams with giant powder and using Judson for throwing out. The plugging was done with hand air drills. Wages were as follows:

Common labor, per nine-hour day.....	\$2.75
Rock men.....	3.50
Powder men.....	4.00
Donkey engineers.....	4.50
Carpenters.....	4.50
Foremen.....	5.00
Blacksmiths.....	4.50

The rock was handled by steam derricks and skip dump cars hauled by tail ropes. The construction work was commenced in the spring of 1909 and finished in 1910—about fourteen months' working time, the working seasons being of very short duration there on account of the great elevation.

### Determination of Radium

Before the American Electrochemical Society convention held at Niagara Falls this month Prof. Herman Schlundt, of the University of Missouri, described some experiments on the quantitative determinations of radium from which the following conclusions were derived:

The solution method—that is, fusion with mixed carbonates, followed by solution and boiling—gave results that are only from 70 to 80 per cent of the values obtained by the fusion method with mixed carbonates. Fusion with mixed carbonates appears to be superior to fusion with potassium acid sulphate, although with carnotite concentrate a slightly higher value was obtained with the sulphate. Fusion with borax probably gives low values as a result of the retention of some of the emanation in the melt. At the temperatures attained in the author's experiments the evolution of gas and its flow through the melt is necessary for complete release of the emanation.

High emanating power in the cold indicates a large release of emanation by heating. A complete separation of the emanation from uraninite is obtained by solution in nitric acid and by fusion with some of the ordinary fluxes. As the result of conflicting views in the discussion which followed the paper, Mr. Mott claiming that uranium is very dangerously poisonous, and Mr. Bleecker maintaining, from years of work with uranium on a large scale, that it is not, a committee was appointed with instructions to get at the facts in the matter.



## Off-Peak Loads and the Electric Furnace

A discussion of the economies relating to heating with off-peak energy and consideration of the various forms of furnaces used in melting metals. By Woolsey McA. Johnson

**I**N discussing the question of "off-peak" loads and the electric furnace it is well to consider two popular views relating thereto, in order to discover the truth that lies between these radically opposite habits of thought.

The first view is held by the enthusiast with an imagination-reflecting gleam in his eye, who states: "This is the wonderful age of electricity. Electricity can, will and shall do everything—smelt ores, refine metals and melt and work all our metals."

The second popular view is held by the careful, cautious man whose judgment is so cold that it paralyzes his imagination. Making a quick mental calculation of cost of heat as given out by a 50-watt lamp, which costs him 3 cents an evening to run in his study, and of the cost of heat from coal of his grate fire, he says: "Electricity costs too much to use for heat."

Within limits, both views are sound. By analyzing them it is possible to bring forward such elements and such facts as are needed for drawing proper conclusions.

For practical purposes the cautious view has much on its side. "Off-peak energy," as sold by steam-operated central stations, can be purchased for from 4 mills to 12 mills per kw-hr. metered, with limits of load of from 50 kw to 1000 kw, depending on the amount used and on local conditions. This corresponds to energy at rates of \$27 and \$81 per electrical hp-year, or \$27 to \$81 for 22,294,000 heat units. Now, a short ton of coal of calorific value of 11,147 heat units per pound has exactly the same number of heat units in it as has an electrical hp-year. Coal used in this country has an average heating value of 13,000 heat units per lb., but, allowing for moisture and loss in handling, the thermal value of a short ton of coal and of a hp-year is about the same, or so nearly the same that in making comparisons they can safely be regarded as the same.

### The Cost of the Electricity for Heating

One is amazed, then, at the thought that a ton of coal costs in the United States from \$1 to \$10, with an average price at manufacturing points of, say, \$2, while electrical energy of equal heating value costs from \$27 to \$81. The cost of the electric calorific seems to be prohibitive. But, of course, the solution of the problem is found in the relation of the two commercial efficiencies.

What will the electrical calorific do and what will the coal calorific do industrially? That is the point. Electrical energy is an expensive heating agent at best, as in Norway, where an electrical hp-year sells for \$7, its cost about equals what the coal dealer would charge the domestic consumer for a short ton of egg anthracite.

Scientifically a calorie is a definite amount of thermal energy. Practically a calorie generated by electrical energy is different from and much more efficient than the "carbon calorie" generated by the combustion of coal. The "carbon calorie" implies that from ten to fifty others escape into the air, absolutely wasted. The "electric calorie" is not accompanied by more than one wasted calorie, lost in radiation. In other words, the

thermal efficiency of electric heat can be enough higher to make up for its greater cost. The industrial advantage of electrical heat in other ways, as by saving of metal, by using cheaper raw material and by making higher grade product, gives an added commercial difference of potential or commercial electromotive force, so to speak. Such is the crux of the commercial economics of the electric furnace.

The usefulness of electricity as a heating agent can best be exemplified by considering the advantages of the electric furnace in one concrete instance, that is, in melting brass. Brass is largely melted in crucibles placed in pot furnaces, generally using anthracite as fuel. In large rolling mills the cost of melting is about ½ cent per lb. without charge for metallic losses, which amount to from 1.5 to 3 per cent, an extremely small amount considering the nature of the work. The labor amounts to something like four-fifths of a man per day per ton of hot metal. The crucibles cost from \$2 to \$4 apiece, last for from twenty-five to forty-five heats, and melt from 2.5 tons to 7.5 tons of metal before giving out. Every now and then a crucible of metal breaks, and \$25 is lost in the ashes. The coal used is large anthracite, amounting to from 30 to 70 per cent of the weight of the hot metal.

In brass foundries doing a jobbing business or working on plumbers' supplies the cost is somewhat higher and the losses are considerably higher, exceeding 5 per cent in many cases. I do not believe that one out of ten of the average brass founders knows what his furnace loss is. His success comes from his ability to mold and cast a high percentage of perfect castings. And if he pays less attention to his core makers and molders and more to his furnace men he will lose.

### Advantages of Electric Brass Furnace

A practical electric brass furnace would possess the following advantages: (1) It would melt in large units; (2) being inclosed, there would be no loss of copper and little of zinc; (3) the heat borne by the men would not be excessive; (4) there would be no loss by crucible breakage; (5) there would be no cost for crucibles. Theoretically, 150 kw-hr. would melt a ton of yellow brass, and if the ingots were warmed to 500 deg. C. in an open-flame coal-fired furnace the quantity of energy would amount to 75 kw-hr. Both of these quantities are net thermal requirements. Suppose the thermal efficiency of the furnace is 75 per cent and it requires 50 kw-hr. to keep the metal hot at the pouring temperature, then the total energy for the time required would be 200 kw-hr. Allowing 10 per cent loss in transformers, busbars and cables, 220 kw-hr. would be required per ton of hot metal, which at 8 mills practically equals the cost of coal.

Assuming the right kind of a furnace, the incidental advantages would be enormous. Materials to make yellow brass are from 2 cents to 8 cents per lb. cheaper than materials to make "composition," "red metal" or "navy bronze," according to the grade of the latter. Yellow brass castings fail usually and are disliked because of the oxide dissolved in or held in suspension in

the metal. With an inclosed electric furnace the atmosphere would be reducing, and copper, tin and zinc oxides could not exist. I give it as my opinion that most of the weak castings, sluggish metal and blow-holes are caused by dissolved zinc-oxide. Hence yellow brass, which costs less, could replace "composition metal" for many purposes. Moreover, chips and skeleton brass, a cheap source of raw material, could be melted down without loss. The physical condition of hot metal is more important than the chemical composition, and, with freedom from gases, the metal could be easily "dead-killed" in an electric furnace plant.

#### Brass Melting

The "commercial potential" of advantage that an electric furnace method has in the case of brass melting can be seen by contrasting the thermal efficiency of from 2 to 4 per cent, in the case of a coal-fired brass furnace, with 75 per cent, which should be attainable in an electric brass furnace. Moreover, the electric furnace could be installed in places where coal-fired furnaces could not be placed. Unfortunately, there is at present no electric brass furnace combining all the good features possible that can be termed, in a broad way, a demonstrated success with a design of a practical nature. Reports have come to me of a favorable nature of work done by a Hering furnace at the plant of the National Cash Register Company, Dayton, Ohio. A Hering furnace is also being tried at a large brass mill at Waterbury, Conn. One has been used for some years at the plant of the Ajax Metal Company, Philadelphia. Dr. Carl Hering, inventor of the Hering furnace, states that he has melted brass for 250 kw-hr. per ton of hot metal.

Another type of brass furnace is in use in connection with a manufacturing plant. Undoubtedly some day they will be introduced rapidly, for in melting brass by electrical energy "the heat can be put inside directly where it is needed." The thermal efficiency is therefore high, and the quality of the product should be superior. Other metals can be economically melted by electrical energy, as for instance silver and gold in local refineries, jewelry manufactories or cyaniding mills near the mines in the West. It is noteworthy, however, that none of these furnaces has been tested severely. Let us consider a recent incident. A young inventor had worked out a good design for a long-known and tested scheme in a silver plant in the East. Through faulty design there was a "break-out" in the bottom of the furnace, and a ton of silver worth \$15,000 ran out on the floor. The proposal had merit, and if proper precautions had been taken and the factors of safety had been ample, commercial success might have been reached.

#### Iron Melting

Besides the chance for melting brass, german-silver, "composition" silver and gold in the electric furnace, there is a decided opportunity for electricity in melting cast-iron turnings, steel turnings, chips, etc.; also skeleton brass and chips in a scrap-refining plant. The raw material could be gathered and the product marketed locally, thus saving freight cost in two ways. In the case of steel, this raw material of a light nature sells for the lowest figure, at from 15 to 35 cents per 100 lb. Probably the surest way to commercial success would be for half a dozen large manufacturers to club together, pool their steel scrap, melt it and refine it electrically, add nickel, chrome and tungsten in the proportions needed for high-speed-tool steel, and take proportionately, at a fixed price, from this operation the high-speed-tool steel needed for their manufacturing plants. Unquestionably in such a manner the high-speed-tool steel could be made and sold at a profit for

35 cents per lb., as three or four lines of "overhead" expenses and profits could be eliminated.

One might even imagine that galvanized-sheet scrap or old tin cans could be smelted and the zinc volatilized and saved as a fume, producing tin and the finest kind of steel ingots. Such an operation if conducted in a continuous furnace in a large way might be extremely profitable. The gross value of the tin or zinc per ton of scrap equals \$1.10, or 100 kw-hr. at 11 mills.

#### Melting Heavy Steel Scrap

Concerning the question of melting electrically heavy steel scrap, such as ends of beams, angles and bars and "fins" from drop-forging plants, one can talk with confidence of immediate commercial success. For making tonnage steel, such as rails, and billets for wire-drawing and for steel castings, the electric furnace—as, for example, the Heroult or the Girod furnace—is a "finished invention" and has reached a "temporary ultimate." By this I mean that, given ordinary business acumen and sagacity, a man can select right subordinates, operate at a handsome profit and defy competition in the production of fine and small steel castings, which are now made either in a crucible or in a "baby" Bessemer side-blown converter. It is safe to say that the cost of hot metal by the crucible process is from \$40 to \$60 per ton, and by the "baby" Bessemer process from \$28 to \$34 per ton. This latter process requires high-silicon, low-phosphorus pig containing only 95 per cent of iron, costing from \$18 to \$20 per ton. There is much loss in converting, since the slags carry off considerable iron. Besides, the material must first be melted in a cupola furnace. Good melting steel scrap can be purchased normally in the East for from \$8 to \$14 per short ton, depending on the distance from a steel furnace plant. In the far West it often sells for less. In an arc furnace 800 kw-hr. at 8 mills and 30 lb. of electrodes at 5 cents will turn this scrap into the "most beautiful" hot metal that a foundryman can desire.

Under the above conditions energy and electrodes cost \$7.90. Allowing for labor, repairs and renewals, interest and depreciation, the sum of from \$4 to \$8 per short ton, the total minimum cost is from \$21.90 to \$29.90 per short ton. Moreover—what, in my judgment, is an important side factor for innate metallurgical reasons which need not be here discussed—a higher percentage of good castings can be obtained from the electric furnace than from the "baby" Bessemer, other things being equal. There are few lines of work that offer better chance for profit and less risk than electric steel casting. The certainty of this can be ascertained by investigating the ten or twelve plants, mostly using arc-type electric furnaces, actually operating in the United States at the present time.

#### Steel Furnaces

Two other kinds of electric furnaces are being developed in this country for steel work. One of these is the "forge-bar" furnace, and the other is the annealing and "heat-treating" furnace. The latter kind is giving commercial results in several places, especially where high-speed-tool steel is used. These furnaces have coke or carbon-plate resistors. The atmosphere naturally is reducing, and no scale is produced. As this scale can amount to from 2 to 5 per cent of the charge, and as the product is worth from 50 cents to \$1 per lb., electricity has certain specific and innate advantages over heating by oil or gas, which gives an oxidizing flame.

The furnace for "forge bars" is of same type as the heat-treating furnace, but the work is entirely different. A word of comment is here in order. In my



mind I have long divided electric furnaces into two kinds:

(1) "Soaking-heat" type; that is, where the heat is transferred slowly from the source of work on to the place of useful absorption.

(2) "Rushing-heat" type; that is, where the heat is transferred rapidly from the source of work on to the place of useful absorption.

In the former can be placed the graphite or carborundum furnaces of Acheson, where the cycle of intermittent operation is several days. In the latter class can be placed ferro-silicon or other ferro-alloy "pot" furnaces. The steel furnace operating on scrap steel combines elements of each class. The stock is rapidly melted and then held hot for a long time.

The forge-bar furnace is one that should be of the "rushing-heat" type. The work is placed in the furnace and in a few minutes withdrawn to go under the drop hammer. In this operation one must have quick heating. Thus there must be a high temperature of the resistor if use is made of a carbon resistance furnace. This throws a heavy duty on the lining, and if "arcing" starts or the brick is melted, silica is reduced to silicon (which is a good conductor) and all the current goes to the bottom, passing through the silicon, and the heat will be generated at the bottom away from the point of "useful absorption," thereby causing the operation to be inefficient. Such has been the fault of certain forge-bar furnaces. There is evidence that this defect has been overcome in a later design of forge-bar furnace that has been tried at Hartford, Conn. Hence for electrically heating forge bars of expensive steel where the scale item is considerable one can expect some commercial success. But the "soaking-heat" type for annealing is commercially practicable now under certain conditions.

I suppose the greatest economic asset that the electric furnace has for central stations is the ready adaptability it possesses. I have purchased energy for my experimental plant at 1.5 cents per kw-hr., the excess above 20,000 kw-hr. at 1.25 cents per kw-hr., the supply company having the right to cut off the energy between the hours of 4 p. m. and 8 p. m. during the months of December, January and February. If a minimum monthly guarantee had been given, energy could have been purchased much cheaper. It was an admirable arrangement for me and a good one for the supply company, especially after I installed an instantaneous break oil switch.

I am of the opinion that electric furnaces, especially of the "soaking-heat" type, can be designed commercially to suit given conditions and will yield good service with intermittent energy supplied; that is, the furnace can be designed to "soak up" heat and re-deliver it to work at intervals.

#### Rates and the Central Station

It is profitable to the central station to offer a low rate for "off-peak" energy used in large quantities for such classes of business as cannot be had at ordinary lighting or motor-service rates. In general overhead charges and distribution costs, the generating plant and overhead and labor charges are the same whether the special load is obtained or not, and the only increase in cost is for the coal consumed. Even this item cannot be considered the average pounds necessary to produce the kilowatt-hour, because the "off-peak" business will come at a time when the boilers are banked and operating inefficiently, and for a small increase in coal consumption the boilers can be made to produce electrical energy. A certain test made last spring during the day when there was a steady load showed a consumption of 2.5 lb. of coal per kw-hr. At night, when the

output was slight, the consumption of coal was 18 lb. per kw-hr. Now, if there had been 1000 kw of load at this time, the pounds per kw-hr. would have dropped rapidly for a slight increase in actual pounds of coal used.

In other words, with central stations where the load curve is normal, the use of energy from midnight to a. m. does not differ greatly, as regards cost, from making use of water which would otherwise go over the dam in the case of a hydraulic station. If, then, the low figure for these seven hours is averaged with the cost during the day, the day being weighted with its proper share of overhead expense, the resultant figure which is the cost of "off-peak" energy without any allowance for depreciation of station machinery, is low enough to show a good profit even at a low selling price.

While it may not be the most agreeable thing in the world to submit to restrictions, yet the restrictions are legally less than 5 per cent of the total time in a year and practically barely amount to more than 2 per cent of the running hours. For many purposes the electric furnace (always when of the "soaking-heat" type) can be so designed that these restrictions are of no importance. For instance, in melting steel or brass the furnaces start at 6 a. m., begin to melt metal at 8 a. m. and pour from 9 to 3 p. m., as soon as the molds are ready. All day long the flasks could be opened and the work brought to the men to remove the gates and sprues. In heat treating the furnaces have well-insulated walls, the value of "kilowatts per cubic foot" low, and it would do little harm to cut off the energy supply for eight hours. Continuous furnaces operating on scrap could withstand a shut-down of from two to four hours each day. A full 500-kw furnace with well-insulated walls can stand like a thermos bottle without losing heat.

All of the above forms of electric furnaces and the commercial conditions present intensely interesting economic problems. The neatness and cleanliness of the electric furnace and the efficiency of electrical heating when intelligently applied for any work requiring a reducing condition above 1000 deg. C. (1832 deg. Fahr.) are beyond all question. The prime requisite is to work out a design correct in engineering to meet such commercial avenues of advance.

#### Base-Metal Thermocouples

A paper read before the American Electrochemical Society by Prof. O. L. Kowalke, of the University of Wisconsin, dealt with the constancy of base-metal thermocouples as related to the microstructure. It has formerly been found that some couples retained a reasonably constant calibration during a series of tests, while others did not. The reason for deviations from the original calibrations did not appear to be entire mechanical strains or lack of uniformity in the metal. It seemed probable that there might have been changes in the structure of the metal due to heat treatments, and that such alloys were used in the wires as when exposed to high temperatures would produce heterogeneity.

The author undertook a research into the matter. His conclusion is that those metals which form solid solutions with one another give the best results, provided that the thermoelectric force is satisfactory and the melting point high. Silicon does not appear to be a desirable constituent in a nickel alloy for thermocouple material. Any segregation of the metal has an undesirable effect on the constancy of the couple. While containing only one metal showed a satisfactory structure.

# Cost of Commercial Electric Vehicle Operation

Averages indicated by more than 900 vehicles engaged in a great diversity of industries and operating in widely separated localities—Large investment in commercial electric vehicles

THE general purposes of the *Electrical World* in developing the cost of operating electric vehicles were announced in preceding issues, and following is a brief outline of the scope of the investigations with relation to the number of vehicle applications covered. Within a very short time after our returns were all received we will publish in detail the final results. In the meantime, owing to our present advance in the matter, we are in a position to state some of our anticipations.

As has been frequently pointed out, there has been much larger collective investment made in vehicle installations of the electric type than in any other form of commercial automobile, and the conservative character of the organizations making such investments must be considered a substantial indorsement of the well-developed status of the electric commercial vehicle and its economic value as a transportation utility. From one of the statistics recently made public the following is quoted as indicating the amount of electric-vehicle investment in a few of the principal lines of industry:

Department stores	\$5,627,000
Laundries	5,350,000
Public-service companies	3,671,000
Press and transfer companies	3,010,000
Wholesale merchants and manufacturers	2,088,000
Long-house organizations	609,000
United States government service	435,000

Selection has been made of approximately 150 installations, embracing about 2500 machines of all sizes and serving the following lines of business:

Department stores,	Oriental goods,	Ice-cream manufac-
Factories,	Household furniture,	turers,
Served foods,	Glass manufacturers,	Mail service,
Flora,	Storage warehouses,	Magazine publishers,
Minimizing compa-	Hardware,	Newspaper delivery,
ies,	Silversmiths,	Packers,
Ching manufactur-	Wholesale dry goods,	Restaurateurs,
ers,	Musical instruments,	Soap manufacturers,
Per goods manu-	Express companies,	Baggage transporta-
facturers,	Silk manufacturers,	tion,
Gears,	Gas-apparatus man-	Government service,
Dries,	ufacturers,	Steamship freight.

From such a wide diversity of industries the figures developed should furnish satisfactory information to almost every intending user of the electric vehicle. Moreover, widely separated localities have been chosen, the installations selected being in the following cities:

New York,	Fort Wayne,	Cleveland,	New Haven,
Chicago,	Washington,	Louisville,	Milwaukee,
St. Francisco,	Pittsburgh,	Wilmington,	Sacramento,
Bton,	York,	Edgewater,	St. Louis,
Woonster,	Newport, Ky.	Portland, Ore.	Oakland,
Springfield,	Kansas City,	Stamford,	Denver,
assa,	New Orleans,	Baltimore,	Frankford,
B'alo,	Sioux City,	Wichita,	Schenectady,
H'ford,	Rochester,	Detroit,	Newark,
Philadelphia,	Birmingham,	Los Angeles,	Norristown,
Innapolis,	Bridgeport,	Manila,	Seattle.

With authentic operation cost from each of these cities there should no longer be any question as to the relative value of the electric machine in any locality, as the topographical and climatic conditions in the cities mentioned cover every variety likely to exist elsewhere.

## Average Daily Operating Costs

Taking at random fifty installations from the data so far assembled, we find 927 machines included in these, with more than 100 of each of the following load-carrying capacities: 700 lb., 1000 lb., 2000 lb., 4000 lb., 7000 lb. and 10,000 lb. The following cost figures are developed collectively:

Installations	50
Number of machines	927
Investment	\$2,953,828
Annual expense	\$2,319,658
Average daily operating cost:	
700 lb.	\$5.68
1000 lb.	\$6.34
2000 lb.	\$7.56
4000 lb.	\$8.92
7000 lb.	\$10.38
10,000 lb.	\$11.74

The investment covers not only the cost of the machines but the garage equipment and spare parts necessary to operate them. The annual operating expense includes, for both machines and equipment, interest, depreciation, fire and liability insurance, licenses, upkeep of tires, batteries and mechanical parts, electrical energy, supplies, provision for garaging and care, as well as driver's wages and supervision.

## Interest and Depreciation Charges

In calculating the cost of vehicle service the owners usually pay little attention to what may be regarded as capital charges, interest and depreciation, nor to charges for the proportionate supervision which this department of their business requires. The view is taken occasionally that no charge should be made for something that has only a theoretical and no practical value. In this connection it must be remembered that transportation charges are a factor in the cost of merchandising goods, and it is generally understood that the market price should include these, and that the ultimate consumer should refund to the merchant his expenses in this direction. Therefore, the transportation charge, if properly made, should refund to the merchant the current rate of interest which he could secure otherwise upon the money invested in the equipment and also should restore to him the gradual depreciation which his equipment is undergoing while in the consumer's service transporting the goods he buys. The portions of the delivery charges covering interest and depreciation are necessarily small in each particular instance, but in the aggregate they are large and sufficient to preserve the value of the capital which the merchant has invested in this part of his business. Thus it will be seen that the consideration of these items is necessary.

We expect that when all the returns are in they will show that in many cases machines can be operated at much lower figures than those given in the forecast. However, if we are able to establish the fact that in the majority of installations covered by our investigation machines can be operated at the costs given above, there should be no difficulty in demonstrating that the electric vehicle is superior to all others used in city merchandise transportation.

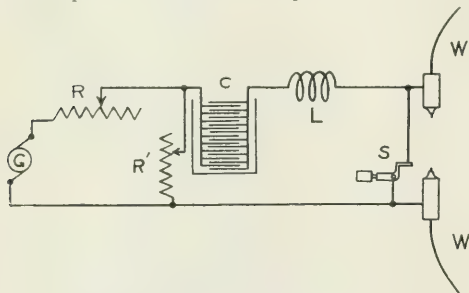


### Electro-Percussive Welding

A paper prepared by Messrs. C. E. Skinner and L. W. Chubb for the recent meeting of the American Electrochemical Society at Niagara Falls was devoted to a discussion of the method of electro-percussive welding of wires, based on the principle of a simultaneous condenser discharge and percussive engagement. The diagram reproduced shows the arrangement.

The welding circuit consists of a direct-current line or a generator *G*, which charges an electrolytic condenser *C* through a resistor of high resistance *R*. Adjustment of the voltage of the charged condenser is obtained by field control of the generator or by varying the resistors *R* and *R'*. The wires *WW* to be welded are secured in the wire grips of the welding tool, which are connected to the terminals of the condenser through an inductance *L* of from two to ten turns of cable. A spring switch *S* with carbon contacts, normally held closed, is connected across the jaws of the welder so that their potential difference will be zero while the wires are being put in or the finished product is being removed. The welder is connected to the auxiliary apparatus by means of long flexible cables which allow welding within a radius of about 50 ft. without moving the condenser and other heavy apparatus.

The process of welding is as follows: The wires are secured in the wire grips and the ends are cut off as short as possible with a suitable pair of cutters. The



ELECTRO-PERCUSSIVE WELDING

switch *S* is then opened, which charges the condenser to the proper voltage; a catch is then released, which lets the sliding member fall by gravity and brings the ends of the two wires into percussive engagement. At the instant of contact the short-circuit current of the condenser builds up to such a value that the ends of the wire are melted by the explosive discharge and instantly forged together by the blow of the falling mass. The weld is then complete and after being removed from the machine will be found to have the strength of the original wire.

The generation of the heat is so localized, so sudden and so intense that there is not time for unequal heat conduction through the shanks of the wire, and the ends will be melted and even vaporized whether the melting point is high or low. For this reason metals of different kinds can be welded together independently of their electrical resistance, melting point or heat conductance.

While the development of this welding method was brought about primarily by the necessity for the successful joining of aluminum wires and the joining of copper leads to such aluminum wires, the method is capable of an extremely varied application. Since metals varying as widely in characteristics as platinum and tin may be easily welded, it follows that almost any metals may be joined where the joint is within the limits of the capacity of the welding apparatus. While the apparatus up to this time has been made only for the

welding of wires 0.072 in. diameter and smaller, the application of larger sizes is merely a question of the design of suitable apparatus.

Electro-percussive welding has already been used to a considerable extent in the joining of aluminum wires, in the welding of copper and aluminum wire, of platinum and nickel, and of platinum and copper, and in the welding of various types of thermocouple wires. It has also been used for the reclamation of short pieces of wires of various kinds, such as aluminum, platinum, spring steel, etc.

### Electrolytic Insulation of Aluminum Wire

At the recent Niagara Falls convention of the American Electrochemical Society a paper presented by Messrs. C. E. Skinner and L. W. Chubb, of the Westinghouse company, dealt with the electrolytic insulation of aluminum wire. The skin or thin layer of natural oxide which is so objectionable in the soldering of aluminum is a non-conductor of high dielectric strength, and for several years engineers have been trying to strengthen the film of oxide so that it can take the place of the fibrous insulation ordinarily used on copper wire.

The authors have devised a method of strengthening the coating by means of an electrolytic action which produces a coating of many times the dielectric strength of the coatings obtained by former methods.

On account of the thinness of the film it is quite flexible and does not open or appreciably weaken when sharp bends and kinks are made in the wire. Soft wire can be stretched 30 per cent of its length without apparently injuring the insulation. Two wires at a potential difference of 250 volts can be crossed and pressed together at the intersection until the wires are deformed to such an extent that the intersection is no thicker than a single wire. If there is no relative motion between the surfaces in contact, the insulation will not break down, but the slightest movement of one of the wires will cause a grinding between the surfaces which will at once produce a short-circuit.

The insulating coating is fireproof and has sufficient strength mechanically to support the wire in small coils when the temperature is above the melting point of the metal. Small coils run with the wire molten will fall to pieces if the current is suddenly stopped, but if the current is gradually lowered the metal will solidify and remain intact.

Electrolytically insulated aluminum wire is suitable for many classes of work requiring wires of relatively small size where the insulation requirements are not excessive, and particularly where temperature requirements are severe. The very small sizes, No. 30 B & S gage and less, cannot be used satisfactorily on account of the difficulty in drawing the wire and in the subsequent handling. In the very large sizes there is no advantage in the use of aluminum wire where the space is restricted. This wire has been found particularly advantageous for use in coils which require light weight and which are subjected to relatively high temperatures, provided that the insulation requirements on the individual wires are not excessive. The weight of an aluminum wire coil is from 40 to 50 per cent of that of the equivalent copper coil. The thermal capacities of the two types of coils are practically the same and the temperature coefficients are equal. The heat dissipation through the aluminum coil is found to be slightly better than the equivalent copper coil.

While the new wire has limitations, it has a decided sphere of usefulness, which will probably be greatly extended, particularly in the event of the ratio between the base prices of aluminum and copper being decreased.

# Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods and Current Practice Among Successful Utilities

## Anticipating Complaints

In a public policy discussion at the recent convention of the Indiana Electric Light Association, Mr. Thomas F. English, Muncie, Ind., told of a complaint-reducing plan his company was using. Two young ladies, educated in the essentials of illuminating engineering, are employed by the company to make calls on customers, visit with them, and make suggestions for improving the home lighting. The results of these semi-social visits have shown themselves in several ways. Carbon lamps are going like the fall leaves, and they will not return. Tungsten lamp sales have been increased 60 per cent. Complaints which formerly came to the office are being forestalled to a large extent by these keen young women, whose suggestions are accepted and appreciated by the company's patrons.

## Electrical Operation Economical for Fertilizer Industry

By C. E. ROSE

Operating on central-station energy near Argenta, Ark., is the recently erected plant of the Arkansas Fertilizer Company, which has a yearly output of about 40,000 tons of fertilizer. Among the interesting features of this installation are the use of specially impregnated squirrel-cage motors, duplicate pump control, and the fact that the unit cost of production is considerably lower than it was when steam-power was used by the company.

Fourteen motors having an aggregate rating of 462.5 hp are installed, the larger units operating on 2200 volts and the smaller ones on 440 volts. Energy is delivered to the plant at 2200 volts over a 3-mile trans-

mission line. That used by small motors and lamps is stepped down to the desired voltage by three single-phase transformers having Y-connected secondaries.

TABLE 1—APPLICATION OF MOTORS IN FERTILIZER PLANT

Application of Motors	Connection to System, Diagram	No. Units	Hp.	Voltage	Type	R.p.m.
Kent mill.....	Extension shaft, flexible coupling, 2 pulleys 9-in. dia. 8-in. face 8 ft. 5 in. c. to c.	2	35	2200	Squirrel-cage	850
Crushers.....	7-in. pulley 6-in. face	1	15	440	Squirrel-cage	1155
Lane shaft.....	12-in. pulley 10-in. face	1	35	2200	Squirrel-cage	850
Car and elevator	10-in. pulley 9-in. face	1	20	2200	Squirrel-cage	850
Bagging machines.....	18-in. pulley 10-in. face	2	50	2200	Squirrel-cage	850
Bone mill.....	15-in. pulley 11-in. face	1	75	2200	Squirrel-cage	1140
Condenser fan.....	7.5-in. pulley 6-in. face	1	7.5	440	Squirrel-cage	850
Deepwell pump.....	Geared	1	7.5	440	Squirrel-cage	.....
Air compressor.....		1	7.5	440	Squirrel-cage	850
Electric crane.....		3	125 in aggregate	440	Wound rotor	.....

Prior to the installation of the present equipment the company operated a steam-driven plant, which burned down in May, 1913, leaving the boilers and engines only



FIG. 1—EXTERIOR OF PLANT, SHOWING 2200-VOLT TRANSFORMERS AND LINE ENTRANCES



slightly injured. The officers of the fertilizing company were interviewed by Messrs. C. E. Rose, of the Merchants' Lighting Company, Little Rock, and A. E. Smith, of the Little Rock (Ark.) Railway & Electric Company, who pointed out wherein central-station electric service was preferable to steam drive. Their arguments resulted in the abandonment of the old equipment even though

heavy load except the crane motors, squirrel-cage-type units are used throughout with the exceptions named. The starting torque of the squirrel-cage motors is 125 per cent of full-load torque, whereas the wound-motor type used on the crane develops 250 per cent of full-load torque while starting. Each motor is impregnated with acid-and-alkali-resisting compound.



FIG. 2—INTERIOR OF PLANT, SHOWING ELECTRIC CRANE, BONE MILL AND BAGGING MACHINE

it was still serviceable. The building which was subsequently erected is constructed of steel with corrugated galvanized-iron walls. In plan the building measures 463 ft. long by 114 ft. wide and is 75 ft. high.

Energy furnished by the Merchants' Lighting Company is delivered to the plant at 2200 volts over three-phase, sixty-cycle transmission lines. A potential of 2400 volts is maintained at the supply end of the line to compensate for line drop. The high potential circuit feeds some of the larger motors direct without intervening transformers, while the smaller motors and lamp circuits are energized by 2200/440/144-volt transformers installed on an elevated platform outside the plant. The units are rated at 30 kva apiece and are Y-connected, with the neutral grounded. Energy for the 440-volt motors is obtained between phase leads

TABLE II—CONTENTS OF DIFFERENT GRADES OF FERTILIZER

Grade	Available Phosphoric Acid	Free Nitrogen	Ammonia	Potash
High...	7.0 to 16	1.65 to 3.30	2.07 to 4.00	7.0
Standard	7.5 to 14	1.50 to 2.00	1.22 to 2.43	0.2 to 4.0
Low...	8.0 to 10	0.82 to 1.65	1.00 to 2.00	1.0 to 2.0

The crane, which spans a space 80 ft. wide, is equipped with a clam-shell bucket capable of lifting 10 tons of material. The crane carriage supports two motors, one for raising and lowering the bucket, and the other for propelling the carriage along the crane. Energy is delivered to these motors through six trolley wires and contact wheels. The main trolley wires feeding the crane are No. 2/0 bare copper wire.

A motor-driven deep-well pump is installed about 1200 ft. from the plant and is controlled from within the building as well as from outdoor apparatus. Duplicate control was furnished so that in case of fire sur-

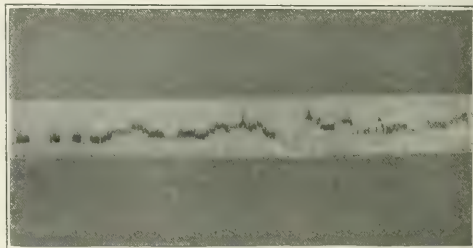


FIG. 4—LOAD VARIATION IN FERTILIZER PLANT

rounding the indoor control equipment, the pump can still be started for fire-extinguishing purposes from the other control station.

An oil switch equipped with automatic no-voltage and overload-release coils is connected between each compensator and its supply circuit to prevent interruption to service in case of compensator trouble. Triple-braided, rubber-insulated stranded conductors inclosed in conduit are employed in the 2200-volt circuits.

During March the plant produced 7083 tons of fertilizer. The maximum power demand during the same period was 170 kw, and the energy consumption was 37,600 kw-hr. These figures indicate that the demand factor (based on the rating in motors) was  $170 \div (0.746 \times 463.5)$ , or 49.17 per cent, and the load factor (based on the maximum demand) was  $37,600 \div (1702 \times 720)$ , or 30.71 per cent. The energy consumed per ton of fertilizer produced was  $(37,600 \div 7083)$ , or 5.3 kw-hr.

For its electric service the fertilizer company pays \$1 per kw of maximum demand from 10 p. m. to 5.30 p. m. and \$2 per kw of maximum demand from 5.30 p. m. to 10 p. m., and in addition thereto 1 cent net per kw-hr. of energy consumed. As a basis on which to estimate the energy charge the electric service company employs General Electric curve-drawing and watt-hour meters, which are installed on the 2200-volt side

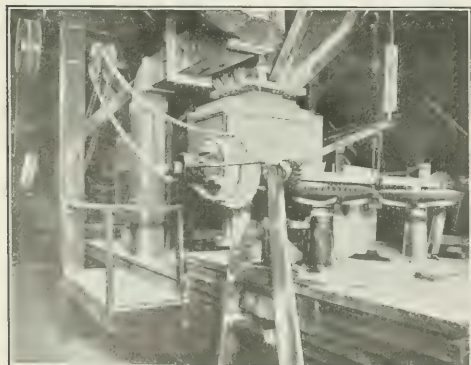


FIG. 3—ACID MILL IN FERTILIZER PLANT

and that for lamp circuits from the same leads to ground. All outlets for 2200-volt circuits consist of cambric-insulated, lead-covered cables provided with outdoor type pot-heads manufactured by the Standard Underground Cable Company.

As none of the motors is required to start under

of the transformers. The peak load for any month is determined from the graphical chart obtained from these meters, by averaging the loads over fifteen-minute intervals. Figured according to the method described above, the reading and bill for March was for 170 kw at \$1, or \$170, plus 37,600 kw-hr. at 1 cent, or \$376, making a total of \$546, or an equivalent rate of 1.45 cents per kw-hr. The net energy cost per ton of fertilizer was 7.7 cents, a figure never approached formerly.

The fertilizer company manufactures three qualities of fertilizer—high, standard and low grades. The contents of each class of fertilizer shown in the accompanying table depend upon the crops which are to be nourished thereby. The fertilizer consists of a mixture of cottonseed meal and acid phosphate. The company manufactures its own acid phosphate from crude phosphate rock and sulphuric acid. Nitrate of soda is purchased from Chile, the Air Products Company's plant at Niagara, and also from a large hydroelectric plant in Sweden. Fertilizer is sold at from \$15.75 to \$30.50 per ton.

### Revenue per Customer at Superior, Wis.

Data presented by Mr. A. T. Holbrook, of the Excess Indicator Company, before the recent convention of the Indiana Electric Light Association showed that the small customers of the Superior (Wis.) Water, Light & Power Company who are using electrical energy on a controlled flat rate are paying the company a greater average monthly bill than are the customers who are on a meter basis. Mr. Holbrook stated that the company's 300 flat-rate residential customers were paying an average of \$1.37 a month, while 2300 similar customers with meters were paying an average of only \$1.27 a month. The flat-rate customers receive energy for 1 cent a watt a month net, while those who have meters are served on a sliding scale ranging from 12.5 cents per kw-hr. for the first four hours' use of the connected load to 6.25 cents per kw-hr. for additional consumption.

### Demonstration of Electric Pump in Public Square

For a number of years irrigation carried on in the Salinas Valley, California, has been done by gas-engine drive, but recently electrical manufacturers have conducted a very effective campaign to convince the farmers of the advantages of motor drive for irrigation.



MOTOR-DRIVEN PUMP ON PUBLIC EXHIBITION

The accompanying illustration shows a motor-driven pump installed in the public square in the center of the business district of the city of Salinas, and it is viewed with interest by all the farmers coming to the city from the surrounding country. They usually tie their horses and park their automobiles at this point, and therefore

cannot fail to see the installation, which consists of a 5-hp Westinghouse motor directly connected to a Byron Jackson pump. The pump takes the water from a large tank and pumps it into a reservoir, from which it flows back to the tank. This process is repeated over and over again. The rating of the pump is 500 gal. a minute.

### Portable Electric Cranes and Storage-Battery Trucks for Handling Cotton Bales

The cost of labor for handling cotton between piers and warehouses at the Savannah (Ga.) terminal of the Central of Georgia Railway Company has been considerably reduced by employing storage-battery trucks and portable motor-driven jib-crane loaders in place of hand trucks and manual loading. Eleven trucks, making an average haul between stops of 1700 ft., are used. When trucking and loading were done entirely by hand the labor cost was 6.27 cents per bale. After hand trucks were replaced by the electric type the cost was reduced to 3.5 cents per bale. Finally, when the electric loaders were used the labor cost amounted to 2.8 cents per bale. Including fixed charges, maintenance and cost of energy, the total cost of hauling cotton was 5 cents per bale. If the trucks were used the entire year instead of during only four months, the unit cost of handling cotton would be considerably less than this value.

With the electric crane a truck can be loaded at the rate of one bale every twelve seconds, which is considerably faster than could be done by hand continuously as the bales are 60 in. long and weigh 500 lb. each. Much faster transportation is also afforded by the electric trucks than by hand hauling, although the latter is still employed for short distances. When equipped with lead batteries the trucks will ascend a 20 per cent grade; equipped with Edison batteries they will climb a 10 per cent grade. On account of the rough usage which the trucks receive, however, it has been considered advisable to use Edison cells.

### Obligation of Allied Companies to Employees

In a recent case before the Court of Civil Appeals of Texas (169 S. W., 375) the court decided that where the plaintiff, who though not regularly employed by defendant was employed by a subsidiary company controlled by defendant, was injured in performing a service at the request of defendant's foreman a charge that if plaintiff was not an employee of defendant verdict should be for defendant was erroneous, tending to mislead the jury into believing that if plaintiff was not a regular employee of defendant there could be no recovery, notwithstanding the fact that if defendant's foreman was entitled to demand plaintiff's assistance the relation of master and servant existed, though plaintiff did not expect to receive compensation for such small assistance. The plaintiff was engaged in the erection of poles and wires for the Waco Gas Company, and the defendant, the Citizens' Railway Company, was engaged in the operation of a street railway and also furnished electricity to the city of Waco and to different power plants and to the Waco Gas Company. Both companies are owned largely by the same parties and have the same general manager. The court ruled that, no matter how temporary an employment is, it is the duty of the master to furnish his servant with a safe place to work. One whom defendant's vice-principal requested to assist in work on defendant's premises is not a mere licensee, and defendant owes him a higher duty than that of merely not intentionally injuring him.



# Illumination and Wiring

## Placing Lock-Nuts on Conduits at Outlets

BY C. V. TALBOTT

The prevalent practice among wiremen when terminating a run of conduit in an outlet box, a pull box or a panel box is to use but one lock-nut, as shown in

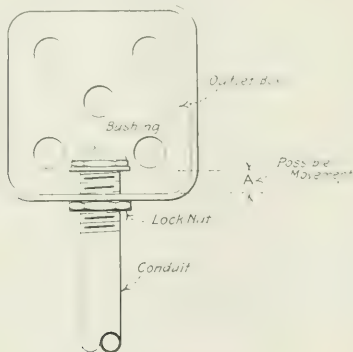


FIG. 1—CONDUIT INSTALLED WITH ONE LOCK-NUT

Fig. 1. The lock-nut is run on the conduit on the outside of the box, and a bushing is turned on the conduit in the inside, as indicated in the illustration. Unless the length of the piece of conduit that terminates in the box has been accurately determined, the bushing may not turn down snugly against the inside of the box on the end of the conduit.

Owing to its construction, the bushing can turn down on the conduit end only a certain distance. If the conduit be cut too long, there will be a space, indicated by A in Fig. 1, between the lower face of the bushing and the side of the outlet box, which allows a lateral movement of the conduit. Where such a lateral movement is possible the conductors that will be drawn into the conduit may be broken, or if vibration is pres-

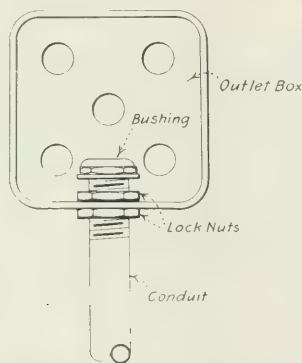


FIG. 2—CORRECT METHOD OF TERMINATING CONDUIT

ent in the building the conduit may move to and fro and injure the insulation on the conductors.

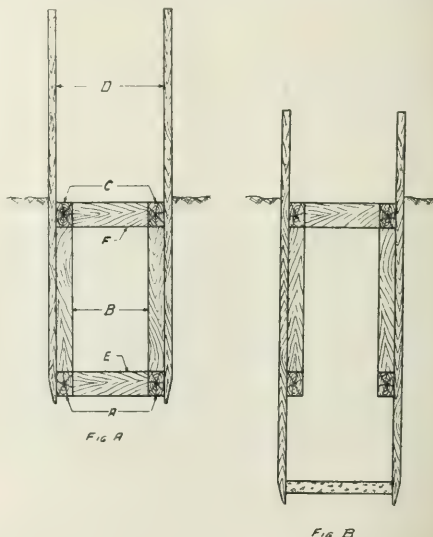
Both conduit and terminal fittings in every installation should be absolutely rigid, so that vibration, breakage and trouble such as referred to cannot occur.

Fig. 2 shows the correct method of terminating a conduit in a box. Two lock-nuts should be used. One is placed on the outside of the box and the other on the

inside. Both are set up snugly, which renders movement of the conduit impossible. The practice of using two lock-nuts is being followed in nearly all good work and is being insisted upon in some cases by the underwriters' inspectors.

## Laying of Fiber Ducts

Four-inch fiber ducts nested in concrete are used exclusively in the underground distribution system serving the Pittsburgh Crucible Steel Company's plant at Midland, Pa. Standard 5-ft. lengths were employed and their ends brush-coated with compound before the socket joints were closed. In preparing the ground for the ducts trenches were dug wide enough to lay the conduits 0.75 in. apart and leave a 6-in. space on each side of the nest. When the trench had been dug about 3 ft. or 4 ft. deep the walls were faced with 2-in. planks placed vertically and held in place by longitudinal timbers and lateral braces as shown in the accompanying



CRIBBING FOR DUCT-LINE TRENCH

drawing. As excavation proceeded the vertical planks were driven down to prevent the earth caving in.

A footing course of concrete (one-three-six mixture) was then laid in the bottom of the trench, and when it had set all of the bracing except the upper timbers and lateral braces was removed to give room for the ducts. After these had been laid in place, separated by 0.75-in. horizontal and vertical spacers, iron forks made of 0.5-in. stock were slipped over the nest to hold it together, and the spaces next to the trench walls were filled with concrete up to the level of the top ducts. Before this had set, however, grout, made of one part cement and three parts sand, was poured into the interstices and the entire nest was covered with a layer of concrete 3 in. thick. As soon as all of the concrete was in place the iron forks and vertical spacers were withdrawn and the concrete was allowed to set. The cribbing and bracing were then removed and used over again for another part of the trench. This construction is very rugged, as was shown, about a month after the installation was completed, by the ability of a 10-ft. section of a twenty-duct line supported at each end to withstand the load of an 18-in. cast-iron water pipe.

### Largest Motograph Sign in the World

A recent conspicuous addition to the spectacular roof signs of Chicago is on the roof of the old five-story building at the northeast corner of East Randolph Street and Michigan Boulevard. It is the largest motograph sign in the world. In a motograph sign the message is spelled out in letters of light, much as though the

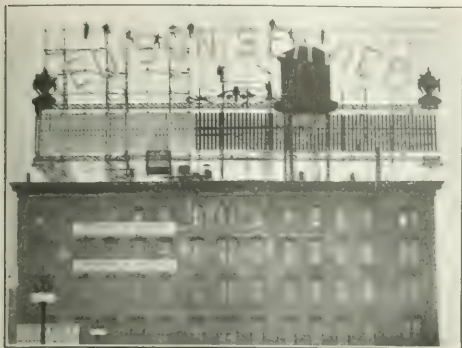


FIG. 1—DAYLIGHT VIEW OF SIGN BEFORE COMPLETION

words passed before the eyes of the observer on a great ribbon or tape. (See *Electrical World*, June 7, 1913, page 1276.) The effect is produced by contacts operating through a perforated ribbon or roll of paper, something after the manner of some types of mechanical piano-players. In principle every lamp socket is wired separately to the motograph instrument, but in the new large sign in Chicago there are four lamps to a switch. At that, over 80,000 ft. of wire is used in the sign. Another novelty in the Chicago sign is the fact that the moving letters, instead of being in single-line outline, are in double-line outline, making a much more impressive effect. These letters are 12 ft. high. There are only a few motograph signs in the United States. The patents for this country are controlled by the Fed-



FIG. 2—NIGHT VIEW OF SIGN

eral Sign System (Electric), which designed and controls the large new Chicago sign.

For three or four months the new sign has been leased to the Commonwealth Edison Company. The whole idea of this motograph sign is to make prominent the moving message. Everything else is steady-burning and accessory. The sign is 130 ft. long east and west and 15 ft. additional north and south. Thus the

whole length is 145 ft. The height is 50 ft. above the roof. The newer portion of the steel structure supporting the sign has been very carefully designed and built and has been pronounced by engineers the finest specimen of structural steel work for electric-sign support in Chicago. In part the sign is supported on trusses resting on the longitudinal walls of the building.

The total number of lamps in the sign is between 7000 and 10,000. Most of them are 10-watt lamps, but there are a number of the 5-watt size. The motograph panel is surrounded by a scroll-work border in colored lamps. It is represented as supported by columns surmounted by urns heaped with flowers. The lamps in the motograph panel, about 4600 in number, are arranged in vertical lines on about 115 socket-boards, each supporting two rows of twenty lamps. In one picture these narrow, upright panels, which look something like the boards in a fence, are painted partly black and partly white. This is done merely for experimental purposes. Above the motograph panel in a curved line formed of letters 9 ft. high are the steady-burning words "Electric Service." Below this the specific message to be conveyed is displayed by means of the motograph. Various departments of the business are men-



FIG. 3—REAR VIEW OF SIGN

tioned, as lighting service, motor service, accessories, domestic appliances, vehicle service, etc.

The Commonwealth Edison Company is advertising the sign liberally in newspapers, in street cars and in other mediums, and the display is attracting much attention. The location of the sign is one of the best in Chicago, and the message can be read distinctly from the corner of Twelfth Street and Michigan Boulevard, 1.2 miles south. The average message spelled out on the present sign is from 50 to 120 words, but the machine can carry a message of 150 words and can be built for longer messages. The switchboard and motograph apparatus is housed in a galvanized-iron structure on the roof. In principle, the machine is automatic, and after things are running smoothly it is believed that the constant attendance of an operator will not be needed. It is interesting to note that if the 75-word or 100-word message spelled out in letters 12 ft. high was shown all at one time it would require the surface of a very large building many stories high. Even then it would not be so effective, because such a permanent sign would be more laborious to read. The moving message passing before the eye is not only a novelty but costs the spectator practically no fatigue. An average message will go through in three or four minutes. Mr. L. G. Shepard, electrical engineer of the Federal Sign System (Electric), designed the new sign. Some of the



messages relating to Edison service which the sign is spelling out are as follows:

"Electric light cheapest, cleanest, safest, most modern, for the store, for the factory, for mansion and cottage, for the apartment, for the tenement; ready for instant service. Electric light makes for good cheer, improves the health, makes stores attractive, makes homes pleasant and comfortable. Safe to use anywhere; use it everywhere. You pay only for what you use. Install electric light now. Call Commonwealth Edison Company, Contract Department."

"Electricity, the ever-ready servant, always willing, always able. It runs your mills, lights your buildings, flashes your advertising through electric signs, reduces human labor, reduces expense. Electric service is more modern than steam power, cleaner, cheaper, more efficient. Make this electric servant work for you. For particulars call Commonwealth Edison Company, Contract Department."

"The electric car is always ready to go and goes readily. The electric car is a Pullman palace, without dust, noise or porters. The electric car runs easy and is easy to run. The electric car cost is little and its maintenance is less. The electric car is its own book-keeper; every month you can know just what the electric car will cost. The electric car is the business man's car. The electric car is a luxurious economy for pleasure, for business, for hills, for boulevards, for father, for mother, for everybody everywhere every time—the electric car. Our vehicle expert is at your service. Call Commonwealth Edison Company, Electric Vehicle Department."

"Electric signs mark the up-to-date merchant. You read this one; thousands read yours. Speak to your audience on the crowded streets through electrical publicity—light, action, color. Compel attention; cause favorable comment. Letters of fire make a lasting impression. Burn your name and location into millions of receptive minds. Feature your business with the electric sign. Capitalize your location. Increase your sales. Install an electric sign now. Big business ahead. Call Commonwealth Edison Company, Contract Department."

### Making Pole-Top Switching Apparatus Safe

To make it impossible for anyone to replace a pole-top fuse while the line is energized, the West Penn Electric Company, Pittsburgh, Pa., has installed operating platforms on its outdoor switching towers to which access can be had only through a trap-door which is automatically locked when the switches are closed. The standard outdoor switching apparatus employed by this company consists of a horn-gap lightning arrester, a choke coil and an air-break horn switch. The switch rods extend through the platform so that a person operating them can do so without running any risk of coming in contact with high-voltage conductors. The switch rods also operate a device which locks the trap-door in the platform when they are closed. It is impossible for a person to crawl around the edges of the platform, as it extends 15 in. from the poles on all sides.

### Recent Telephone Patent

Mr. A. G. Cerda, of Mexico, is the patentee for a party-line system in which a number of branch lines, each for one station, radiate from the end of a main line. A common battery is supplied for all branch lines, and when a call is received from one of the latter an associated relay serves to remove the current supply

from all other branch lines and to connect the calling branch to the main line. If a call is coming the other way, the operator sends out impulses on the main line which serve to drive a contactor around to close the signaling current to the desired branch.

## Letter to the Editors

### Determination of Wave-Length in Radiotelegraphy

To the Editors of the Electrical World:

SIRS:—In an article under the above title published in your issue of Aug. 15, 1914, Mr. A. S. Blatterman investigates the transmission formula given by Dr. L. W. Austin with the view of determining the most suitable wave-length to be used for a given distance between stations. He makes use of a graphical method which must necessarily be somewhat laborious and limited. The same results can be obtained in a simpler and at the same time more general form by an elementary mathematical consideration of the formula.

The transmission formula given by Dr. Austin is as follows:

$$I_r = 4.25 I_e \frac{h_1 h_2}{\lambda d} \epsilon^{-\alpha d / \sqrt{\lambda}} \quad (1)$$

and the problem is to ascertain the value of  $\lambda$  to be used, when the distance is given, so that  $I_r$  shall have a maximum value. This can be readily determined by differentiating  $I_r$  with respect to  $\lambda$  and equating the result to zero, the usual method for maxima-minima determination. Thus,

$$\frac{\partial I_r}{\partial \lambda} = 4.25 I_e \frac{h_1 h_2}{d^2} \left\{ \frac{\alpha d}{2\sqrt{\lambda}} - 1 \right\} \epsilon^{-\alpha d / \sqrt{\lambda}} \quad (2)$$

and the condition for  $I_r$  maximum is,

$$\frac{\alpha d}{2\sqrt{\lambda}} = 1, \quad \text{or} \quad \lambda = \frac{\alpha^2 d^2}{4} \quad (3)$$

$\lambda$  and  $d$  are expressed in kilometers, and  $\alpha = 0.0015$  is the absorption coefficient.

When the relation between  $\lambda$  and  $d$  is satisfied by the equation (3),  $I_r$  will have its maximum value for any given values of  $I_e$ ,  $h_1$  and  $h_2$ . The above formula checks closely with the results obtained by Mr. Blatterman.

In the table below the values of  $\lambda$ , corresponding to maximum value of currents, for different distances are given, as taken from Mr. Blatterman's curves in Fig. 6 and those calculated by formula (3). Considering that

VALUES OF  $\lambda$

$d$		$\lambda$ for Maximum	$\lambda$ Calculated by Formula 3
In Miles	In Kw		
530	850	380 m	406 m
700	1120	700	705
800	1425	1050	1145
1000	1700	1780	1625
1325	2120	3000	2540

Mr. Blatterman plotted his curves on a comparatively small scale, and the maxima are not sharply defined, no great accuracy could be expected, which will account for the discrepancy of from 5 per cent to 20 per cent between the values obtained from the curves and those calculated by the formula.

Washington, D. C.

LOUIS COHEN.

# Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

## Protecting Armature Coils Against Corona

If generators are made to develop very high voltage, there will be a corona discharge from the armature coils which may injure the insulation sufficiently to cause a breakdown. A method of preventing this effect was described in a report before the recent convention of the Association of Edison Illuminating Companies. It was said that while mica insulation would help, considerably better results can be obtained by covering the coils with layers of thin metal ribbon, each turn overlapping the preceding one but insulated from it to prevent eddy currents. Experiments have been made, it was reported, showing that the insulation of an unprotected coil is gradually eaten away by corona, causing the formation of nitrous oxide and nitric-acid fumes. This does not occur with a coil protected as described.

## Speed Regulation and Steam Consumption Affected by Dash-Pots

Dash-pots on a Corliss engine should receive as much attention as the governing mechanism, for the latter will have little or no effect on the speed and the steam economy will be low if the dash-pot pistons do not close quickly. If the dash-pots are sluggish in action, the engine may even run away. A little oil dropped in the dash-pots now and then will prevent leakage between the piston and cylinder and will also prevent scoring which may give rise to trouble later. Indicator cards will show whether the governing mechanism or dash-pots are the cause of poor speed regulation or high steam consumption. If the admission curve drops off gradually before the expansion curve starts in, it shows that the admission valve is not closed quickly enough and that the steam is being "wire-drawn." If this is the case the dash-pot pistons may be too snug or they may be worn and leak air. In either event the trouble should be remedied to get the full advantage of automatic cut-off.

## Peculiarities of Some Directly Connected Exciters

Some directly connected exciters used with large turbo-generators have been observed to act very peculiarly when starting or stopping a machine. In a paper read before the Edison association recently it was declared that some of these units have a tendency to hesitate to build up their voltage on starting until a particular position of the shunt-field switch is reached, when the field voltage rises so suddenly that the alternator voltage may go above the rated value. A similar effect is noted when the load is taken off in that when the critical position of the shunt-field rheostat is reached the exciter voltage suddenly drops to zero, and as a result of the time lag in the alternator field the energy stored therein causes a reversal of the polarity of the exciter. When the unit is again started, the exciter voltage is therefore reversed, requiring changes in connections of the exciter or the instruments used with the exciter, in order to restore normal operating conditions.

The great dependence placed upon individual exciters in connection with large generating units in recent practice makes this feature of their operation a matter to be regarded seriously, in view of the serious results attending mistakes of operators in conducting switching operations without knowledge of reversal of potential in systems where provisions are made for interconnecting exciter circuits. It is therefore desirable that the slope of the straight part of the magnetization curve be gradual, with the knee of the curve corresponding to the point at which the rated no-load voltage of the alternator is obtained. Under such conditions and with the exciter field rheostat subdivided into fine steps, the troubles now noted will probably be obviated.

## "Hold Card" to Insure Greater Safety to Workmen

Systematic and convenient methods for preventing accidents happening to men working on high-tension lines and apparatus are being used by practically all companies, the more highly perfected systems being used by the larger electric-service organizations. The

After work is complete return this card and all tags to Cedar Rapids office

4

## HOLD

Apparatus		Date Issued		Date Released	
Held for		M		Time Required	
Work to be Done					
Released by				Time Released	
Remarks					
Cards Used		A	B	C	D E F
Issued by				Called In by	

---

Date 4-A

## HOLD

APPARATUS BEARING THIS CARD  
NOT TO BE OPERATED

CARD NOT TO BE REMOVED EXCEPT BY  
ORDER OF SYSTEM OPERATOR

Placed for

On

Placed M by

Removed M by

Signed

Date 4-B

## HOLD

APPARATUS BEARING THIS CARD  
NOT TO BE OPERATED

CARD NOT TO BE REMOVED EXCEPT BY  
ORDER OF SYSTEM OPERATOR

Placed for

On

Placed M by

Removed M by

Signed

---

Date 4-C

## HOLD

Date 4-D

## HOLD

"HOLD CARD" ISSUED BY SYSTEM OPERATOR

"hold card" illustrated herewith is now in use on the lines running from the Mississippi River power plant at Keokuk, and also on the system of the Iowa Railway & Light Company, with headquarters at Cedar Rapids. Although shown only in part, the card consists of seven sections, one of which is kept by the system operator, while the smaller portions, marked A, B, C, D, E

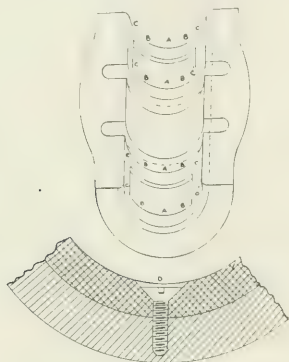


and *F*, are issued by the system operator and attached to control apparatus which if operated might energize the line upon which the men are working. When once these cards have been placed upon switches and control apparatus they are removed only by order of the system operator, and upon their removal the time is filled in the blank space and the small sections of the cards are returned to the headquarters of the system. When returned to the main office these cards, properly filled in, give a complete record of the time during which the line was out of service.

### Method of Repairing Large Warped Bearings

By J. G. KOPPEL

When large freshly rebabbitted bearings cool it occasionally happens that the metal warps, leaving a gap between the babbitt and the casting. If it is allowed to remain in this condition, there will be a tendency for the lining to become elliptical, and the shaft will have



METHOD OF REPAIRING BEARING

too much play. The accompanying drawing shows how a 5000-kva generator bearing which had become warped was fastened to the casting. Holes were drilled, countersunk and tapped at *A*, *A*, *A*, and flat-headed screws were inserted, fastening the babbitt securely to the casting. The edges of the lining were then clamped to the casing and similar holes provided for screws at *B*, *B'*, *C* and *C'*. After all screws had been set firmly with a screwdriver their heads were "tinned" and solder was poured over them until it was just flush with the inner surface of the lining. The babbitt was then scraped until it conformed with a mandrel having the same diameter as the shaft to be supported in the bearing.

### Increasing Boiler Output at Peak Loads

The capacity to which a boiler can be driven without seriously affecting its economy cannot be stated definitely, as it is quite variable and depends upon a great many local conditions. According to Mr. W. H. H. Wilson, with hand firing 125 per cent of rating is very good; with chain grate or over-feed inclined stokers 150 to 175 per cent is about the maximum for continuous operation, while with under-feed stokers with forced-draft equipment capable of producing 4 in. of air pressure in the tuyere box capacities as high as 250 to 300 per cent have been obtained with very good efficiencies and plants have been operated continuously at 200 per cent of rating with excellent results. The maintenance expense is of course increased, but when

this is calculated on the basis of tons of coal burned it will be found to be less when using a stoker capable of being driven at high ratings than with stokers using natural draft, which cannot greatly exceed the normal rating of the boiler. Locomotive boilers and marine boilers have been driven to evaporate from 18 lb. to 20 lb. of water per hour per square foot of heating surface without showing any distress in the boiler proper, and there is therefore no reason why the capacity to which stationary boilers are driven should not be increased to a point greatly above that which is now ordinarily obtained. The steaming ability of the boiler depends entirely upon the size of the stoker provided, the power of the driving mechanism to feed the coal, and the power of the forced-draft equipment to furnish the air; and, as the efficiency is not greatly affected by such forcing, it would appear that the capacity to which stationary boilers are driven should be greatly increased.

### Against Transposing Transmission Lines

Discussion regarding the advisability of transposing transmission and telephone lines occupying the same set of poles came up at the recent convention of the Indiana Electric Light Association and the trend of the argument seemed to indicate that a majority were in favor of transposing the telephone circuits at frequent intervals but carrying the high-tension circuit straight through. Representatives of one company operating transmission circuits in connection with an extensive system of interurban railways stated that it was their practice to transpose both circuits, placing a transposition in the transmission line every one-half mile and reversing the telephone wires at more frequent intervals. The telephone circuits, they say, are quite free from inductive disturbances. The idea of "doing all fancy work with the lighter stuff," however, seemed to meet with more favor, and advocates of this less complicated practice stated that they had little trouble, especially when using insulating transformers at telephone service stations.

### Proportion of Houses Wired for Electricity

How large a percentage of houses in cities with populations of 20,000 and under are wired for electricity? We have seen various estimates, but these are obviously too low. W. & CO.

From returns made to the *Electrical World* by central stations in all sections of the country, the number of houses in cities of 20,000 and less inhabitants which are equipped to use electricity varies with the localities. Returns from 100 cities of a population of 5000 or less taken at random from all parts of the country indicate that 58 per cent of the houses are wired. In cities with a population ranging from 5000 to 10,000 the percentage is 54. Thirty-two cities with population of more than 10,000 and less than 20,000 show that 60 per cent of the houses are wired. In the newer sections of the country west of the Mississippi the percentages are considerably higher than in the older sections. On the Pacific Coast the percentages run as high as 98, while in the Middle West the average is over 60 per cent. The Atlantic Coast shows the lowest percentage. These figures are not, however, absolutely accurate and would not be true of all of the cities in the country having a population of 20,000 and under. They are based on incomplete returns for the entire country and represent the conditions in progressive communities. If complete returns were available, the percentages would be doubtless lower. However, the returns for the Middle West and the Pacific Coast represent conditions accurately.

# Digest of Current Electrical Literature

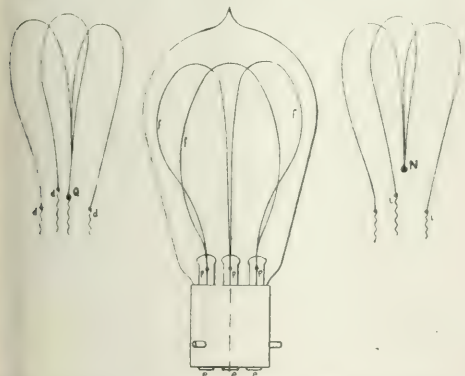
## Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

### Generators, Motors and Transformers

**Determining the Power of an Induction Motor for a Change of Voltage or Frequency.**—ROBERT MOSER.—If the mechanically produced or electrically consumed power of a single-phase or polyphase induction motor is to be determined without complicated measurements, characteristic curves are used which show the relation between current and power. But these curves, which generally can be obtained from the manufacturer, are valid only for the exact voltage and frequency for which the motor was designed. If it is to be operated at a different voltage or frequency, these curves may also be used if recourse is had to the so-called method of "corresponding load points." In this case not only the current but the voltage at the terminals and the no-load current at the new voltage must be measured. The method is explained by several examples.—*Elek. Zeit.*, Sept. 10, 1914.

### Lamps and Lighting

**Three-Phase Incandescent Lamps.**—An illustrated description of the Ernest Gerard three-phase incandescent lamp. As shown in Fig. 1, the ends of three identical filaments *fff* are connected in pairs to three points *p p p* each of which is connected with one of the external contacts *e e e*, which through the socket of the lamp make connection with the conductors of the three phases when connected in delta. If the three-phase distribution is in star connection, the three filaments start from the three points *d d d* in Fig. 2 and end in a common center point *Q*. The points *d d d* are connected with the three phases and the point *Q* with the neutral conductor. As shown in Fig. 3, it is possible in this case to use only three external connections, the neutral point *N* being left without connection to the outside.



FIGS. 1, 2 AND 3—DIAGRAMS OF THREE-PHASE INCANDESCENT LAMPS

Fig. 4 shows the construction of the socket. A bayonet joint is used. The rectangular parallelepiped on *R* is provided with three flat pieces *t t t*. The members *m m m* are in connection with the external conductors *B B B* while *m' m' m'* make connection with the elastic buttons *b b b* pressing against the contacts *e e e* of the

lamp. The switch closes the circuit when the key *K* is turned one-quarter revolution. Laboratory tests carried out with low frequencies down to fifteen cycles have shown that a very satisfactorily uniform light is obtained with this lamp, while for the same frequency single-phase lamps show a very disagreeable flicker

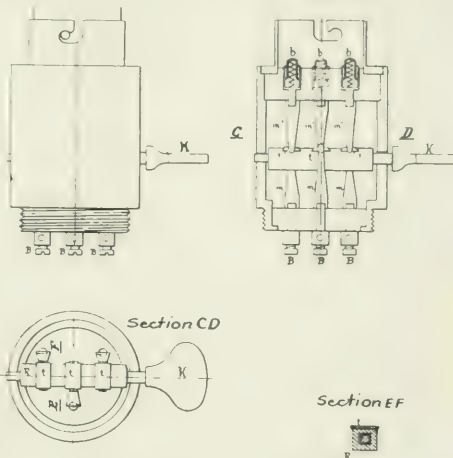


FIG. 4—SECTIONAL DIAGRAMS OF SOCKET

effect.—*Bulletin Mensuel, Société Belge des Electriciens*, July, 1914.

**Mine Lamps.**—JANZEN.—The first part of an illustrated description of a set of mine lamps of the Siemens-Schuckert company. It is shown that safety against gas explosions can be obtained by simple methods of design. The article is to be completed.—*Elek. Zeit.*, Aug. 13, 1914.

### Generation, Transmission and Distribution

**Calculation of Constant-Voltage Transmission Lines.**—H. B. DWIGHT.—The remarkable economies secured and the success in operation which has attended the use of synchronous motors on a large scale for controlling the voltage of transmission lines have placed the constant-voltage system on a footing where it must be seriously considered, either for adoption or rejection, not only by the designers of new power projects but also by those responsible for the management and operation of existing power systems of all sizes. In order to judge the new method fairly, it is necessary to make use of calculations specially adapted to constant-voltage transmission lines. In this article is given a collection of formulas which are useful in the solution of most electrical problems connected with the design of such lines.—*Elec. Journal*, September, 1914.

**Transmission System for Heavy Internal-Combustion Locomotives.**—HEDLEY J. THOMSON.—A paper read before Section G of the British Association at the recent meeting in Australia. The chief reason for the slow progress of powerful internal-combustion engines for heavy traction has been the want of a suitable



transmission system. The author describes the Thomas transmission, which comprises a mechanical system of gears operating in conjunction with two electrical machines controlled by an electrical controller. The working of the system is explained and efficiency curves are given. The advantages of the system are discussed, more especially with regard to its application to internal-combustion locomotives.—*London Electrician*, Aug. 28, 1914.

#### Traction

*Traction with Internal-Combustion Engines with Buffer Dynamo and Battery.*—L. SAINT-MARTIN.—A very long illustrated paper on electric traction with internal-combustion engines (meaning engines which utilize directly in the cylinders an explosive mixture of air and some fuel, whether gaseous, liquid or solid). The thermodynamic efficiency of such engines is from 16 per cent to 18 per cent, that of a steam locomotive only from 4 per cent to 5 per cent, and that of electric traction from 5 per cent to 6 per cent. The fuel used so far in internal-combustion engines has been rather expensive, but it is possible to use a much cheaper fuel, like crude oil, etc. Traction with internal-combustion engines has the same advantages over the steam locomotive as electric traction; that is, independence of the motor cars and a smaller first cost. Internal-combustion engines have, however, one serious disadvantage, the lack of subtle control. To overcome this disadvantage, Henri Pieper uses an electric buffer system in connection with internal-combustion engines. In this system a shunt dynamo is mounted directly on the axle of the internal-combustion engine so as to act as a fly-wheel. This machine operates as either a generator or a motor within a wide range of speed by simple regulation of the excitation. A small storage battery on the car furnishes automatically the buffer energy for the dynamo when the permissible output of the internal-combustion engine is insufficient, and it recuperates energy produced by the dynamo acting as generator when there is an excess of power. The importance of this recuperation of energy is emphasized and the advantages of this system over mechanical transmission or electrical transmission are pointed out. Several designs of cars of the Pieper system are described and illustrated and its applications are discussed.—*Bulletin Mensuel, Société Belge des Electriciens*, July, 1914.

#### Installations, Systems and Appliances

*Oil for Electrical Purposes.*—CHARLES C. GARRARD.—An article on the properties and the testing of oils used in oil switches and in oil-cooled transformers. The author discusses the influence of moisture and describes several tests for determining the presence of moisture. The best test is the measurement of the dielectric strength. He then describes the drying of oil. The greatest disadvantage of the presence of free sulphur in oil is that it attacks the copper windings. Insulation resistance is not a safe guide as to dielectric strength of oil. The insulation resistance often falls with increase in temperature, while the dielectric strength increases. This is probably due to the fact that the conduction is electrolytic, which means, of course, a negative temperature coefficient. The dielectric strength of oil is measured by the maximum electric stress or maximum difference of potential per unit of length (i. e., potential gradient) which it can withstand without breaking down. For comparative results a disk and a needle point are the most convenient electrodes for performing the break-down voltage test. For determining the exact figure of the dielectric strength the spherical electrodes may be used. The author then discusses the flash point, which is the temperature at which inflammable vapor is given off. Transformer oil which

has been in use in transformers sometimes shows a very marked lowering of the flash point. This has been traced to the presence of naphtha in the insulating compound of the transformer, which, not having been thoroughly expelled from the winding previously to being put into use, has been absorbed by the oil. For this reason it is very dangerous to bring naked flames into the neighborhood of manholes or vents in the tops of oil transformer tanks. Explosions have been caused by neglect of this precaution. Viscosity is of special importance if the oil is to be used in switches. The author then deals briefly with tests of oil for freedom from acid and alkali and numerous impurities and with routine tests of insulating oils and gives standard specifications for transformer oil and switch oil. He finally discusses under what conditions it may become necessary to change the oil in switch transformer tank and deals with the probable life of transformer oil and the formation of sludge.—*London Electrician*, Aug. 21, 1914.

#### Wires, Wiring and Conduits

*Break-Down Voltage and Height Above Sea Level.*—ALEXANDER KLEINSTUECK.—The break-down voltage in air depends on the air pressure, and therefore also on the height above sea level. This is of importance, for instance, in using suspension insulators in mountainous districts. Fig. 5 gives the relation between break-down

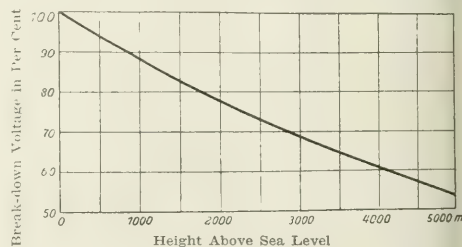


FIG. 5—CURVE SHOWING BREAK-DOWN VOLTAGE AT VARIOUS ALTITUDES

voltage and height above sea level on the basis of mathematical calculation. Ryan found, for instance, that the break-down voltage of certain insulators at a height of 1189 m above sea level was only 76,000 volts, while the manufacturer had guaranteed it to be 90,000 volts at sea level. From the diagram it is seen that at a height of 1189 m the break-down voltage is 86 per cent of the value at sea level. Since the latter was 90,000 volts, we get  $0.86 \times 90,000 = 77,300$  volts, which is almost exactly the experimental value.—*Elek. Zeit.*, Sept. 10, 1914.

*German Wiring Contractors.*—A report of the twelfth annual meeting of the Association of German Wiring Contractors. The discussions dealt especially with the competition which wiring contractors have from large corporations and from many central stations and also from municipalities and the state. A four-year apprenticeship is recommended. The tendency toward monopoly in the electrical industry is to be counteracted.—*Elek. Zeit.*, Sept. 10, 1914.

#### Electrophysics and Magnetism

*Roentgen Radiation.*—WHEELER P. DAVEY.—An account of an investigation of the factors which determine the quantity of Roentgen radiation given off by an X-ray tube. The author points out the advantages that would ensue for many purposes if the quantity of Roentgen rays could be measured in terms of the current through the tube, the potential difference across it, and the inverse square of the distance from the tube. In the author's experiments the generating plant con-

sisted of a commutator transformer machine. Two tubes were used, one with a platinum target and the other with a tungsten target. Current was measured by a moving-coil milliammeter. The potential difference across the tube was measured by radiographs of a Benoist penetrometer on Schleussner X-ray plates and reduced to readings on an electrostatic voltmeter and to approximate readings on the equivalent spark-gap between cones. The quantity of X-rays was measured by the ionization in a zero-reading electroscope especially constructed so as to compensate in large measure for "natural leak." The construction of this electroscope is described and illustrated. The author's measurements show that with a constant potential difference across the terminals of the tube (that is, constant "hardness") the ionization per second (that is, the quantity of X-rays per second) is directly proportional to the first power of the current through the tube. Except in so far as the state of vacuum in the tube helps to determine the current at a given voltage drop, it has no effect upon the quantity of radiation given off, at least within the ordinary working limits of a standard tube. For rays from a given tube, operated by a given source of emf, the quantity of radiation is directly proportional to the energy consumed in the tube. It is, therefore, necessary for any given generating outfit to measure once for all, by means of Kienböck paper or other fairly reliable method, the quantity of Roentgen rays delivered at a meter's distance per kilovolt per milliamperere per second. Thereafter all measurements of Roentgen rays produced with that outfit may be made in terms of the energy (kilovolt-milliamperere-seconds) per square meter sent through the tube, and may be translated in terms of Kienböck, Sabouraud or other accepted units for purposes of comparison with data obtained on other outfits.—*Phys. Review*, September, 1914.

*Atomistic Theory of Energy.*—SAUL DUSHMAN.—In a second article on recent views on matter and energy the author discusses the experimental evidence which has led to the view that energy is not capable of infinite subdivision. This has led to an atomistic theory of energy which is quite analogous to the older atomic theories of the structure of matter and electricity.—*Gen. Elec. Rev.*, September, 1914.

#### Electrochemistry and Batteries

*Electrochemical Industries.*—F. FOERSTER.—The first part of a paper read before the German Association of Electrical Engineers on electrochemistry and its applications in metallurgy and the chemical industries. In the present instalment the author deals with electrolytic refining of metals, the production of aluminum and sodium by electrolysis of fused electrolytes, the industries of the electrolytic production of chlorine and caustic alkali, and the applications of electro-osmosis in ceramics. The paper is to be concluded.—*Elek. Zeit.*, Sept. 10, 1914.

#### Telegraphy, Telephony and Signals

*Future Progress of Cable Telegraphy.*—H. W. MALCOLM.—The first part of an article in which an analytical study is made of the problem of increasing the speed of the submarine telegraph cable and of rendering it, if possible, distortionless. The problem is attacked from first principles in order that clear ideas may be obtained. The discussion comes under three heads: (a) Distortion and how it is produced; (b) present-day methods of reducing distortion, and (c) the loaded submarine telegraph cable. Tables and diagrams are given throughout so as to render the results readily available to those who have not the time to follow the processes by which they are obtained. In the present instalment the author discusses the production of distortion in cir-

cuits with one mesh, two meshes, three meshes, four meshes and five meshes. He shows that the speed of signaling is greatest when the capacity is continuously distributed.—*London Electrician*, Sept. 25, 1914.

#### Miscellaneous

*Electric Photographs.*—With reference to the recent description by A. Palme of a method for making electric photographs of coins, Henze remarks that when a photograph is taken of an electric spark an exact picture is obtained of the electrode placed on the photographic plate. For instance, a coin may thus be photographed. He arranged a photographic plate with the glass side on tinfoil, placed the coin on the emulsion side, and connected the tinfoil and the coin with the poles of a small static influence machine which was rotated for a short time (fifteen seconds). With this arrangement the production of the photograph is without any danger. If the influence machine does not excite itself well, it is recommended that a glass plate be placed below the tinfoil.—*Elek. Kraft. u. Bahnen*, Aug. 14, 1914.

*Strength of Welded Pipe.*—An account of tests made by F. L. Pryor on thermit-welded pipe as compared with the strength of the pipe itself and with pipe joined together by means of ordinary couplings. In every instance the welded joint was of practically the same strength as the pipe itself, while the coupling developed only from 54 per cent to 76 per cent of the strength of the pipe and always broke at the root of the thread. The thermit welder is used on ammonia, steam and hydraulic pipes.—*Reactions*, No. 3, 1914.

## Book Reviews

*THE FUTURE OF THE WORKING CLASSES.* By Roger W. Babson. American edition. Boston: Babson's Statistical Organization, Inc. 76 pages, illus. Price, 50 cents.

A study of economic facts for employers and wage earners, this book is suggestive for those who are engaged in welfare work. It is based on lectures delivered by the president of the Babson Statistical Organization at London and Paris in March and April, 1913. The desire of the author is to promote economic education and he presents convincing reasons to support his arguments. It is interesting to find that incidentally he discusses the relative economic conditions of three of the principal nations now at war—England, France and Germany—but his conclusions were based on the peaceful conditions that prevailed at the time the lectures were delivered.

*ELEMENTARY MAGNETISM AND ELECTRICITY.* By Prof. Cyril M. Jansky. New York: McGraw-Hill Book Company. 212 pages, 121 illus. Price, \$1.50.

A practical elementary treatise on magnetism and electricity as well as some of their chief applications. The book is intended either for students at their own homes or for students in evening classes at industrial schools. The ten chapters into which the book is divided relate to the following subjects: Magnetism, electromagnetism, some practical applications of electromagnets, electromagnetic induction, current electricity, electrolysis, resistance, electric generator and motor, work and energy. Each chapter ends with a recapitulation. A list of forty-four practical experiments is also given. Elementary algebra is used. The arithmetical treatment is perhaps no more difficult than is rendered necessary by the partial exclusion of the metric system of units. The illustrations are good.



# New Apparatus and Appliances

## An Illustrated Descriptive Record of Recently Developed Manufactured Products of Interest to Electrical Readers

### Electrically Lighted Spirit Level

By adding electric lighting and an inclinometer to the ordinary spirit level the Universal Level & Tool Company, 1422 Marquette Building, Chicago, Ill., has produced what is said to be one of the most marked improvements in levels made during the last sixty years. Although no larger than other levels, this tool can be used as a plumb, a grade finder, an inclinometer, a protractor, and even as a surveying instrument for land and road grading, ditch layouts and the like.

A 2-cp tungsten lamp is placed over each level tube so that an artisan at work in dark corners or on a dark day can read his instrument with speed and accuracy. Energy for lighting the lamps is supplied from ordinary small-sized dry cells placed under one butt plate of the level, individual push-button switches on the face of

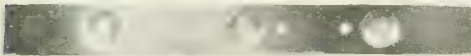


FIG. 1—ELECTRICALLY ILLUMINATED SPIRIT LEVEL, SHOWING PUSH-BUTTONS

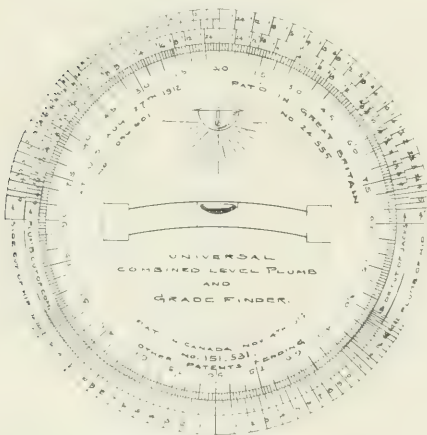


FIG. 2—INCLINOMETER USED WITH SPIRIT LEVEL

the level being used to complete the circuit from the battery to the lamp. The lamp illuminating the inclinometer level turns with the revolving dial and receives energy through sturdy sliding contacts.

The inclinometer consists of two graduated concentric brass rings, the outer fixed in the stock, the inner carrying the spirit glass revolving in the outer ring. By rotating the inner ring until the spirit level is horizontal various grades, degrees of angles, etc., can be instantly determined. The inclinometer illustrated is that of the carpenters' model graduated to show roof pitches and the cuts for all rafters in roof framing.

Improvements in this level are the invention of Mr. Daniel W. L. Frank, Chicago.

### Ceiling Receptacle

A ceiling receptacle with a flat back designed for use with 3.25-in. and 4-in. outlet boxes and for surface installations is shown in the accompanying illustration.



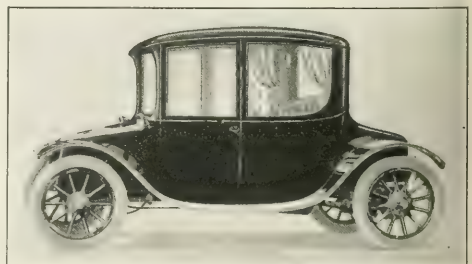
FLAT-BACK CEILING RECEPTACLE

The device is 1.5 in. high and the diameter at the base is 4.625 in. Holes for supporting screws are spaced 2.75 in. and 3.5 in. on centers. The porcelain base insulates the shell from the wall or box. This receptacle is being placed on the market by the Bryant Electric Company, Bridgeport, Conn.

### Electric Coupé

A light electrically operated coupé with seating arrangements for four persons has just been placed on the market by the Milburn Wagon Company, Toledo, Ohio. The body is hung low on cantilever springs. The battery consists of twenty cells and its rated charge is 180 amp-hr. The total distance traveled on one charge varies from 60 miles to 75 miles. The normal speed of the car is 17 miles an hour, while the maximum speed is 20 miles an hour.

A motor of General Electric manufacture is used to operate the car. Speed control and steering are accomplished by horizontal levers. If the brakes are set while the battery circuit is closed an alarm bell is au-

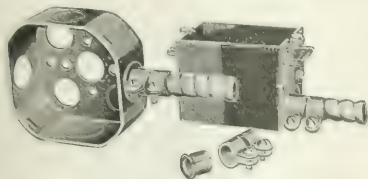


FOUR-PASSENGER ELECTRIC COUPÉ WITH MAXIMUM SPEED OF 20 MILES PER HOUR

tomatically rung. The coupé weighs approximately 2000 lb. and has a wheelbase of 100 in. The above company also has recently placed on the market a roadster which in many respects is similar in design to the coupé, and a light delivery wagon with a carrying capacity of 750 lb.

### Bushing for Flexible Metallic Conduit

A bushing which is utilized as a fastening and grounding device for armored cable and flexible metallic conduit is shown herewith. The manner of using the bushing with switchboxes and outlet boxes having flat surfaces is also illustrated. The ring is finished smooth to prevent injury to the insulation of

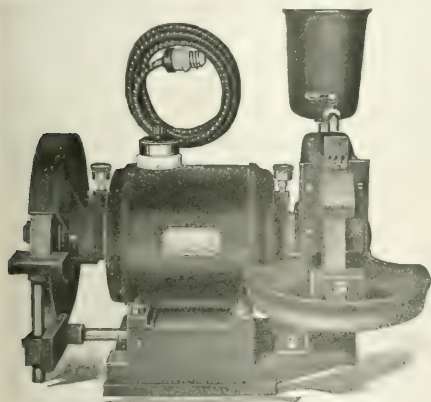


BUSHING FOR USE WITH OUTLET BOXES

the wires and is inserted from within the box. The inner end of the sleeve is turned over to fit into a groove in the ring, and after being attached to the cable or conduit the sleeve is drawn together around the ring by means of the inner screw. The more tightly it is drawn the more closely it fits into the groove and against the outer surface of the box. By using two washers the bushing will fit knockouts for 0.5-in. conduit and can be used without washers for 0.625-in. knockouts. All parts are of steel and are given a coating to prevent corrosion. The bushing has been approved by the National Board of Fire Underwriters. The device is being made by the Chicago Fuse Manufacturing Company, 1014 West Congress Street, Chicago, Ill.

### Combination Electric Wet and Dry Grinder

A combined motor-driven wet and dry grinder recently developed is shown in the accompanying illustration. The wet-grinder end is equipped with a water hopper so that additional water can be poured into the basin below when necessary. The motor is completely inclosed and is provided with a snap switch on the frame and 10 ft. of cord and a plug. It is rated at 1 hp. The



MOTOR-DRIVEN WET AND DRY GRINDER

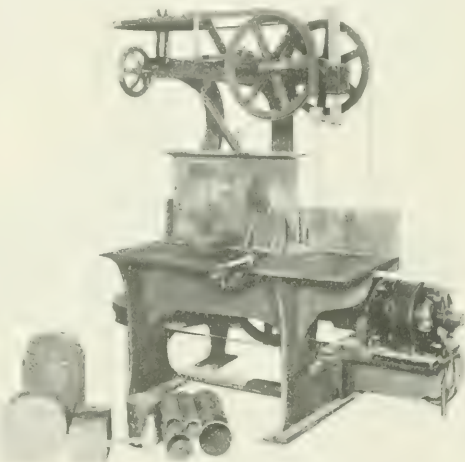
grinding wheels are amply covered with guards and are equipped with adjustable tool rests. The outfit is portable. It is being placed on the market by the Cincinnati Electrical Tool Company, Cincinnati, Ohio, and is operated by a motor made by the Robbins & Myers Company, Springfield, Ohio.

### Fixture for Lighting Small Areas

A lighting fixture for use with stitching and knitting machines, loopers, shoe machinery, etc., where the operator's attention is necessarily confined to a small area has recently been developed. The fixture is equipped with an adjustable arm so that the light can be directed in any manner desired. A 5-watt tungsten lamp is said to provide sufficient illumination for ordinary work. When not in use the lamp may be turned aside. The fixture is being placed on the market by E. I. Van Doren, 332 River Street, Troy, N. Y.

### Motor-Driven Metal Band Saw

An electrically operated band saw, designed for cutting metals as hard as tool steel, is shown in the accompanying illustration. The table is 20 in. high and the floor space covered by the machine measures 36 in. by 50 in. A  $\frac{1}{2}$ -in. blade 20 ft. 9 in. long is used. The total weight of the machine is approximately 900 lb., and it is operated by a 0.5-hp motor. The blade can



ELECTRICALLY OPERATED METAL BAND SAW

be carried 16 in. to the rear to accommodate different lengths of stock. The table is equipped with a swivel back and vise for cutting at any angle. After the saw is placed against the work the feed is automatic. This machine is being made by H. C. Williamson, 1840 West Lake Street, Chicago, Ill.

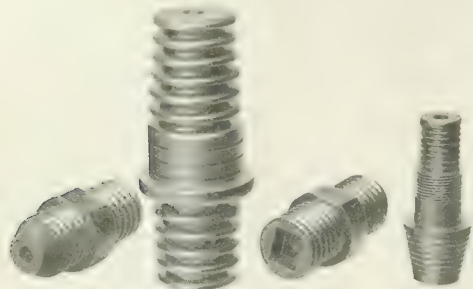
### Molded Busbar Insulators

In the accompanying illustrations are shown some one-piece busbar insulators made of the material known as "condensite." Figs. 1, 2 and 3 illustrate high-tension insulators for disconnective switches and Fig. 4 shows a molded pillar. The large insulator shown in Fig. 2 weighs approximately 5 lb., is 11.5 in. high and has a maximum diameter of 5 in. These insulators were molded by the Dickinson Manufacturing Company, Springfield, Mass., the material being supplied by the Condensite Company of America, Glen Ridge, N. J.

The material used in the manufacture of these insulators is produced by a chemical reaction between phenol and formaldehyde. When heated to a certain



point it fluxes or softens and then can be molded by pressure into any desired form. Upon further application of heat it hardens permanently, so that no further heating will soften it. In this state, the manufacturers declare, it is infusible and is insoluble in alcohol, oils, gasoline and acids. However, it will not withstand

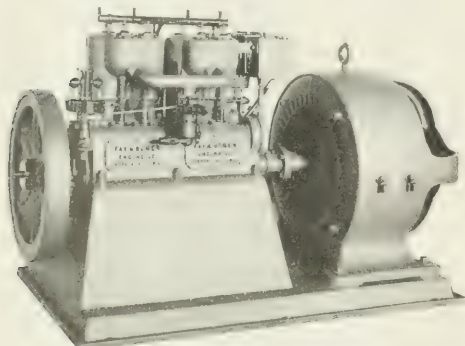


FIGS. 1, 2, 3 AND 4—ONE-PIECE BUSBAR INSULATORS

the action of caustic soda. The material when molded is very hard and retains its finish. In electrical tests it has withstood a pressure of 400 volts per mil; mechanically it has shown a tensile strength of 5000 lb. per sq. in. and a crushing strength of 25,000 lb. per sq. in. cold and 11,070 lb. per sq. in. at 218 deg. Fahr.

### Directly Connected Generating Set

In the accompanying illustration is shown a small directly connected 5.5-kw generating outfit for use on farms or factories where central-station service is not available. The engine is of the two-stroke-cycle type and is mounted on the same cast-iron base as the generator. The engine and generator are connected together by a cast-iron coupling. This set is equipped with the Bosch high-tension ignition system. For outfits of this type with small ratings magnetos only are used; for the larger sizes magnetos and battery-starting systems are employed. The switchboard used with this set consists of oil-slate panels. An underload circuit-breaker automatically disconnects the generator from the remainder of the system in case the engine

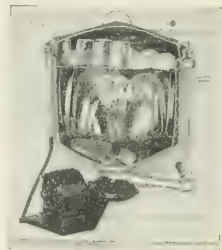


SELF-CONTAINED GENERATING OUTFIT

accidentally stops when the battery is being charged. This generating set is being placed on the market by the Fay & Bowen Company, Geneva, N. Y. The generator is made by the Crocker-Wheeler Company, Amperre, N. J., and the storage battery by the Electric Storage Battery Company, Philadelphia, Pa.

### Electric Dishwashing Machine

In the accompanying illustration is shown a sectional view of an electrically operated dishwasher which consists of a cylindrical container with a funnel-shaped bottom and an aluminum "dasher" operating at 344 r.p.m. Trays are arranged as shown, plates, saucers etc., being held on edge in an upright position on the



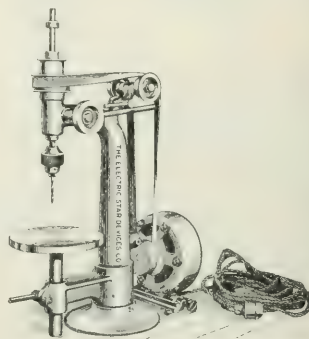
MOTOR-DRIVEN DISHWASHER

lower tray, and cups, glasses and small bowls being turned upside down on the upper tray. In the center of the lower tray is a receptacle for knives, forks and spoons. Each tray is equipped with two handles. For washing pots, pans, skillets, etc., the upper tray is removed. The cover is fitted with an automatic vent which permits the steam and air to escape without forcing up the cover. The dasher forces the water up through and between the dishes. When an operation is finished the water can be taken off through a drain at the bottom. The washer can be mounted on a wall support as shown in the illustration or on legs equipped with casters.

The Walker Brothers Company, Syracuse, N. Y., is manufacturing this electric dishwasher.

### Portable Electric Bench Grinder

The portable bench drill illustrated herewith is being manufactured by the Electric Star Devices Company, Pittsfield, Mass. The drill is approximately 27 in. high and occupies a space on the bench 22 in. by 19 in. The drill table is mounted on an arm which swings in either



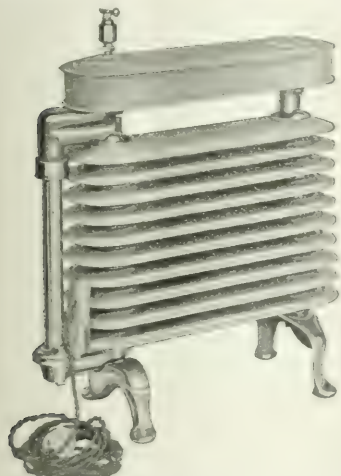
PORTABLE MOTOR-DRIVEN BENCH DRILL

direction; it is 8 in. in diameter and can be lowered or raised approximately 6 in. The drill spindle is of large diameter, thus reducing vibration, it is declared to a minimum, and permitting accurate drilling. The spindle is equipped with end-thrust bearings. The drill chuck, which is mounted on the spindle, is designed for

hold any size of twist drill up to 0.375 in. in diameter. For very accurate work an Almond, a Jacobs or a New Britain chuck is employed. Motors of 1/6-hp or 1/4-hp rating are used to operate this drill.

### Electric Hot-Water Radiator

The hot-water radiator shown herewith is equipped with a heating element in the bottom section which can be connected to any lighting socket. The total heating surface is 18 sq. ft. The equipment weighs 65 lb. when filled with water, and as the feet are polished the device can be easily pushed from one place to another. The over-all dimensions are: length, 20.5 in.; width, 6 in., and height, 22 in. This heating system has an advantage over central-boiler equipments in that the heat is generated where it is wanted and much of it is not lost, as with the latter, in an elaborate distribution network. Also with the central-boiler system the circulation must be forced through long runs of pipe and through radia-



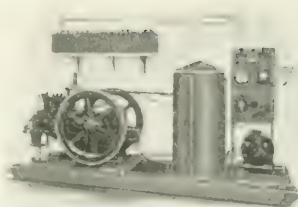
ELECTRICALLY HEATED HOT-WATER RADIATOR

ors which have dead ends, causing the circulation to be retarded.

The electrically heated radiator described is being made by the Rathbone Manufacturing Company, Grand Rapids, Mich.

### Small Generating Plant

A generating outfit consisting of a four-stroke-cycle, single-cylinder, volume-governed oil engine, shunt-round generator, storage battery, switchboard and water tank for the engine has been brought out by the Varner Lamp Company, Davenport, Ia. The generator acts as a motor in starting until the engine is brought up to speed. As an aid to the generator in this starting operation a device is provided which removes the compression. The cylinder lubricator is automatically turned off and on with the starting and stopping of the engine. The condition of the battery is determined by an ampere-hour meter. When the battery is fully charged the hand on this meter closes an electric circuit which controls the automatic switch and stops the engine. A movable contact is provided which may be set at any point on the dial so that when the hand strikes it an alarm is given, indicating that the batteries



OIL-ENGINE-DRIVEN GENERATING OUTFIT

are discharged to the point at which contact is located. In case of trouble or lack of fuel the automatic switch is opened.

### Steel Reflector

The porcelain-enameled reflector shown herewith was recently developed by the Friedley-Voshardt Company, 733 South Halsted Street, Chicago, Ill. The reflector is 18.5 in. in diameter and 5.25 in. deep. The reflecting surface is broken into diamond-shaped de-



OUTDOOR PORCELAIN-ENAMELED STEEL REFLECTOR

pressions as shown. The bell-shaped steel top serves as a protection for the socket, thus making the reflector serviceable for outside installations.

### Miniature Transformer for All-Night Service

To meet the demand for a low-burning lamp for all-night service the General Electric Company, Schenectady, N. Y., has produced a device, consisting of a miniature transformer contained in a brass shell connected to a small tungsten lamp, which may be screwed into an ordinary lighting socket. The function of the transformer is to step the line voltage down to a pressure of about 7 volts. The complete apparatus, which is called the "nite lite" transformer lamp, is designed especially for lighting door numbers, sick-rooms, etc.



FIGS. 1 AND 2—LAMP ASSEMBLED AND DISASSEMBLED



# Jobber, Dealer and Contractor

## THE ELECTRICAL CONTRACTOR'S PROBLEM

Quality of Workmanship and Material Essential to Success

—Co-operation with Jobbers, Manufacturers and Central

Stations Also Necessary

BY E. K. PATTON\*

The foundation of any business is the ultimate consumer. He must be pleased. To please him is no easy task even in an ordinary mercantile business. In contracting it is vastly more difficult because of the technical ignorance of the buying public.

The first concern of the electrical contractor who wishes to build up a permanent business institution enjoying the confidence, respect and friendship of the buying public is to educate that public to appreciate quality in electrical work and to be able to evaluate it in dollars and cents.

If a man is able to pass intelligently upon the value of something he is about to purchase, he buys quickly and confidently. He has no regrets—no misgivings. Furthermore, he is not misled by low prices into buying inferior goods.

### Obstacles Born of Electrical Ignorance

This electrical ignorance of the general public is one of the wiring contractor's greatest obstacles. The average man knows that motors turn around and drive machinery and that lamps burn and give light. Beyond this he knows and cares little. When he wishes to install electrical equipment he calls in a number of contractors and gives the work to the lowest bidder, as the only result he is looking for is that the motor should run and carry its load and the lamps give the required light. He cares nothing about the details as long as the results are there.

That is just the point. The purchaser must be shown that the results are not there, and this is the contractor's first task. The successful contractor must think, talk and execute quality. He must collect facts and figures and be prepared to demonstrate the value of quality and the danger of ignoring it.

On its face this policy may savor of philanthropy—a thankless job, a losing proposition. It is not easy to carry it out because of unscrupulous competition, and yet the writer maintains it is the only road to lasting success.

### Quality Versus Inferiority

The contractor must do one of two things: set a standard of quality, take the purchaser into full confidence and get fair prices, or suppress quality and get as high prices as possible.

The first policy will preclude competition with low-grade and irresponsible contractors. It will result in good work, satisfied customers and a good reputation that will spread with continually increasing rapidity. Such a contractor will get the intelligent buyer who appreciates quality and is willing to pay for it.

The second policy will necessitate the use of low-grade and inferior materials and cheap labor. It will require competition with the worst element of the contracting business. It will bring to the contractor those people who buy on price alone and have no conception of true value. A contractor following such a policy cannot do good work. His reputation for poor work and low prices will also spread with continually increasing rapidity and will drive him down and down the price scale until he is finally forced out of business.

### Co-operation Essential to Success

To the contractor who chooses the quality basis for his business the writer ventures to suggest the following three rules of conduct:

(1) Refuse absolutely to bid against irresponsible contractors.

(2) Co-operate with responsible contractors to raise the standards of their work and stamp out the irresponsible and low-grade class.

(3) Co-operate with the jobber, the manufacturer and the local central station to educate the general public in the appreciation of the true value of high-grade electric wiring, fittings and fixtures.

It will be observed that the keynote is co-operation. A contractor struggling along alone with his high ideals will have a good deal of hard pulling before he establishes himself in a permanently safe position. Some may feel they are forced to abandon their ideals in the struggle, but few will collapse financially. By co-operating with other high-grade contractors, jobbers and manufacturers the quality program will go through victoriously and will result in benefit to contractor and consumer alike.

The contractor, jobber, manufacturer and central station working together in friendly and intelligent co-operation will accomplish wonders. Each has his part in the great scheme and each has something to give and to receive.

### The Contractor the Base of the System

The contractor is the base of the system. He stands under it and supports it. He comes into intimate contact with the ultimate consumer. With him originate the ideas for improved methods and appliances. His duty is to raise and maintain high standards of quality, to keep in close touch with fellow contractors and work with them for the common good, to help educate the public in the appreciation of the value of good electrical work, and through the jobber to keep in close touch with the manufacturer, following closely his new developments and keeping him informed of the needs of the trade.

### The Utility of the Jobber

The jobber forms the middle section of the pyramid, equalizing and distributing the pressure between the apex, which consists of relatively few manufacturers, and the base, which comprises a large number of contractors and other consumers. At first thought one is apt to regard the jobber as a luxury and his profit as an extra burden on the consumer. However, careful second thought reveals that just the opposite is the fact.

The high-grade jobber facilitates every department of the business, and to the strictly high-grade manufacturer and contractor he is almost a necessity.

The trade can support a larger number of jobbers than it can agencies of any single manufacturer, and therefore the jobber comes into closer personal touch with the contractor and consequently can give him the best credit terms and assist him in many other ways.

The contractor saves time and money by dealing with a reliable jobber. He makes one purchase, has one shipment, one bill and one responsibility, as contrasted with one each for a number of different manufacturers. Some of these may be unknown and of questionable responsibility, and if credit is extended it must be separately arranged for in each case.

Furthermore, the jobber brings the contractor into closer touch with the manufacturer by effectively transmitting his ideas, suggestions and needs to the manufacturer and keeping him posted on new development produced by the manufacturer for saving time, labor and money.

\*Western manager Bryant Electric Company.

In its efforts to assist the dealer and suggest to his customers articles suitable for Christmas gifts, the Beardsley Chandelier Manufacturing Company, Chicago, Ill., has inaugurated an extensive campaign which embraces several interesting features. First of all, the company has prepared an attractively illustrated booklet which will be mailed to prospective gift purchasers. This publication is entitled "The Gift of Gifts" and contains numerous pertinent holiday suggestions. About Dec. 10 it is the intention of the company to follow the booklet with a post card which will bear the dealer's name. In addition to the above helps, various schemes of decorating windows and arranging stock in the store and methods of dealing with prospective buyers will be outlined. Free cuts for newspaper advertising will also be supplied to the dealers.



# Industrial and Financial News

## Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

**Manufacturer of Insulating Material Moves Factory.**—The Condensite Company of America has moved its factory from Glen Ridge, N. J., to the neighboring town of Bloomfield. The new plant will be on a piece of ground covering 2.5 acres.

**Metal-Filament Lamp Imports.**—Approximately 80 per cent of the metal-filament lamps imported in August came into the port of New York. The actual value of the lamps received in New York was \$41,401, of which \$1,075 came from Germany, \$392 from England, \$4,758 from Austria and \$35,176 from the Netherlands.

**Manufacturer of Small Lighting Plants Busy.**—The Main Electric Manufacturing Company, 219 South Beatty Street, Pittsburgh, Pa., has recently been receiving a number of orders for its lighting outfits, and prospects for the near future are very bright. This company builds plants for use on farms, estates, etc., and also for garages, villages, and small factories.

**Oklahoma's First Motor-Driven Loom.**—To introduce the weaving of cotton fabrics in Oklahoma a newspaper of Muskogee has purchased and equipped a motor-operated textile loom, which is now set up and weaving towels from native Oklahoma cotton. The establishment of cotton mills locally will, it is hoped, save the present cotton situation in the State.

**Electric Slate and Marble Drill.**—The Van Dorn Electric Tool Company, Cleveland, Ohio, recently developed a drill for slate and marble work which, it is declared, is meeting with considerable success particularly with switchboard panels, marble staircases, etc. The drill is operated by a slow-speed motor which develops a speed of about 180 r.p.m. when operating under normal load. The housing is of aluminum and the weight complete is 14 lb. The drill will make a hole 1 in. in diameter or under.

**Interest in Sectional Display Signs.**—Harvey Deschere & Company, 1501 Garden Street, Hoboken, N. J., are receiving a number of inquiries regarding their miniature sectional signs, which, it is claimed, are meeting with considerable success. As was stated in the *Electrical World* of March 21, the burning out of a lamp in any of the letters will not affect the brilliancy of any of the others in the sign. These small lamps are very durable and are said to have a life of 1000 hours. The above concern has also designed a plaque sign, the letters and backing of which are entirely of aluminum.

**Business of Bylesby Properties Good Since Outbreak of War.**—Comparisons of actual net connected-load gains made by the properties of H. M. Bylesby & Company show that more business was added during the first eight weeks of the war than during the corresponding period last year. During the eight weeks ended Sept. 25 the electrical properties gained 4737 customers, representing a connected load of 7300 kw, as compared with 4587 customers with 6999 kw connected load during the corresponding weeks in 1913. The number of already-built houses which were wired in the same period advanced from 268 to 616.

**"Thought Powders" for the Housewife.**—The Home Washing Machine Company, 54 Myrtle Avenue, Brooklyn, N. Y., is sending out an appeal to the housekeepers by means of a small scroll inclosed in an ordinary capsule. Visible through the celluloid container is the caption "Thought Powders for Housekeepers," which is followed by the admonition to "take one before and after washing." On opening the capsule and unfolding the paper one reads further: "Don't go to a doctor for that pain in your back. It is only caused by rubbing and stooping over your washtubs. The 'Walton' will cure and prevent that pain in your back and will save you doctors' bills."

**Electric-Smelting Plant to Be Enlarged.**—The Noble Electric Steel Company, Heroult, Cal., recently increased its capital stock for the purpose of enlarging its plant and increasing the output of ferro-alloys. The company has just begun making ferro-manganese and by the middle of November it is expected that 40 tons of this material will be produced a day. By that time also the company expects to have its mines sufficiently opened to take care of the increased production. The present equipment includes one 2000-kw and one 3000-kw iron furnace of the long and narrow type, one 2000-kw iron furnace of the shaft type, one 2000-kw steel furnace of the tilting type, twenty charcoal retorts, and four 5-ton unit lime kilns.

**New Lamps at New York Electrical Show.**—The Cooper Hewitt Electric Company, Hoboken, N. J., exhibited a number of its new "targon" and "diffuser" incandescent lamps at the New York electrical exposition. Ten 1800-watt "targon" lamps were placed in different parts of the large inclosure and owing to their brilliancy aided considerably in the general interior illumination. Another lamp was placed outside of the building, where at night time it was very conspicuous. The bulbs of the "diffuser" lamps are ground in such a way that glare is greatly reduced, while the loss is declared to be not more than 1.5 per cent. The company also had on display a number of its mercury-vapor lamps for motion-picture studios and for textile mills.

**Adjustable Lighting Fixture Proving Successful.**—The Adjustable Light Holder Company, Newark, N. J., has been receiving many orders for its adjustable lighting fixtures. One of these holders consists of three pairs of disks placed at the proper angles to each other to form a universal joint. These disks are hollow in the center and thus have a bearing only on the outer portion of the face. A coil spring is provided to take up the surplus cord. The lamp shade is attached to a telescoping rod which works in a metal tube. The fixture can be tilted at any angle and can be extended to a considerable distance. The above company is also placing on the market a special fixture for use with sewing machines. Recently 350 of these devices were sold to Benjamin & Jones, Newark.

**Electric Clock.**—Betts & Betts, 256 West Fifty-fifth Street, New York, have made a standing clock, 9 ft. high, for the General Electric Company. This clock is designed for exhibition purposes. The dial is of metal, 30 in. in diameter, and the minute marks are designated by small tubular lamps. The numerals are enameled in black on 25-watt round-bulb frosted lamps. The hands are special tubular lamps which receive energy by means of collector rings. The pendulum contains seventeen 10-watt frosted sign lamps, and in place of the usual pendulum ball there is a 40-watt round-bulb lamp. This clock is operated by one-minute impulses by means of a primary self-winding master clock. The clock was on display at the recent New York electrical show and will also be shown at the coming Chicago electrical show. It will be shipped to San Francisco after the close of the latter show, where it will be installed in the electrical building at the Panama-Pacific exposition.

**Electrical Machinery for the Farmers.**—The increasing interest of the farmer in everything electrical has affected the De Laval Separator Company, New York, very favorably, and its motor-driven cream separators and clarifiers are very much in demand. A new electrically operated milk clarifier has recently been developed by the above company. This machine is designed to remove sediment and other contamination from the milk and accomplishes this by centrifugal action. No strainer or filter is used. The De Laval company is also working on an electric milking apparatus which has not yet been placed on the market. It has been

found very difficult to milk a cow completely dry with the electric apparatus, and it is necessary to follow the machines by a man who finishes the operation. It is said that this difficulty has been met with all electric milking machines thus far produced.

**Large Cooling Towers.**—What is said to be one of the largest cooling-tower installations ever made is that of the Texas Power Company, Waco, Tex., which was built by the Wheeler Condenser & Engineering Company, Carteret, N. J. The towers are of the steel-shell type and are arranged in a battery 100 ft. long, 18 ft. wide and 40 ft. high. There are six pairs of 10-ft. fans operating at 250 r.p.m., which are belt-connected to motors. The water piping is so arranged that an installation of towers of the same rating can be added if desired. The present equipment is designed to cool 600,000 gal. per hour. The Wheeler company has also received a contract for a single-tower installation with a rating of 600,000 gal. per hour. The company manufactures and sells a great many units with smaller ratings.

**Orders for Gas Engines.**—The Bruce-Macbeth Engine Company, Cleveland, Ohio, has recently received orders for the following gas engines: One 150-hp four-cylinder natural-gas engine for the borough of Emporium, Pa.; one 40-hp natural-gas engine for James Hodgkin, Youngstown, Ohio; one 90-hp four-cylinder gas engine for the C. F. Jackson Company, Findlay, Ohio; two 75-hp twin-cylinder natural-gas engines for the board of public affairs, Toronto, Ohio; one 40-hp twin-cylinder artificial-gas engine for Washington University, St. Louis, Mo.; one 125-hp four-cylinder natural-gas engine for the Jeannette Glass Company, Jeannette, Pa.; one 135-hp four-cylinder gas engine for the Universal Rolling Mill Company, Bridgeville, Pa.; one 90-hp natural-gas engine for the United States Paper Goods Company, Cincinnati, Ohio; one 150-hp natural-gas engine for the McJunkin Straight Dairy Company, Pittsburgh, Pa.; one 50-hp producer-gas engine and producer for the Fessenden Light & Power Company, Fessenden, N. D., and one 150-hp natural-gas engine for the Victor Auto Parts Company, Cincinnati, Ohio. The municipality of Ford City, Pa., has recently purchased from the above company a 350-hp four-cylinder gas engine which will be connected direct to a 250-kva generator.

**Electrical Machinery for Textile Manufacturers.**—As an indication of the status of the textile industry the following orders for electrical apparatus recently received by the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., are of interest: Cheney Brothers, South Manchester, Conn., 616 textile motors and switches for looms; the Livingstone Worsted Company, Washington, R. I., one 312-kva waterwheel generator, exciter and switchboard, and a number of motors; the Princeton Mills, Trenton, N. J., 145 motors; the Botany Worsted Mills, Passaic, N. J., eleven motors; the Germania Mills, Holyoke, Mass., one 500-kw, 625-kva bleeder turbine; the Hockanum Mills, Rockville, Conn., a number of worsted loom motors and switches; William Skinner & Sons, Holyoke, Mass., several silk-loom motors and switches; the Habersham Mills, Habersham, Ga., one 250-kva generator, exciter and switchboard; the Renfrew Manufacturing Company, North Adams, Mass., a number of motors; Ritzer Brothers, Doylestown, Pa., nineteen silk-loom motors; Paul Guenther, Dover, N. J., one 150-kw direct-current generator; the Ludlow Manufacturing Associates, Ludlow, Mass., fifteen motors with an aggregate rating of 2075 hp, and the Hartford Carpet Corporation, Hartford, Conn., thirteen carpet-loom motors.

## Corporate and Financial

**Missouri Company Makes Note Offer.**—The City Light & Traction Company, of Sedalia, Mo., is offering \$25,000 6 per cent one-year coupon gold notes, dated Jan. 1, 1914. The notes are secured by first mortgage bonds of the City Light & Traction Company in the ratio of \$200 par value to every \$100 of this issue outstanding. The notes are offered at par and accrued interest to yield 6 per cent.

**Northern California Power Assessment.**—An assessment, the first, of \$2 per share has been levied upon the capital stock of this company, payable immediately. The assessment is said to be a precautionary measure. The last earnings statement of the company for the seven months ended July 31 shows an 8.3 per cent increase in gross income and a 13.6 per cent increase in net income.

**Atlantic Gas & Electric Company.**—The holders of the first lien sinking fund gold bonds, Series A and Series B, of the Atlantic Gas & Electric Company, recently declared bankrupt, have been requested by the bondholders' committee to deposit their holdings with the Guaranty Trust Company of New York by Oct. 30, 1914. The committee is composed of Messrs. Charles H. Sabin, chairman, F. W. Allen, W. H. Bennett and Frank B. Newell. Mr. W. C. Bradley is secretary of the committee.

**New Company's Mortgage.**—The Utah Light & Traction Company, the new company formed to take over the Utah Light & Railway Corporation and the Salt Lake Light & Traction Company, has been authorized to put out an unlimited issue of first and refunding mortgage bonds dated Sept. 18, 1914, and due Oct. 1, 1944, with the Bankers' Trust Company as trustee. The Utah Light & Traction Company is owned by the Utah Securities Corporation, which in turn is controlled by the Electric Bond & Share Company.

**Idaho-Oregon Protective Committee.**—The protective committee for the holders of the first and refunding bonds of the Idaho-Oregon Light & Power Company has, through its secretary, Mr. D. H. Clark, sent the following letter to the bondholders: "You have doubtless received a letter from Mr. G. S. Speer under date of Sept. 3, 1914, and of the Priest committee under date of Sept. 9, 1914, giving copy of the decision of Judge Dietrich regarding the status of \$718,000 of first mortgage bonds. We are reliably informed that from the judgment entered in accordance therewith an appeal will be taken immediately. This will necessitate another adjournment of the sale of the company's property and continue the receivership for a considerable time and involve the contending interests in further expense. Mr. Edmund Seymour, of our committee, has just returned from Idaho, where he inspected the new installation at the Ox Bow, and after advising with competent hydraulic engineers in New York he is impelled to the belief that the installation will be found to be insufficient and the power produced intermittent or inconsistent. As we read the letter referred to above, the Priest committee in the purchase of the property must provide for: Receiver's certificates or money already borrowed by the Priest committee, \$200,000; railway indebtedness (if \$718,000 of bonds are subordinated according to Judge Dietrich's decision), \$110,000; payments to sinking fund to Dec. 31, 1913, on underlying bonds claimed by trustee of underlying mortgage, \$78,460.52; total (this we estimate to exceed), \$600,000. As the Priest committee represents something less than \$2,000,000 of bonds, it will be necessary for it to make an assessment of at least 30 per cent or create a large prior lien. Evidently the Priest committee intends to purchase the property without consulting those whom it represents as to the price, condition of sale or the manner in which the necessary cash is to be raised. The committee has already incurred a great liability in becoming responsible for the funds necessary to complete the makeshift installation at the Ox Bow, which it must meet, together with the expenses of the receiver and of its committee and the requirements of the sinking fund of the underlying mortgage and the cash payment to non-consenting bondholders, by a direct assessment or prior lien that can leave but little for its depositors. This committee has endeavored to take no part in the contest, which we have felt was most unadvised and which has been carried on at so great an expense to your property by the contending interests."

### NEW YORK METAL MARKET PRICES

	Oct. 6	Oct. 13
Copper:		
Prime Lake	11.80 to 12.00	11.65 to 11.75
Electrolytic	11.80 to 11.70	11.35 to 11.45
Casting	11.50 to 11.60	11.25 to 11.35
Copper wire base	13.00 to 13.25	13.00 to 13.00
Lead	3.50	3.50
Nickel	40.00 to 45.00	40.00 to 45.00
Sheet zinc, f.o.b. smelter	8.50	8.00 to 8.50
Spelter, spot	4.90 to 5.00	4.75 to 4.85
Straits tin	31.00	30.00
Aluminum, 98 to 99 per cent	18.00 to 18.50	18.00 to 18.50

### COPPER EXPORTS

Total tons to Oct. 13	6,225
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† Nominal.



**Cities Service Company Shows Improvement.**—In a letter to the stockholders of the Cities Service Company Mr. H. L. Doherty, the president, made the following remarks on the company's progress under existing conditions: "We assume that all stockholders are keeping in touch with general developments regarding the European war and their effect on American industry and finance. The machinery of credit in this country is gradually being adjusted to overcome the sudden and unexpected strain caused by war conditions, but there have been no developments which would warrant your directors in making any change in their policy of deferring dividends. Since July 30 action has been taken by various corporations in this country discontinuing, deferring or reducing payments of interest and dividends on approximately \$2,000,000,000 of capital and to the extent of practically \$100,000,000 in annual payments to security holders. Every action of this character is depressing, but should not be interpreted as an indication of added difficulties. Few realized the potentiality of this situation in its early stages. A majority interpreted much of the subsequent news as indicative of increased distress. As a matter of fact, many recent events resulting in curtailment of credit were inevitable as a part of the work being done to correct a financial and business situation which had come about almost in a day as a result of the war. On the whole, the properties of Cities Service Company are making a satisfactory showing, with encouraging news from time to time of added improvement. Curtailment of oil exports and consequent restriction of purchases by the pipe-line companies at lower prices have unfavorably affected the revenues derived from sales of crude oil, but this situation is one which should begin to show improvement in the not distant future. Otherwise there has been no marked effect to lessen the earnings of the various properties. Here and there minor reductions in revenue have been experienced due to shutting down of factories dependent upon foreign markets for raw materials or for the sale of their finished product. Payment of bills by large consumers is not being made as promptly as usual, but this also is a situation which will be corrected as the financial and credit systems of the country slowly become adjusted to existing conditions. At Galveston, where all shipping ceased for some time after the declaration of war, conditions are rapidly improving. Some apprehension was felt for the hat industry at Danbury in anticipation of a shortage of dyes, but in view of recent developments there now seems to be no fear on that score, and a marked stimulation in business is anticipated due to the supplying of markets heretofore controlled by European hat manufacturers. In a bulletin issued by the Department of the Interior, United States Geological Survey, attention is called to the fact that practically all European zinc smelters are in the war zone and the prediction is made that a great impetus to the zinc industry in this country will result. Prices of zinc ores have already advanced, stimulating production. This will add materially to the prosperity of the gas and electric properties controlled by your company in Missouri, Kansas and Oklahoma. An unexpected development in this line is that ores are now being shipped from Australia to be smelted in this country. These shipments will enter by the port of Galveston, thus contributing to the activities of that city, and will be smelted in the district supplied with gas and electric service by subsidiaries of Cities Service Company. In addition to this, negotiations are now in progress for the purchase of large quantities of natural gas from subsidiaries for carrying on these smelting operations. If these negotiations are successfully concluded, the resulting business will add materially to the gross and net earnings of your company. On Sept. 12 an injunction was granted by the United States District Court for the Northern District of Ohio, Western Division, restraining the city of Toledo from any attempt to enforce the so-called Schreiber 3-cent-fare ordinance. The effect of this restraining order will be to increase substantially the earnings of the Toledo street railway lines. It also is very significant that the decision of Judge Killits was received with general approval by the Toledo public. Since the Toledo properties came under the present management the feeling toward the local utilities has been steadily changing until at present relations are extremely cordial."

## CONDITION OF UTILITIES IN FAR WEST

### The Pacific and Mountain States Make a Better Showing in July Than in June

The returns for the July operations of the electric-utility industry of the Pacific and Mountain States, as received by the *Electrical World*, indicate a better and firmer status than did the June figures. A June slump was experienced all through that region by both large and small companies, and the improved conditions of July are equally manifest.

TABLE I—COMPARATIVE RETURNS FOR JUNE AND JULY FROM COMPANIES IN SIX LARGE CITIES IN CALIFORNIA, WASHINGTON, OREGON, UTAH AND COLORADO, REPRESENTING OVER 60 PER CENT OF ELECTRIC-UTILITY INDUSTRY OF PACIFIC AND MOUNTAIN STATES

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
June	\$1,649,297	\$1,559,596	5.1	140,494,562	129,504,858	8.5
July	1,645,688	1,531,493	9.6	144,776,151	131,387,904	10.4

Table I shows that July earnings and outputs are far in advance of those of June for companies in San Francisco, Portland, Seattle, Denver, Salt Lake City and Spokane. These large cities represent over 60 per cent of the industry of the far West. Table II shows the conditions for six small cities. While the returns for the small cities are not

TABLE II—COMPARATIVE RETURNS FOR MAY, JUNE AND JULY FROM COMPANIES IN SIX SMALL CITIES IN NEW MEXICO, ARIZONA, WASHINGTON, WYOMING AND IDAHO, REPRESENTING LESS THAN 1 PER CENT OF THE INDUSTRY OF THE PACIFIC AND MOUNTAIN STATES

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
May	\$55,828	\$54,103	3.3	1,613,341	1,770,549	*8.8
June	54,753	55,596	*1.5	1,262,268	1,645,528	*23.3
July	58,250	56,805	3.5	1,488,635	1,756,973	*13.2

\*Decrease

as gratifying as those from the large cities, they do nevertheless show a decided improvement over June operations.

Considering the Mountain States and the Pacific States separately as shown in Tables III and IV, it is seen that the gain is not localized but is true for both territories. The greatest gain, however, was in the Mountain States. This

TABLE III—COMPARATIVE RETURNS FOR JUNE AND JULY FROM OVER 60 PER CENT OF THE CENTRAL-STATION INDUSTRY OF THE PACIFIC STATES OF CALIFORNIA, WASHINGTON AND OREGON

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
June	\$1,329,041	\$1,251,956	6.2	110,466,824	102,761,425	7.6
July	1,323,118	1,245,135	6.2	114,993,629	106,422,888	8.0

is more readily noticed in contrast with the figures for June, which represent very poor conditions. The lumping of these figures as in Table V, together with those for all the other companies not in the comparative reports, shows July to have been a very satisfactory month. Too few returns have been received for August operations from this

section of the country as yet to make any definite statement.

On the basis of the figures in Table V, rough estimates can be made for the entire central-station industry of the Pacific and Mountain States. Taking the May figure of 60 per cent as true for the whole, the increase over May, 1913, would have been \$170,000 in income and 25,000,000 kw-hr. in output. June, on the basis of the 70 per cent returns,

TABLE IV.—COMPARATIVE RETURNS FOR JUNE AND JULY FROM OVER 80 PER CENT OF THE CENTRAL-STATION INDUSTRY OF THE MOUNTAIN STATES OF COLORADO, NEW MEXICO, UTAH, ARIZONA, WYOMING, NEVADA AND IDAHO

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
June	\$565,846	\$559,962	4.8	44,859,631	39,074,902	14.8
July	586,453	528,292	11.0	44,686,495	37,832,222	18.0

would have shown an income increase of \$125,000 and an output increase of 20,000,000 kw-hr. Using the July figures, July would have shown an increase of \$24,000 in income and 17,700,000 kw-hr. increase in output. In income July has the greatest lead, having almost double the increase that June had and having more than a 40 per cent increase lead over May. In energy-output growth May showed the greatest advance, with July third. In both May and June the growth was apparently for the most part in motor load. In

TABLE V.—RETURNS RECEIVED BY THE ELECTRICAL WORLD FOR MAY, JUNE AND JULY FROM THE CENTRAL-STATION INDUSTRY OF THE PACIFIC AND MOUNTAIN STATES

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
May, 60 per cent of industry	\$1,325,729	\$1,426,885	7.0	141,800,552	126,957,045	11.0
June, 70 per cent of industry	1,891,887	1,791,918	5.8	155,326,455	141,836,377	9.6
July, 75 per cent of industry	2,212,827	2,068,249	6.8	183,160,015	169,748,887	7.0

July the growth was in higher-priced energy. A growth in higher-priced energy, which is probably energy for domestic purposes, at this time would augur well for the future months. August and September were months of industrial depression, and therefore a decrease in motor load is to be expected. If, then, the domestic load has increased as fast as it seems to have increased in July, the loss in motor load will be amply made up on the income side of the ledger.

## Business Notes

**The Triumph Electric Company,** Cincinnati, Ohio, has established an office at 114 Liberty Street, New York, and W. B. Elliot has been placed in charge.

**The Electric Machinery Company,** of Minneapolis, Minn., has opened a district office at 515 Putnam Building, Davenport, Ia., with R. B. Coleman as manager.

**The Dale Lighting Fixture Company,** 107 West Thirteenth Street, New York, has purchased the entire plant and show-rooms of the Dale company and will continue to manufacture and sell the fixtures made by the latter company.

**The Haller Consolidated Company.**—The Haller Sign Works, Inc., and the Consolidated Electric Sign Company have been merged into the Haller Consolidated Company, with offices and factory at 568 Fulton Street, Chicago, Ill.

## New Industrial Companies

**The Libson Company,** of Brooklyn, N. Y., has been incorporated with a capital stock of \$5,000 by M. J. Wilson, M. Herwitz and I. Libson, 385 Clinton Street, Brooklyn, N. Y.

**The Elliott Safety Appliance & Train Control Company,** of Springfield, Mass., has been chartered with a capital stock of \$500,000 by C. V. Elliott, F. F. Sturtevant and G. L. Maranville, of Springfield.

**The Beller Insulated Wire Company,** of Chicago, Ill., has been incorporated with a capital stock of \$20,000 by Peter Boller, William Boller and W. H. Bentley. The company intends to manufacture and deal in motors, electrical appliances, wire, machinery, etc.

**The S. L. S. Electric Company,** of Poughkeepsie, N. Y., has been incorporated with a capital stock of \$30,000 to manufacture storage batteries and auto accessories, etc. The incorporators are A. Bolognesi, Highland, N. Y.; A. M. Sherer, Poughkeepsie, and J. B. Ball, Milton.

**The Universal Conduit Manufacturing Company** has filed articles of incorporation under the laws of the State of Delaware with a capital stock of \$300,000. The company purposes to install electric wiring and other service systems. The incorporators are F. R. Hansell, Philadelphia, Pa.; G. H. B. Martin and S. C. Seymour, Camden, N. J.

## Trade Publications

**Washing Machines.**—Electric washers are described and illustrated in a booklet issued by the Meadows Manufacturing Company, Pontiac, Ill.

**Clay Products.**—Various kinds of clay products are outlined in a folder sent out by the Laclede-Christy Clay Products Company, St. Louis, Mo.

**Electric Grinder.**—A folder has been issued by the Wisconsin Electric Company, Racine, Wis., which is descriptive of a small motor-driven grinder.

**Transmission-Line Calculator.**—A device for calculating electric-circuit problems is described in a bulletin sent out by R. W. Adams, 180 Taher Avenue, Providence, R. I.

**Elevators.**—Various types of electrically operated elevators are described and illustrated in a catalog issued by the General Elevator Company, 29 Broadway, New York.

**Adjustable Lamp.**—The Halbauer-Hardman Manufacturing Company, 957 State Street, Schenectady, N. Y., has published a leaflet describing its "Liberty Bell" adjustable lamp.

**Bushings for Flexible Cable.**—Bushings for non-metallic and flexible metallic conduit are the subject of a booklet issued by the Chicago Fuse Manufacturing Company, Chicago, Ill.

**Vacuum Cleaners.**—The Clements Manufacturing Company, 601 Fulton Street, Chicago, Ill., has issued leaflets which describe its "Little Ben" and "Big Ben" electric vacuum cleaners.

**Wireless-Telephone Apparatus.**—Bulletin D-14 issued by the Radio Telephone & Telegraph Company, New York, describes and illustrates various kinds of devices for use in wireless telephony.

**Automatic Devices for Motors.**—Automatic protective and control devices for electric motors are the subject of a catalog sent out by the Rowan Electric Manufacturing Company, Baltimore, Md.

**Direct-Current Motors.**—Several different types of steel-frame direct-current motors are described and illustrated in Bulletin No. 121 published by the Robbins & Meyers Company, Springfield, Ohio.

**Electric Pumps.**—Bulletins No. 35 and 30-A and an attractive catalog entitled "Water Supply," issued by the Dayton Pump & Manufacturing Company, Dayton, Ohio, contain information on motor-driven pumps.

**Progress Report of Cedars Rapids Development.**—The fourth progress report of the work on the generating station of the Cedars Rapids (Quebec) Manufacturing & Power Company has recently been sent out.



## Personal Mention

Mr. George Miltenberger, for several years with the Public Service Company at Perry, Mo., has been made manager of the Hickman (Ky.) Electric, Ice & Water Company as successor to Mr. O. T. Moss, resigned.

Mr. G. W. Milliken, local manager of the Arkansas Valley Railway, Light & Power Company at La Junta, Col., has been elected secretary of the Merchants' Association of La Junta, which has been broadened to one having civic objects.

Mr. E. H. Le Tourneau, of the Portland (Ore.) Railway, Light & Power Company, has been appointed secretary of the Northwest Electric Light & Power Association. Mr. Le Tourneau's office will be at 602 Electric Building, Portland, Ore.

Mr. George D. Rice, who retired as general superintendent of the Omaha & Lincoln Railway & Light Company, Omaha, Neb., on Oct. 1, was presented with a cut-glass water service by the trainmen in the employ of the company as a token of esteem.

Mr. R. H. Sterling has been appointed manager of the Santa Barbara (Cal.) Gas & Electric Company. Mr. Sterling was formerly manager of the American River Electric Company of Stockton and was also at one time connected with the Pacific Gas & Electric Company.

Mr. George B. Wheeler, secretary and general manager of the Chippewa Valley Railway, Light & Power Company, Eau Claire, Wis., and a past-president of the Wisconsin Electrical Association, has resigned to devote his time to private interests. Mr. Wheeler's resignation followed twenty-three years of active management of the Eau Claire railway and light property.

Mr. A. B. Leach, president of A. B. Leach & Company, New York, has been nominated for the presidency of the Investment Bankers' Association of America, which will hold its annual convention at Philadelphia Nov. 13. Mr. George B. Caldwell, of the Continental and Commercial Trust and Savings Bank, Chicago, is the retiring president of the association, having served in that office since the formation of the association two years ago.

Mr. J. C. De Long, who has been elected president of the Empire State Gas and Electric Association, has been identified with electrical development in New York for twenty-eight years. Since 1912 he has been the president of the Syracuse (N. Y.) Lighting Company, to which he went in 1907 as vice-president and general manager, serving in that capacity until his promotion two years ago. The first position which Mr. De Long had in the electrical industry was that of general manager of the old Utica Electric Light Company, the predecessor of the present Utica Gas & Electric Company. He took this position in 1886 and after two years resigned to become identified with the Thomson-Houston Company of Lynn, Mass. He remained with that company until it became a part of the General Electric Company on the organization of the larger corporation. During his connection with this company he devoted part of his time to some of the stations in New York State. In 1891 he was made general manager of the Toledo Electric Light Company. He constructed the station at Toledo and remained there until 1896, when the company was consolidated with the railway system. Afterward he spent some time in several towns and cities in Ohio, where he engaged in reconstruction work, etc. He then returned to the East as general manager of the East Chester Electric Company, which operated in Mount Vernon and New Rochelle. Afterward this company and the Larchmont Electric Light Company were brought under the same management, al-

though the corporate identity of each was maintained. Still later these companies were taken into the consolidation of various companies under the title of the Westchester Lighting Company, then controlled by the United Gas Improvement Company. Mr. De Long became identified with the headquarters of the United Gas Improvement Company at Philadelphia and remained there, acting in various matters connected with engineering, reports, operation, etc., in connection with the many subsidiary properties until 1907, when the company acquired control of the Syracuse Lighting Company. Mr. De Long has long been an active member and official of the Empire State Association, and most of the time which he has devoted to association work has been given to its activities. He has been a vice-president for several years and has served on a number of its committees. He was chairman of the committee on schedules and a member of the calorimetry committee. He has also been active in the work which the association has done to promote a better public understanding of the affairs of the companies.

Mr. Sergius P. Grace, for more than ten years chief engineer of the Central District Bell Telephone Company in Pittsburgh, has been appointed principal assistant engineer of the Public Service Commission of New York State in the investigation and appraisal of the New York Telephone Company. Mr. Grace left Pittsburgh in 1913, shortly after the consolidation of the Central District Company with the Philadelphia Bell Company, and since that time has been in general consultation work in New York. He is past-president of the Engineers' Society of Western Pennsylvania, a graduate of the University of Michigan and an associate member of the American Institute of Electrical Engineers.

## Obituary

L. H. Arms, a resident of Chicago for forty years and prominent in the electrical supply business, died Oct. 2. He is survived by a widow, one son and one daughter.

George Seaman Searing, one of the best-known electrical men of Chicago, died Oct. 11 at the age of sixty-six years. A native of Jamaica, L. I., Mr. Searing first came to Chicago in 1885. In 1892 he became Western manager of the Hart & Hegeman Manufacturing Company, a position which he continued to hold until the time of his death. Mr. Searing was one of the early members of the Jovian Order and of the Chicago Electric Club.

Curtis E. Whittlesey.—It is with deep regret that we record the death of Curtis E. Whittlesey, for many years treasurer and secretary of the McGraw Publishing Company, Inc. He passed away at his home in Madison, N. J., Oct. 9, in his seventy-second year, and though he had been ill with pneumonia for several days, the end came suddenly. Mr. Whittlesey was born near Rochester, N. Y., in 1842 and when yet a young man entered business in Corfu, N. Y., where his industry and ability won him early success. In 1890 he joined Mr. James H. McGraw as a member of the firm which at that time published the *Street Railway Journal* and which was the predecessor of the present McGraw Publishing Company, Inc., publisher of the *Electrical World*, *Electric Railway Journal*, *Engineering Record*, *Metallurgical and Chemical Engineering*, etc. During the twenty-four years of his association with this publishing house Mr. Whittlesey had become widely known, and his judgment was constantly sought not only in the affairs of the company which he had done so much to establish but by many individuals who valued his opinions on commercial and financial questions highly. Although Mr. Whittlesey's passing came with the ripeness of years it is deeply lamented by a host of friends who loved and honored him. To have known him is a privilege. His gentle character and uprightness of life were ennobling and an inspiration to his business associates and to the community in which he lived. He leaves a wife, with whom he was united in wedlock for over fifty-one years, and three daughters, Mrs. Carl A. Felt, wife of the Rev. Carl A. Felt, of Peking University, China; Mrs. James H. McGraw, wife of the president of the McGraw Publishing Company, Inc., and Mrs. Robert E. Harned, wife of the Rev. Robert E. Harned, librarian of the Drew Theological Seminary.



J. C. DE LONG

## Construction

### New England

**BANGOR, MAINE.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Nov. 9 for the installation of an electric passenger elevator and a hydraulic lift in the United States post office at Bangor, Maine. For details see proposal columns. O. Wenderoth is supervising architect.

**ROCKLAND, MAINE.**—The Rockland, Thornton & Camden St. Ry. Co. has asked for permission to erect trolley lines on Linden, Scott, Beech and Broad Streets to supply electricity for lighting purposes.

**BURLINGTON, VT.**—A petition is being circulated asking the city of Burlington and the town of Colchester to extend the electric lamps from a point on North Avenue to Malletts Bay.

**ANDOVER, MASS.**—The new electric-lighting plant at Phillips Academy is nearing completion. The authorities will soon be able to establish a better lighting system on the school property and grounds, and it is expected that an effort will be made to co-operate with the town officials for improving the lighting system on Andover Hill.

**CAMBRIDGE, MASS.**—Mayor Good has authorized T. C. O'Hearn, city electrician, to prepare plans for an ornamental street-lighting system on Cambridge Street from Lechmere Street to the railroad crossing.

**CHESTER, MASS.**—The Chester El. Lt. Co. is considering the purchase of two small oil or producer-gas engines with a 20-kw. to 50-kw. three-wire, direct-current generator within the next two months. E. H. Roy Gardner is treasurer and manager.

**LYNN, MASS.**—Plans are being considered by the Municipal Council and the Lynn Gas & El. Co. for changing the 1516 incandescent street lamps now in use for a new type of lamps. The proposed change, it is said, can be made without additional cost to the city.

**MONTAGUE, MASS.**—The Franklin El. Lt. Co. of Turners Falls, has petitioned the Massachusetts Gas and Electric Light Commission for permission to purchase the property and franchises of the Montague El. Lt. Co. for \$3,000.

**SEEKONK, MASS.**—Arrangements have been completed by the Selectmen with the Seekonk El. Co. for the installation of a street-lighting system. About 4 miles of wire will be erected.

**TAUNTON, MASS.**—Steps have been taken by the Chamber of Commerce to promote the establishment of an ornamental street-lighting system in Taunton.

### Middle Atlantic

**BATH, N. Y.**—Bids will be received by Joseph H. Goulden, president board of trustees New York Soldiers and Sailors Home, Bath, N. Y., until Oct. 27 for alterations to electric plant, underground piping, steam, etc., at the New York State Soldiers and Sailors Home, Bath, and at the New York State Soldiers and Sailors Home, Capital, Albany. Copies of drawings and specifications may be obtained at the Department of Architecture upon deposit of \$10 for each branch of the work, to be refunded upon return of plans. Lewis F. Filcher is state architect.

**HUDSON, N. Y.**—Bids will be received by Miss Mary Hinkley, president of board of managers New York Training School, Hudson, until Oct. 23, for hospital-building construction, including heating, plumbing, electric work and electric elevator; complete hospital construction, refrigerating plant and equipment, heating, plumbing and electric work at the New York State Training School, Hudson. Drawings and specifications may be consulted at the New York office of the Department of Architecture, Room 1224, Woolworth Building; the New York Training School, Hudson, and at the office of the Department of Architecture, Capitol Albany. Copies of drawings and specifications may be obtained at the Department of Architecture, Capitol, Albany, for which a deposit of \$10 will be required upon return of plans. Lewis F. Filcher is state architect.

**NEW YORK, N. Y.**—Plans are being considered by Commissioner Williams of the Department of Water Supply, Gas and Electricity to replace the various types of arc lamps now in use for lighting the streets of the city with the new nitrogen incandescent lamps. Experiments are now being made with 500 lamps.

**NEW YORK, N. Y.**—The Public Service Commission has awarded the contract for the construction of the diagonal station at the Grand Central, extending the new Lexington Avenue line at Forty-third with the old Park Avenue line at Forty-first Street, to the Rapid Transit Construction Co., a subsidiary of the Interborough Rapid Transit Co., at \$3,097,312.

**NIAGARA FALLS, N. Y.**—The Niagara River & Eastern R. Co., recently incorporated, proposes to build an electric railway over the right-of-way of the Niagara, Lockport & Ontario Pwr. Co. between Lockport and Niagara Falls, on which is built the power transmission line running to Syracuse. E. G. Connette, of Buffalo, president of the International Ry. & Eng. Co., and A. J. H. H. H. H. H. W. Gray, of Niagara Falls; Charles Hickey, of Lockport, and E. R. Woods, of Toronto, are among the directors.

**SYRACUSE, N. Y.**—Contracts have been awarded by the New Process Gear Corp., Syracuse, for additions to its plant, to cost approximately \$100,000. The new buildings will be used for its case-hardening, carbonizing and sand-blast departments. The company is now building a new power plant.

**ALLENTOWN, PA.**—The contract for the new building for the Consol. Tel. Co. in Allentown has been awarded to W. M. Gangaware.

**BROOKVILLE, PA.**—Plans are being prepared for improvements in the lighting of the Solar El. Co. of Brookville, which will include changing the system from two-wire and three-wire direct current to three-wire, three-phase alternating current, with 2200-volt primary and 110-volt secondary circuits. The entire plant will be driven by natural-gas engines, the overhead distribution system will be used, and a number of constant-current series incandescent lamps will be installed for street-lighting. H. O. Swoboda, Empire Building, Pittsburgh, is consulting engineer.

**HARRISBURG, PA.**—Articles of incorporation have been approved at Harrisburg for the following companies: Dean Township Lt., Ht. & Pwr. Co., Munster Township Lt., Ht. & Pwr. Co., and Clearfield Lt., Ht. & Pwr. Co., all in Cameron County. Concord Township Pwr. Co., Wayne Township Pwr. Co., Waterford Township Pwr. Co., Summit Township Pwr. Co., and Lower Pwr. Co. of Iron Township, and Leboft Township Pwr. Co. all of Erie County. It is proposed to merge these six companies with the Erie Lt. Co. of Erie.

**HOLLSOPPLE, PA.**—The Victor Coal Mining Co. is reported to be contemplating equipping its mine at Hollsopple with electrically operated machinery. J. W. Fletcher is superintendent.

**PHILADELPHIA, PA.**—In connection with equipping its main line between the Broad Street Station, Philadelphia and Paoli, the Pennsylvania Railroad Co. is laying conduits so as to place its telegraph and telephone lines underground. Similar work is being done on the New York division between Jersey City and Rahway, N. J.

**BUTLER, N. J.**—Bids received by the Borough council for the installation of an electric-light system, consisting of poles, wires, equipment, etc., exceed the appropriation of \$30,000. Revised plans and specifications will be prepared.

**IRVINGTON, N. J.**—Plans are being prepared by Burton & Carey, consulting engineers, Newark, for the installation of a municipal electric-lighting plant in Irvington.

**JERSEY CITY, N. J.**—Bids will be received by the Board of Commissioners of Jersey City, Chamber of Commerce Building, Jersey City, until Oct. 23 for lighting the streets by electricity, contract to extend from date of contract to Nov. 30, 1915, or from date of contract to Nov. 30, 1919. Blank forms of bid may be obtained at the office of the chief engineer, Room 23, City Hall, Jersey City, N. J. Michael I. Fagen is chief engineer.

**NEWARK, N. J.**—The Board of Public Utility Commissioners has granted the Public Ser. El. Co. permission to issue \$3,000,000 in capital stock, the proceeds to be used for plant extensions.

**PATERSON, N. J.**—Plans are being considered by the Board of Public Utility Mayor R. H. Fordyce for the construction

of a municipal distributing system for electricity for general consumption and city lighting. It is proposed to purchase energy from the Public Service El. Co.

**SAYREVILLE, N. J.**—Bids will be received by the township committee of the township of Sayreville, Township Hall, Sayreville, until Oct. 21 for lighting the roads, alleys and lanes of the town for a period of five years from Oct. 21, 1914, the installation to consist of 15 arc lamps, 132 incandescent lamps of 32 cp and 18 40-watt lamps. Frank Hartman is chairman of committee.

**HAGERSTOWN, MD.**—Arrangements are being made by the City Council for erecting electric lamps in the section of the city lying between the creek and the terminus of the corporate limits. It is estimated that between 60 and 65 arc lamps will be required.

**HAGERSTOWN, MD.**—Tentative plans are being prepared by the Hagerstown & Frederick Ry. Co. to furnish electricity in the George's Creek region, including Midland, Mount Savage, Lonsaconing and intermediate towns. The company recently purchased the property of the Frostburg & Mfg. Co. in Frostburg, Md. J. H. Coblentz, of Frederick, is president of the railway company.

**WASHINGTON, D. C.**—Bids will be received at the Engineer Depot, Washington Barracks, D. C., until Oct. 31, for furnishing miscellaneous materials for electric lighting fixtures. For further information address Joseph E. Kuhn, Lt.-Col. of Engineers.

**WASHINGTON, D. C.**—An American consular official at Cuzco, Peru, writes that a firm desires to be put in touch with American manufacturers of electrodes for electric furnaces. Further information may be obtained by addressing No. 13,912, the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., or the branch office, Room 315, United States Custom House, New York, N. Y.

**WASHINGTON, D. C.**—A retail merchant in a South Carolina city wishes to arrange to represent American manufacturers or supply houses handling electric devices, lamps and other accessories and supplies, telephones and electric bell accessories. Further information may be obtained by addressing No. 13,918, Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., or the branch office, Room 315, United States Custom House, New York, N. Y.

### North Central

**DETROIT, MICH.**—Bids are being received by Smith, Hinchman & Grylls, architects, 710 Washington Arcade, Detroit, for the erection of a three-story building (71 ft. by 35 ft.) at 48 Atwater Street, for the Public Service Co.

**DETROIT, MICH.**—Plans are being prepared by E. R. Dunlap, it is reported, for the erection of a 32-suite apartment house at St. Aubin and Jefferson Avenues. The building will be equipped with two electric elevators, bids for which will soon be asked.

**GRAND RAPIDS, MICH.**—Bids, it is reported, will be received by Frank Vincent, superintendent of police and fire signal systems, for the installation of a new switchboard.

**GRAND RAPIDS, MICH.**—The contract for wiring the new Young Women's Christian Association Building in Grand Rapids has been awarded to the Grand Rapids El. Co.

**LANSING, MICH.**—The Board of Water Works and Electric Light Commissioners, it is reported, has purchased a site on South Pennsylvania Avenue on which an auxiliary pumping station and electric-light plant will be erected.

**MONTAGUE, MICH.**—The Village Council has accepted the proposal of the Frugale Pwr. Co., of Whitehall, to furnish electricity in Montague.

**SAGINAW, MICH.**—Plans have been approved by the City Council for a new street-lighting system on South Franklin Street and South Washington Avenue. Lamps of 60 watts and up will be tried out. Poles will be of cast iron, 14 ft. in high.

**BARBERTON, OHIO.**—Application has been made by O. C. Barber to the City Council for permission to erect electric-light poles on the city poles on his concrete plant on West Norton Avenue to his Anna Dean farm. A substation will be erected on Norton Avenue, where transformers and meters will be installed.

**RITLER, OHIO.**—A new gas engine will be purchased for the municipal elec-



tric-lighting plant for which bonds have been voted. The street-lighting system will probably be changed from arc lamps to incandescent.

**CAMDEN, OHIO**—The proposal to establish a municipal electric-light plant and water-works system, to cost about \$30,000, will be submitted to the voters on Nov. 3. Plans and specifications have been prepared by the Reliance Engineering Co., National Bank Building, Cincinnati, Ohio.

**CANTON, OHIO**—The Municipal Electric Light Department is trying out in Canton for the purpose of bringing to a vote the proposal to issue bonds to the amount of \$300,000 to provide funds for the construction of a municipal electric-light plant. The association is endeavoring to secure the construction of the plant, if possible, before the expiration of the contract held by the Canton El. Co. for lighting the city, which will be in 1916.

**HAMILTON, OHIO**—The Municipal Electric Light Department is trying out a new nitrogen street lamp with a view of replacing the lamps now in use, if it proves satisfactory. James O'Toole is superintendent.

**LIMA, OHIO**—Bids will be received by George W. Whitne, secretary state hospital commission, care Frank L. Packard, architect, New Hayden Building, Columbus, Ohio, until Nov. 6 for furnishing and installing lighting fixtures in the Ohio State Hospital. Plans and specifications are on file at the office of the architect and at the office of the hospital, Lima.

**MILLERSBURG, OHIO**—The Citizens' Lt. & Pwr. Co., of Millersburg, has applied to the State Utilities Commission for permission to purchase the property of the Millersburg El. Lt. Co.

**READING, OHIO**—Improvements are contemplated to the municipal electric-lighting plant, for which \$1,500 in bonds have been sold.

**SIDNEY, OHIO**—Application has been filed with the Public Utilities Commission by the Sidney El. Co. for permission to purchase the property of the Sidney El. Lt. Co., at a price to be agreed upon. The commission, also the poles and transmission lines of the Western Ohio Railroad and the Western Ry. Companies in the city of Sidney, for \$30,000. The Sidney El. Co. proposes to purchase electricity to supply the local service from the plant of the railway companies at St. Mary's.

**YOUNGSTOWN, OHIO**—The Mahoning Valley Wtr. Co., of Youngstown, is reported to be purchasing land for the development of water-power. D. M. Wise, civil engineer, has been engaged by the company to prepare plans for the construction of dams and rapids.

**BEATTVILLE, KY.**—The Beattyville Utilities Co., recently organized with a capital stock of \$10,000, contemplates the installation of an electric-light plant. E. Pearce Bullock, Jr., care John D. Wakefield & Co., 118 South Fifth Street, Louisville, has charge of the purchase of the equipment.

**BRANDENBURG, KY.**—Plans are being considered by W. D. Coleman, proprietor of the Doe Run Flouring Mills, it is reported, for the installation of an electric plant, to be operated by water-power.

**LEXINGTON, KY.**—Plans have been completed by the business men's committee for the installation of an ornamental lighting system in the business district. A proposition will be submitted to the Council proposing that the merchants purchase the system and the city maintain the same.

**PEBBLE, KY.**—At an election held recently the proposal to establish a municipal electric-lighting plant was carried.

**ATTICA, IND.**—Two 150-hp., high-pressure, return-tubular Frost boilers are being installed in the municipal electric-light plant. G. McDonald is general superintendent.

**COLUMBIA CITY, IND.**—Within the next few months a new 300-kw to 500-kw generating plant, consisting of a generator and engine, will be purchased for the municipal lighting plant. F. T. Schultz is superintendent.

**FRANKLIN, IND.**—The Public Service Commission has granted the Franklin Wtr., Lt. & Pwr. Co. permission to issue \$10,000 in bonds.

**GARY, IND.**—Within the next two months the Gary Ht., Lt. & Wtr. Co. expects to extend its transmission lines to East Gary. Leonard Fitzgerald is vice-president.

**GARY, IND.**—Application has been made to the Public Service Commission by H. A. Yossler, L. Moe and C. H. Maloney for permission to construct and operate an electric light and power plant in Gary.

**NEW ALBANY, IND.**—The United Gas & El. Co., of New Albany, has received authority from the Public Service Commission to issue \$25,000 in bonds.

**ATWOOD, ILL.**—At an election held Oct. 3 the proposal to issue bonds for the installation of a municipal electric-light plant was carried.

**EMDEN, ILL.**—The Emden Lt. & Pwr. Co., recently organized, expects to erect a transmission line and purchase material for same, including poles, wire, transformers. No contracts have been placed as yet.

**GRAYS LAKE, ILL.**—Bids will be received by the Village Board until Nov. 2 for furnishing one deep-well pump (capacity of 150 gal. per minute) and motor, height about 110 ft., water level 60 ft. from surface of ground, cylinder to be 200 ft. below surface of ground. All bids must be accompanied with detailed drawings, plans and specifications. D. G. White is village clerk.

**JOLIET, ILL.**—As soon as litigation now pending before the Supreme Court of the United States is disposed of the Public Ser. Co. of Northern Illinois, of Chicago, it is reported, will build a new water-works plant at Joliet, where 15,000 hp will be developed. The company also contemplates, it is stated, the erection of a new steam generating plant near Brandon Bridge, developing 12,500 hp.

**PEORIA, ILL.**—Bids will be received by the board of school inspectors of Peoria until Oct. 28 for electric work and fixtures for a new high school. Plans and specifications are on file at the office of the board.

**ST. JACOB, ILL.**—The Village Council has granted a franchise to Fred Scheurer to install an electric-lighting plant in St. Jacob. Electricity for operating the system will be obtained from the plant of the Marine Lt. & Ice Co., of Marine.

**ANTIGO, WIS.**—Plans are being considered for the installation of an ornamental street-lighting system at Antigo and placing cables underground.

**MAZMANIE, WIS.**—Plans are being considered to erect a new transmission line to the plant of the Wisconsin River Pwr. Co., near Prairie du Sac.

**PARDEEVILLE, WIS.**—Within the next six months the owners of the local electric-lighting plant will purchase some vacuum cleaners. Joseph Chandler is treasurer and manager.

**WILD ROSE, WIS.**—The Rose Milling Co., of Wild Rose, expects to change its street-lighting system from arc lamps to incandescent lamps within the next two months. E. H. Hoagland is president.

**BROOKSTON, MINN.**—Improvements are contemplated to the light and water systems, involving an expenditure of about \$6,000.

**DULUTH, MINN.**—Steps have been taken by the Hillebrand Commercial Club for the installation of an ornamental street-lighting system on Fourth Street.

**FARIBAULT, MINN.**—The Consumers' Pwr. Co. (Faribault division) has secured a contract to furnish electricity to the Minnesota Brick & Tile Co. for a period of four years.

**HARMONY, MINN.**—Within the next three months the Harmony El. Co. expects to erect a substation in Harmony and rewire the town throughout and also to purchase a new generator and transformer. The Energy to operate the system will be secured from a new dam near Preston.

**HAWLEY, MINN.**—The Board of Electric Light and Water Commissioners is considering the installation of a power pump having a capacity of 150 gal. per minute and one 2-kw, 110-125-volt exciter within the next six months and would like to receive estimates on same; second-hand machines preferred. The commissioners would like prices on ornamental poles for single lamps and would also consider second-hand poles. W. A. Lee is superintendent.

**HAYFIELD, MINN.**—The Iowa-Minneapolis Pwr. & Ltg. Co. is reported to have been granted a franchise to construct and operate an electric-lighting plant in Hayfield.

**MINNEAPOLIS, MINN.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Nov. 3, for construction of underground conduit and cable system for the city of Minneapolis. The connection between the present United States court house and post office, and new post office building in Minneapolis. For details see proposal of J. W. O. Wenderoth is supervising architect.

**ST. PAUL, MINN.**—A permit has been

issued by the Building Department for the construction of a brick and concrete power house for the new Catholic Cathedral to be erected at Salby and Farrington Avenues, to cost \$15,000.

**ST. PAUL, MINN.**—Specifications for street lighting for this coming year, being prepared by Victor H. Roehrich, director of the city testing laboratories, provide for asking for bids on nitrogen-filled lamps to replace the old inclosed-arc lamps, or at least to be used where new installations are required. If lamps installed this year prove satisfactory, it is proposed next year to do away entirely with the gasoline street lamps and replace them with incandescent lamps.

**DE WITT, IA.**—The De Witt Commercial Club has started a movement to install an ornamental street-lighting system, to cost about \$1,200.

**HAWARDEN, IA.**—The power house of the municipal electric-lighting plant was recently rebuilt and new equipment installed. The transmission lines are being extended into territory now without electrical service. S. C. Green is superintendent.

**CLARKSVILLE, MO.**—Preparations are being made for the installation of an electric light plant in Clarksville. At present a 15-kw, single-phase, 2300-volt gas-engine generating unit has been installed for temporary use. Next season it is proposed to install a transmission line to Louisiana, a distance of 16 miles, to furnish electricity there, and also to residents along the line. The city of Clarksville has contracted for a street-lighting service amounting to \$300 per year. C. K. Lee, of Bowling Green, is at the head of the project and is engineer in charge.

**CRANE, MO.**—The Crane Ice & Cold Storage Co., organized by C. F. Woodson and W. E. Montgomery, is contemplating the construction of an ice and cold storage plant. Later on the company, it is reported, will install an electric-light plant.

**ROLLA, MO.**—Bonds to the amount of \$12,000 have been voted, the proceeds to be used for improvements to the electric-light plant and water-works system.

**WESSINGTON, S. D.**—Plans are being prepared for the installation of an electric light plant in Wessington. A. G. Schuler, of Woonsocket, will have charge of the work.

**BLAIR, NEB.**—At an election held recently the proposal to issue \$35,000 in bonds for the installation of an electric-light plant was carried.

**MAXWELL, NEB.**—The Village Board has engaged the Alamo Engine & Supply Co., of Omaha, to prepare plans and estimates of cost of an electric-lighting system with a view of submitting a bond issue to the voters. The cost is estimated at approximately \$36,500.

**NORTH BEND, NEB.**—The City Council has entered into a contract with the city of Fremont whereby the municipal electric plant in Fremont will supply electricity in North Bend for a period of ten years. The city of North Bend will put in a switch at Ames and supply that town with electricity.

**KANAPOLIS, KAN.**—The Kanopolis El. Lt. Co., it is reported, is planning to extend its transmission lines into the country south and southwest of the town.

**SABETHA, KAN.**—Within the next two months the Electric Light & Water Commissioners for lighting system on three blocks (six to each block). An ornamental lighting system consisting of ornamental poles and fixtures has just been completed, standards for which were furnished by the King Foundry Co., of St. Joseph, Mo. C. A. Darby is superintendent.

## Southern States

**ORANGEBURG, S. C.**—Plans are being considered by the City Council for improvements to the municipal electric-light plant, including the installation of an ornamental battery of boilers, to cost about \$10,000.

**MADISON, GA.**—The Water and Light Commission may possibly purchase some small transformers, line wire, wiring supplies and electric irons. G. W. Hubbard is superintendent.

**ROME, GA.**—Within the next 30 days the Rome El. Lt. Co. expects to purchase three transformers, increasing the output of the substation by 2000 kw. H. J. Arnold is superintendent.

**VALDOSTA, GA.**—The Valdosta Ltg. Co. expects to purchase an air compressor for the next two months an air compressor for pumping

water or to drill a deep well and install a deep-well pump. W. G. Eager is secretary and president.

**VILLA RICA, CAL.**—The Villa Rica L. & Pwr. Co. expects to purchase within the next three months a small oilfield at Moss. W. B. Powell is general manager.

**LAKELAND, FLA.** At an election held Oct. 13 the proposal to issue \$100,000 in bonds, the proceeds to be used for enlarging the municipal electric-lighting and water-works plant and for extensions to distribution systems was carried.

**TAMPA, FLA.**—The Florida Fertilizer & Oil Co., Citizens' Bank Building, Tampa, it is reported, will receive bids until Nov. 1 for the installation of generators.

**CHATTANOOGA, TENN.**—The Chamber of Commerce is reported to be considering plans to extend the ornamental street-lighting system on Market Street.

**FAYETTEVILLE, TENN.**—Bids will be received at the office of the supervising architect, Treasurer, Department of Public Works, D. C., until Nov. 19, for construction, including mechanical equipment, lighting systems and approaches, of the United States Post office. Drawings, specifications and plans may be obtained at the above office or from the custodian of site at Fayetteville. O. Weindorfer is supervising architect.

**THOMASVILLE, ALA.**—The Thomasville Mfg. Co. is reported to be erecting a mile of transmission line and installing an additional boiler in its plant. All materials have been purchased. W. A. Scott is manager.

**BENTONVILLE, ARK.**—The Electric Light and Water Works Commissioners expect to purchase within the next three months one 75-kw. two-phase generator, one complete switchboard panel, wattmeters and one carload of materials. George A. Johnson is superintendent.

**BERRYVILLE, ARK.**—Within the next 30 days the Berryville Milling Co. expects to purchase some weather-proof wire and materials. J. W. Neff is president.

**BRINKLEY, ARK.**—Within the next few months the Brinkley Wtr. & Lt. Co. expects to purchase one 80-kw. 100-volt, three-phase, 60-cycle, 2300-volt generator. They prefer second-hand machine if in good condition. The company has recently extended its line about 3000 ft. and may furnish electricity in one or two towns about 15 miles distant and will need step-up and step-down transforming equipment and wire. J. E. Thompson is president.

**MALVERN, ARK.**—The Arkansas Lt. & Pwr. Co., which operates electric plants at Camden, Arkadelphia, Magnolia and other points in Tennessee, has filed a mortgage in favor of the City of New York, N. Y., to secure an issue of bonds, not to exceed \$1,000,000, to obtain funds to improve its proposed projects, which not only include improvements to its present plants but also the purchase of new power plants. The company is also reported to be considering erecting a power plant at Caddo Gap.

**TEXARKANA, ARK.**—The Southwestern Gas & El. Co. of Texarkana, it is reported, is contemplating the installation of a turbo-generator, which will double the output of its plant, to cost about \$70,000.

**GRETN, LA.**—The City Council is contemplating the installation of a municipal electric-light plant, to cost about \$50,000.

**MANFIELD, LA.**—Bids will be received by the town of Mansfield until Nov. 3 for furnishing and installing pumping machinery in the municipal water-works pumping plant under construction. For details see proposal columns. L. E. Colvin is city clerk.

**JET, OKLA.**—J. A. Humrichous, of Carnegie, Okla., it is reported, has been awarded a contract by the City Council to install an electric-lighting system at Jet.

**SAND SPRINGS, OKLA.**—The Sand Springs Pwr. Lt. & Wtr. Co. is planning to install an electric plant here. The company, it is understood, would like to receive prices for equipment for proposed plant, including turbine, generator and transformers.

**TISHOMINGO, OKLA.**—F. A. Gillespie, of Tulsa, is reported to have purchased a power dam (90 acres) on the Blue River, where he proposes to develop about 1500 hp.

**CRYSTAL CITY, TEX.**—The City Council has granted A. D. Riddle, of Cotulla, a franchise to construct and operate an electric light and power plant in Crystal City.

**PORT LAVACA, TEX.**—The Citizens' Lt. & Wtr. Co., recently organized, is contemplating the installation of an electric light and power plant.

## Pacific States

**SEATTLE, WASH.**—The city utilities committee has recommended to the City Council the extension of the municipal lighting service to Lake Burien, Allentown, Tuckwila, Foster and Riverton districts, which are outside of the city limits.

**PORTLAND, ORE.**—Property owners and business men on Fourth Street from Yamhill Street to Burnside Street have been granted permission by the City Council to install a system of street bracket lamps. The cost of installation and maintenance is to be borne by the property owners.

**DURHAM, CAL.**—Within the next six months the Durham Lt. & Pwr. Co. expects to purchase a few transformers, wire, electric irons, heating appliances and wiring supplies as required.

**GREENVILLE, CAL.**—The Plumas Lt. & Pwr. Co. expects to build within the next six months a new power house in Greenville and to erect about 6 miles of transmission lines, of which 4 miles are expected in the next three months; also to purchase a 550-kw. alternating-current generator, water wheel, 1700 ft. of 12-in. pipe and all necessary appliances for this installation; also several transformers, wire, meters, etc., for distribution and lighting systems, and electric cooking apparatus, vacuum cleaners and washing machines, wiring supplies to meet demands. E. C. Cox is president.

**SANTA CRUZ, CAL.**—Within the next three months the city of Santa Cruz expects to erect a new four-circuit Gamewell fire-alarm system with 25 round positive non-interfering successive boxes, requiring 1000 ft. of No. 12 insulated iron wire, and one complete switchboard with motor-generator set for charging storage battery. J. C. Geyer is superintendent of the electrical department.

**PECK, IDAHO.**—Plans are being considered by F. S. Lantz, of Spokane, to construct a saw mill and also to install an electric-light plant on the site of the old Lakin Mill, to cost approximately \$2,000.

**TRUMP, IDAHO.**—A special election will be held Oct. 20 to submit to the voters the proposal to issue \$3,000 in bonds for the installation of an electrical distributing system.

**NOGALES, ARIZ.**—The State Corporation Commission has granted the International Gas & El. Co. a certificate of convenience and necessity to establish an electric-light plant in Nogales; also to issue stock to provide funds to build a plant.

**HANNA, WYO.**—Within the next two months the Hanna Pacific Coal Co. of Hanna, expects to install one 50-kw. 2300-volt, 60-cycle, three-phase Westinghouse turbo-generator set, two 50-kw. motor-generator sets, three 25-kw. single-phase transformers and four 25-hp. single-phase transformers, and two 25-hp. induction motors for driving pumps; also Charles Hickel, chief electrician.

**BOULDER, COL.**—The Western Pwr. Co. has been granted a new franchise in Boulder. The company, it is understood, contemplates extensive improvements to its system.

**LIMON, COL.**—The Limon Brick Co., it is reported, is contemplating the installation of an electric-light system and a brick-manufacturing plant.

**ALAMOGORDO, N. M.**—The Alamogordo El. & Pwr. Co. is reported to be planning to install new engine and other equipment in its power plant.

**DEMING, N. M.**—The Phelps-Dodge Co. it is stated, contemplates the installation of an electric lighting and power plant in Deming. Albert Kohler will have charge of the work.

**LAS VEGAS, N. M.**—Plans are being considered for the installation of an ornamental lighting system on the grounds of the New Mexico Normal University in Las Vegas, bids for which will soon be asked.

## Canada

**DAUPHIN, MAN.**—Improvements have recently been made to the municipal electric-light plant, including the installation of a 225-kv. Canadian General Electric generator, with belt-driven exciter, switchboard apparatus, Goldie & McCulloch vertical engine, 100-hp boiler and jet condenser W. J. Brinkman is superintendent.

**SAULT STE. MARIE, ONT.**—The property of the Tagona Wtr. & Lt. Co., of Sault Ste. Marie, has been taken over by the town of

Sault Ste. Marie. The electric plant, it is understood, will be operated by energy supplied by the Hydro-Electric Power Commission.

**YORK, ONT.**—The West Fairbank Ratepayers' Association has applied to the York Township Council asking for street lamps to be placed on the streets of the West Fairbanks district between the city limits and Eglington Avenue.

## Miscellaneous

**PANAMA.**—Bids will be received at the office of the general purchasing officer of the Panama Canal, Washington, D. C., until Oct. 31 for furnishing steel angles, cold-rolled steel, sheet copper, electric fuses and cable connectors, lamp cord, copper wire, fuse wire, etc. Blanks and general information relating to this circular (No. 101) may be obtained from the above office or from the office of the assistant purchasing agents, 24 State Street, New York, N. Y.; 614 Whitney-Central Building, New Orleans, La., and 1056 North Point Street, San Francisco, Cal. Major F. C. Boggs, is general purchasing officer.

**PANAMA.**—Bids will be received at the office of the general purchasing officer, Panama Canal, Washington, D. C., until Oct. 20 (extension of date from Oct. 9) for furnishing electrical apparatus under Circular No. 863-H. For further information address Major F. C. Boggs, general purchasing officer.

## New Incorporations

**WILMINGTON, DEL.**—The Latin-American Car & Coal Ltg. Co. has filed articles of incorporation under the laws of the State of Delaware with a capital stock of \$700,000 for the purpose of operating lighting plants. The incorporators are S. S. Adams, J. H. M. Kennedy and M. B. F. Hawkins, of Wilmington.

**AUGUSTA, MAINE.**—The Ohio Electric Securities Co., of Augusta, has filed articles of incorporation under the laws of the State of Maine with a capital stock of \$2,500,000. The company proposes to operate electric generating plants, also to transmit and sell electricity for all purposes. E. M. Leavitt, of Winthrop, is president and treasurer.

**ST. LOUIS, MO.**—The Meldrum Bunsen Lt. Co. has been incorporated with a capital stock of \$2,000 by Philip I. Nassauer and others.

**ALBANY, N. Y.**—The Mount Whitney Pwr. & El. Corp., of Albany, has been incorporated with a capital stock of \$4,000,000 to take over the California corporation of the same name. The directors are: Harris Hammond, R. D. Hanna and T. T. Adams, of Brooklyn, N. Y.; and Charles R. Blyth, of San Francisco, Cal.

**WATERTOWN, N. Y.**—The Remington Paper & Pwr. Co. has been chartered with a capital stock of \$1,575,000. The directors are Louis Bettner, of Brooklyn, N. Y.; Nelson R. Cassell and B. Wilder, of Watertown.

**HAMILTON, OHIO.**—The Economy El. Co. has been chartered with a capital stock of \$10,000 to construct and operate electric plants with a capital stock of \$2,500,000. The directors are: Don Stuart, Robert O'Connell, William L. Spence and Egbert and E. L. Dollinger.

**HEALDTON, OKLA.**—The Colonial Pub. Ser. Co. has been incorporated with a capital stock of \$6,000 by W. Jennings, Harvey Franklin, Healdton, and E. C. Lichty, of Fort Smith, Ark.

**PORT LAVACA, TEX.**—The Citizens' Lt. & Wtr. Co. has been chartered with a capital stock of \$10,000 by R. H. Hamilton, J. H. Shelton and J. W. Tatum.

**WACO, TEX.**—The Texas Tel. Co. has been incorporated with a capital stock of \$2,000,000 to take over several telephone systems operating in central, south and east Texas, including the Brazos Valley Telegraph & Tel. Co., Waco, and the South Texas Tel. Co., of Port Arthur. The company, it is understood, contemplates the erection of new exchange building in Waco, to cost from \$75,000 to \$100,000. J. B. Earle is president of the new company.

**WHEELING, W. VA.**—The Neff-Burns El. Co. has been incorporated by E. W. S. Neff, E. J. Neff, William H. Burns, G. P. Burns and E. J. Neff. The company is capitalized at \$25,000 and proposes to generate and distribute electricity.

**TIGERTON, WIS.**—The Tigerton El. Co. has been chartered with a capital stock of \$10,000 by J. Mueller, Louis Bucksieck and T. Swanke.



# Weekly Record of Electrical Patents

## UNITED STATES PATENTS ISSUED OCT. 6, 1914.

Prepared by Robert Start Allen, 16 Exchange Place, New York, N. Y.]

- 1,112,019 (issued Sept. 29, 1914). SYSTEM FOR SECURING CONNECTIONS. REMBERT CANTON, St. Louis, Mo. App. filed Aug. 10, 1913. Uses polarized relay.
- 1,112,433. ELECTRICAL GROUND DETECTOR; H. W. Brown, Wilkinsburg, Pa. App. filed Oct. 17, 1912. Adapted for use of any circuits.
- 1,112,435. ELECTRICAL CONVERSION SYSTEM; S. Cabot, Brookline, Mass. App. filed Dec. 4, 1909. Embodies a "resonant" circuit.
- 1,112,436. ELECTRIC CONVERSION; S. Cabot, Brookline, Mass. App. filed Aug. 22, 1912. By synchronous commutation.
- 1,112,438. SYSTEM OF ELECTRICAL DISTRIBUTION AND REGULATION; F. Conrad, Swissvale, Pa. App. filed July 9, 1906. Booster generator supplements or opposes electromotive force of storage battery.
- 1,112,439. ELECTRIC-CIRCUIT-CONTROL SYSTEM; R. J. Dearborn, Wilkinsburg, Pa. App. filed Feb. 20, 1906. For alternating-current electric railway.
- 1,112,441. SYSTEM OF STORING POWER; R. A. Fessenden, Brant Rock, Mass. App. filed April 2, 1906. By windmill, reservoirs and pumps.
- 1,112,452. WINDING FOR INDUCTION MOTORS; T. Hooker, East McKeesport, Pa. App. filed Sept. 6, 1910. Squirrel-cage winding made up of slitted and folded sheet.
- 1,112,458. ARC-LIGHT ELECTRODE; I. Da-doff, Cleveland, Ohio. App. filed June 1, 1911. Contains calcium titanate.
- 1,112,466. PLUG SWITCH; G. K. Mitchell, Baltimore, Md. App. filed Dec. 23, 1911. Especially for three-wire and three-phase systems.
- 1,112,469. ANTISEPTIC HOLDER FOR TELEPHONE MOUTHPIECES; J. G. O'Donnell, Washington, D. C. App. filed Aug. 26, 1913. Holds a powdered antiseptic.
- 1,112,473. ELECTRIC SIGNAL SYSTEM FOR RAILWAYS; F. L. Pilgrim (deceased), Paterson, N. J. App. filed April 28, 1911. Signal switches operated by car movements.
- 1,112,480. DRY CELL; J. E. Runner and W. A. Pfisterer. App. filed Aug. 4, 1913. Negative electrode suspended wholly within the electrolyte.
- 1,112,482. SYSTEM OF MULTI-CURRENT DISTRIBUTION; H. M. Scheibe, Wilkinsburg, Pa. App. filed Oct. 8, 1910. Alternating-current source, storage batteries and interposed vapor rectifier.
- 1,112,497. TELEPHONE SYSTEM WITH AUTOMATIC RINGING; R. I. Utter, Chicago, Ill. App. filed Oct. 25, 1913. Interrupter prevents premature operation of control relay by an incidental momentary operation of the supervisory relay.
- 1,112,548. ELECTRIC-RAILWAY SYSTEM; E. J. Murphy, Cary, Ind. App. filed Nov. 3, 1913. Protected contact-making mechanism.
- 1,112,549. APPARATUS FOR AMPLIFYING OR DETECTING ELECTRICAL VARIATIONS; G. W. Pierce, Cambridge, Mass. App. filed Nov. 26, 1913. Frequencyless; uses a gaseous conducting medium.
- 1,112,571. MECHANISM FOR ELECTRICALLY INDICATING AND RECORDING LOCK-KEYS; A. L. Sohn, Los Angeles, Cal. App. filed Sept. 13, 1910. The form of the key selects the circuit.
- 1,112,580. DEVICE FOR OPERATING MAGNETOS; E. A. Watts, Springfield, Ohio. App. filed April 16, 1912. By which accelerated movements may be imparted to magnetos.
- 1,112,582. ELECTRIC HEATER; F. R. Whittlesy, Oakland, Cal. App. filed Oct. 7, 1913. Sectionalized and arranged so that different sections can be plugged in or cut out.
- 1,112,592. BURGLAR-ALARM DEVICE; L. H. Berg, New York, N. Y. App. filed April 18, 1913. Contacts operated by the swinging open of the door.
- 1,112,624. ELECTRIC-LAMP MOUNT; E. S. Keogh, Freeport, N. Y. App. filed Dec. 11, 1913. Lamp-holding cap which fits down over the end of an ordinary dry cell.

- 1,112,634. LIGHTNING CONDUCTOR; L. L. Mast, West Milton, Ohio. App. filed July 22, 1911. Special coupling.
- 1,112,639. CIRCUIT-BREAKER; C. H. Miller, Milwaukee, Wis. App. filed May 26, 1909. Overload switch controls the circuit of the setting winding.
- 1,112,645. SIGNAL APPARATUS; J. D. Nelson, Cincinnati, Ohio. App. filed Nov. 17, 1910. Capable of transmitting two distinct sets of signals and renders recording or indicating device operative.
- 1,112,655. APPARATUS FOR RECEIVING OR RELAYING ELECTRIC SIGNALS; G. W. Pierce, Cambridge, Mass. App. filed Aug. 5, 1913. Utilizes gaseous conductor.
- 1,112,682. ELECTRIC REGULATION; J. L. Creveling, New York, N. Y. App. filed Oct. 11, 1910. Of battery-charging dynamo.
- 1,112,721. METHOD OF PREPARING BARIUM OXIDE; L. E. Saunders, Niagara Falls, N. Y. App. filed Feb. 5, 1912. Decomposes barium sulphate by heat of electric arc.
- 1,112,743. THERMOSTAT; J. G. Wallmann, Oakland, Cal. App. filed March 18, 1913. For attachment to a radiator.
- 1,112,745. CONTROLLER FOR ELEVATORS; C. W. Wheeler, Chicago, Ill. App. filed March 18, 1907. Embodies a motor with three field windings.
- 1,112,750. ANNEALING AND TEMPERING APPARATUS; E. H. Angle and A. H. Ketchum, New London, Conn. App. filed May 6, 1914. For "dental regulating arches."
- 1,112,779. METHOD AND APPARATUS FOR FORMING METALLIC SHEETS AND THE LIKE; G. H. Forsyth, Chicago, Ill. App. filed Jan. 16, 1911. Sheet is electrically heated while in the press in which it is worked.



1,112,441—System of Storing Power

- 1,112,784. MEANS FOR CONTROLLING ELECTRIC CURRENTS; E. L. Gale, Sr., Yonkers, N. Y. App. filed May 1, 1905. Control circuit includes an extra field winding on the motor.
- 1,112,785. TRACTION ELEVATOR; E. L. Gale, Sr., Yonkers, N. Y. App. filed April 26, 1913. Special brake control.
- 1,112,788. ELECTRICAL RESISTANCE; F. W. Gore, New York, N. Y. App. filed Dec. 23, 1910. Especially for arc lamps.
- 1,112,795. IGNITER; A. B. Herrick, New York, N. Y. App. filed Nov. 30, 1912. Has means for reversing the magnetic flux through the induction coils.
- 1,112,833. AUTOMATIC REGULATION FOR ELECTRICAL APPARATUS; C. P. Poole, South Orange, N. J. App. filed April 13, 1912. Includes saturated poles and automatically controlled resistance.
- 1,112,841. SELECTOR APPARATUS; H. O. Rugh, Sandwich, Ill. App. filed Feb. 15, 1910. Double-signal selector system.
- 1,112,861. STORAGE BATTERY; A. H. Snyder, Lancaster, N. Y. App. filed Aug. 15, 1912. For submarine use.
- 1,112,862. REVERSE-PHASE SAFETY RELAY FOR MOTOR CIRCUITS; C. H. Spangler, Reading, Pa. App. filed June 4, 1913. Embodies a swinging disc segment actuated by two electromagnets.
- 1,112,882. ELECTRIC SWITCH; F. Barr, New York, N. Y. App. filed April 21, 1911. Chain-guide eyecot for pull sockets.
- 1,112,883. ELECTRIC SWITCH; F. Barr, New York, N. Y. App. filed April 29, 1912. Porcelain chain guide.
- 1,112,884. MOTOR FOR ELECTRIC SHEARS; H. M. Barner, Chicago, Ill. App. filed April 17, 1913. Solenoids act on cores attached to shear blade.

- 1,112,903. ELECTRICAL INSTALLATION; H. H. Ham, Shrewsbury, Mass. App. filed May 1, 1912. Dimmable automobile lamps by switching them in series.
- 1,112,908. TRANSFORMER; A. S. Hubbard, Belleville, N. J. App. filed Sept. 24, 1909. The number of turns in one of the transformer coils is gradually varied.
- 1,112,912. TROLLEY; H. Jolly, Michigan City, Ind. App. filed July 23, 1913. Ice scraper combined with special trolley head.
- 1,112,913. ELECTRIC-CURRENT CONVERTER; A. T. Kasley, Swissvale, Pa. App. filed Oct. 12, 1905. Embodies a conducting liquid annulus sustained within a casing by centrifugal force.
- 1,112,925. SYSTEM OF MOTOR CONTROL; W. D. Lutz, Allendale, N. J. App. filed Nov. 22, 1909. Prevents too sudden a reversal of the motor.
- 1,112,953. OUTLET FIXTURE FOR CURRENT CONDUCTORS; W. M. Webb, Philadelphia, Pa. App. filed Nov. 14, 1911. Corner elbow provided with removable water-excluding cover.
- 1,112,974. COMBINATION PRESSURE GAGE AND DEFLATION SIGNAL; J. H. Brown, Midvale, Utah. App. filed June 9, 1913. Indicates the pressure and sounds an alarm when pressure becomes too low.
- 1,112,994. SPEED INDICATOR FOR CALLING DEVICES; J. Erickson, Chicago, Ill. App. filed Oct. 30, 1911. Indicates when a calling device for an automatic telephone system is operated at the proper speed.
- 1,113,013. SYSTEM OF CAR SIGNALING FOR GRADE CROSSINGS; W. N. Johnson, Wheelersport, Pa. App. filed July 29, 1913. Lamps at sides of car are switched in when car goes over a grade crossing.
- 1,113,038. FUSE; G. Moore, Frankfort, Ind. App. filed Oct. 11, 1913. Fuse wire stretched by spring within cartridge.
- 1,113,052. SAFEGUARD LIFE AND TELEPHONE ATTACHMENT; I. E. Rosenthal, Argenta, Ark. App. filed Feb. 27, 1913. Fire-alarm system operates telephone to send in the alarm.
- 1,113,087. OIL SWITCH; H. B. Ball, New York, N. Y. App. filed Oct. 11, 1905. Pressure produced by arc at one point extinguishes the arc drawn at another break point.
- 1,113,092. BOX-SUPPORTING FLUSH PLATE; F. R. Beugler, Binghamton, N. Y. App. filed July 29, 1913. Has bifurcated lugs to which the box is adjustably attached.
- 1,113,094. SYSTEM OF SPEED REGULATION; L. E. Bogen, Milwaukee, Wis. App. filed April 19, 1909. Automatically applies an electrical load when machine increases speed beyond predetermined limit.
- 1,113,102. SAFETY SWITCH; H. W. Cheney, Milwaukee, Wis. App. filed June 6, 1910. For hoists.
- 1,113,125. THERMOSTATIC CIRCUIT-CLOSER; J. M. Johnson, Kansas City, Kan. App. filed May 1, 1912. Mercurial type.
- 1,113,126. THERMOSTAT; J. M. Johnson, Kansas City, Kan. App. filed Sept. 15, 1913. Adaptable to be screwed into ordinary lamp socket.
- 1,113,128. ANNUNCIATOR; O. M. Leich, Genoa, Ill. App. filed March 4, 1912. Combined door and jack structure for telephone work.
- 1,113,134. INDUCTION ELECTRIC FURNACE; W. S. Moody, Schenectady, N. Y. App. filed Oct. 18, 1906. Primary winding consists of a metallic tube with a metallic conductor therein.
- 1,113,138. CABLE SPLICE; A. J. Penote, Cleveland, Ohio. App. filed June 14, 1911. Arranged to insulate the spliced ends thoroughly.
- 1,113,147. MAGNETO-ELECTRIC IGNITION APPARATUS; A. Zähringer, Stuttgart, Germany. App. filed May 4, 1908. Special distributor construction.
- 1,113,149. WIRELESS RECEIVING SYSTEM; E. H. Armstrong, Yonkers, N. Y. App. filed Oct. 29, 1913. Using an "audion."
- 1,113,154. SAFETY DEVICE FOR ELECTRICALLY HEATED COOKING APPARATUS; L. G. Cope-man, Flint, Mich. App. filed Dec. 23, 1911. Has low-fusing connections.

# Electrical World

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**Central Stations and The Electric Vehicle Association**  
the Electric Vehicle convention which has just closed in Philadelphia may be regarded as marking an epoch in the industry, inasmuch as the latent hope of all those interested has been crystallized at least in one direction. It is fully realized that the one great outstanding problem is the general introduction of electric vehicles in city merchandise transportation. This problem has become an administrative one and calls for the concentration upon it of the best minds the electrical industry can command. It has been thoroughly demonstrated that of the many groups of persons interested in the general propaganda the central stations will receive the most benefit. The problem of quantity introduction, therefore, becomes the duty of the central station rather than the hope of the manufacturer. The determination reached during the convention that this responsibility would be recognized and acted upon by those in charge of central-station properties, with due regard to the magnitude of advantages likely to result to them, is a most gratifying accomplishment. This has been a latent purpose among the manufacturers for many years, and they have striven long and earnestly to bring it to practical realization. Consequently, if this one result of the Philadelphia convention were the only accomplishment, those associated in this organization would have good reason to feel much gratified.

## Politics and Monopoly

President Wilson reserved his comment on the new trust legislation for his political letter to Representative Underwood. When he omitted to talk about the legislation at the time of affixing his signature it appeared to be a reversal of a practice that he has usually followed. The country has learned to expect his views upon legislation in which he is personally interested and in general has not objected to his way of making them public. There may be some difference of opinion concerning the departure seen in his discussion of the legislation for what is obviously a campaign document, but that is, after all, purely incidental to the real opinion of the Executive on this vital subject. The industry cannot easily forget the warmly outspoken words of reassurance with which the President announced his trust legislation program. It may be that monopoly," the man of straw, was created for the purpose that it has now served in being defied, attacked and tormented by the heroic efforts of Congress. If that is all that the letter of the President means, business will not begrudge any credit that a political party asks or

claims for what it has accomplished. What is really important is that the trust legislation shall be accepted as completed; that Congress, having had its way, shall be content and leave business alone and free to prosper if it can, and that business shall be out of politics.

## Anniversary of Incandescent Lamp

October 21 is a significant day for the electric-lighting industry, in that it marks the anniversary of the invention of the incandescent lamp by Edison. It is fitting, therefore, that the day should be had in remembrance by the central stations of the country, difficult though it may be to grace it with suitable ceremony. However, no celebration of the electric-lighting industry can suffice to do honor to the genius of Edison. His is a grander, nobler and more transcendent glory. He belongs not to the electrical industry but to the world. Kings with their armies have done less to advance civilization than he. The whole universe owes him a debt such as no other living mortal can claim. Great as is the incandescent lamp, greater still, in the estimation of many, are the phonograph and motion picture. One were enough to put us all in his debt. Let us not forget, we who honor our military heroes, that there are men more deserving of immortalization than they—men who have won recognition not in war but on the battlefield of life, whose energies have been devoted to the uplift and comfort of their fellow-men. There is a mighty host of these silent heroes in the world, and leading them all is Edison.

## Maintaining the Record

For many years electric central stations have had deep pride in their inherent ability to withstand the effect of adverse conditions in general business. They have justly proclaimed to the world the reasons for their superior position. As a result of their power in this respect they have been able to obtain better terms for securities from bankers and investors. When money had to be borrowed the reputation which they have built up has been worth actual dollars in lower interest rates and higher prices of securities. The reputation which made such highly desirable savings possible is the real product of the good earnings which electrical utilities have fortunately been privileged to exhibit. It was not built up in a day; it is the result of characteristics which have marked the industry from the early days. Countless times in years past the companies have shown their happy freedom from vicissitudes which have fallen upon business generally. As



time goes on their service has become more necessary, and the great and undiminished growth of new business from year to year has overcome occasional reductions in the demand from established customers. So it has been that alike in what the financial world calls good and in what it calls bad years electrical utilities have made satisfactory records. In the present financial disturbance all of the indications still go to show that the companies are true to history. If their earnings are held well, operators may be sure that the problem of raising new capital will be solved. How long it will take the banks to restore financial equilibrium in the large centers no one can tell. Except in the South, which is still depressed by the cotton situation, there are many smaller centers throughout the country where capital is abundant and untimid. The company at Sedalia, Mo., is trying the novel plan of offering locally \$25,000 of one-year 6 per cent notes in one-hundred-dollar denomination, secured by a deposit of first mortgage bonds. Either through local capital or funds secured from the banking centers the companies will find that their wants will be supplied in time. The burden of maintaining the record untarnished rests in part on the new-business department, whose work in such times as these exerts an incalculable effect on the future of the property.

### Electromagnet as Standard of Field Strength

In a great variety of electromagnetic measurements a magnetic field of known intensity must be produced. In some cases it suffices to be able to produce this intensity at a given point. In other cases it has to be produced throughout a certain circumscribed region. Instruments of the Weston-D'Arsonval type carry about within them a substantially constant magnetic field in the narrow air-gap or air-gaps of a permanent-magnet circuit. In the shunt-wound dynamo machine a fair approximation to a uniform total useful flux is ordinarily attained. In the compound-wound machine, especially that provided with compensating field poles, the degree of approximation is yet higher.

A special form of compensated electromagnet, suitable for maintaining a substantially constant flux density in a fairly wide air-gap, has recently been described by Dr. R. Beattie in the London *Electrician*, as alluded to in our Digest. The electromagnet is provided with two magnetic circuits, one of which is nearly saturated, while the other remains of nearly constant reluctance. By opposing mmfs in these magnetic circuits the flux produced by the exciting current through the main coil rises but slowly with rise of current, owing to the influence of saturation, whereas the flux produced by the same exciting current through the auxiliary coils follows a nearly straight-line law. The merging of these two opposed fluxes in the air-gap common to both keeps the resultant practically constant over a fairly wide range of exciting current. If the apparatus were employed with a shunt winding connected to ordinary direct-current lighting mains, the flux in the gap should remain practically constant over any range of tempera-

ture, or of voltage variation, likely to be encountered practically.

A compensated magnetic field of the above type should also be capable of being used as a source of relatively feeble low-frequency sinusoidal emf for testing purposes by rotating a small coil at measured speeds within the gap. After the field intensity had once been measured by way of calibration, the little generator could be left connected all day long to the exciting mains and the magnitude as well as the emf of the generated voltage determined from the speed of rotation given to the rotor coil. In the permanent-magnet type of portable magnetic field the gap is necessarily so narrow that there is room only for the passage of a small coil to and fro, but with a stationary and more powerful electromagnet the air-gap with its steady magnetic field might become sufficiently enlarged to admit of spinning a small coil within it. It is remarkable how limited are our laboratory means for maintaining constant flux density. We ought to possess means for maintaining a fairly strong field throughout an appreciable region for laboratory purposes.

### The Bishop Creek Plant

The hydroelectric installation of the Southern Sierras Power Company, an account of which by Mr. C. O. Poole is now appearing in our columns, had its beginning about ten years ago in furnishing energy to the Nevada mining district around Goldfield. As need for electric energy in California became greater and the possibilities of the Bishop Creek location were more fully appreciated, a plan for extension was formulated and the long line connecting Bishop Creek with the San Bernardino country was built and put into service. This line stretches over nearly 240 miles practically straight-away and is joined at each end to another transmission system, the northern one running north-east into Nevada, the southern one down to and across the Mexican line, making a total stretch from the power station of about 400 miles. The whole group of generating stations along the Bishop Creek watershed on the eastern slope of the Sierra Nevada cover a distance of about 15 miles, with three capacious reservoir sites. They comprise in all seven stations, of which five are now in operation, forming a remarkable example of the complete utilization of a stream. The storage reservoirs are natural lakes ground out by glacial action.

The original station, operated under 1100 ft. head contains two 750-kw and three 1500-kw generators driven by Pelton wheels. This plant was first installed in 1905, and since then the four others, descriptions of which are contained in our articles, have been added and two more will be installed later. The first plant has 118 miles of transmission line to Goldfield and Tonopah operating at 55,000 volts, while the longer line southward is designed for 140,000 volts. The present section of the article by Mr. Poole deals particularly with the most interesting and delicate hydraulic work done in extending the series of plants.

Perhaps the most striking engineering feat performed was tapping the south lake reservoir from 600 ft. below the site of the dam, driving a tunnel into the solid granite, coming up to the lake, and breaking through the lake bottom to convert the tunnel into a pressure pipe. The end of the tunnel being 65 ft. under water, the task of cutting through involved some rather unusual work. It was actually accomplished by excavating very cautiously within about 20 ft. of the lake bottom and then cutting short laterals to provide a powder chamber for blowing up the bottom and admitting the water. The tunnel was tamped for 30 ft. with muck back of the powder, and when the 5200-lb. charge was fired the end of the tunnel was blown out into the lake. This, one of the many formidable engineering problems solved in the construction of the Bishop Creek plants, is an excellent example of the resourcefulness of the engineer brought out by facing the difficulties of such construction. Our readers will follow with interest the story of the development of this great enterprise, which involves as much of originality and thoroughness in engineering work as any hydroelectric system with which we are acquainted. It is a splendid addition to the already distinguished list of great enterprises which make the Pacific Coast pre-eminent in the work of energy transmission.

### The Need of the Railroads

The rehearing of the freight-rate-advance case by the Interstate Commerce Commission, which began this week, is the outgrowth of the plain necessities which the war put upon carriers. The commission said in effect on July 29 that the roads were not in need of more revenue so seriously as to make the desired advance in freight rates necessary; the meaning of this is that the roads were earning what they were entitled to earn, not substantially either more or less than that. If the roads, under the conditions then existing and reasonably to be anticipated, were earning a fair return, they are not now earning a return corresponding to the altered state of the money market. To be successful in the vital object of attracting continual new capital investment, the rate of return allowed to a public utility must approximate the going rate for money. Great destruction of capital has a lasting effect on money rates. Future higher money rates are as logically a consideration for the commission in freight rate-making as the volume of traffic. All of the signs show that, irrespective of fluctuations in revenue, the cost of capital for long-term and short-term borrowers of all classes will be higher. That will be one of the prices that this country will pay for war.

The reason why companies conducting a public business should be dealt with more generously than private industries at such times is that, under the theory of regulation, they are restricted in profit to a reasonable return. Unlike private industry, they may not greatly increase their rate of return in good times. If the commission keeps them from increasing the rate

of return in normal times, why is it not logical for it to keep them from decreasing their return in abnormal times? If the rule is worked to hold the roads rigidly from raising, why should it not be operated to save them from calamitous lowering? The doctrine which regulative theorists raise is peculiar. It is assumed by them that a reasonable return is consistent with good public policy and that any departure from that limit in the direction of a higher return is dangerous to the general welfare. Yet when earnings or untoward conditions threaten to make the return perilously low some one argues that general trade should not be made to pay more in order that the railroad may be protected in its position. This argument is specious, because when general trade was active and prosperous it had the benefit of the lowest living rates that the railroad could give. The situation of the carriers is one of the gravest arising from the European war, and its relief and disposition demand high and constructive statesmanship from the commission.

### Exchange and Sales for Latin America

The committee on Latin-American trade appointed by Secretary of Commerce Redfield recommends as of chief importance the establishment of a dollar exchange and the perfection of our selling machinery. Although the cautionary words in which the committee restrains over-enthusiasm need emphasis, the main interest in the report, an abstract of which is published elsewhere in this issue, centers in the constructive recommendations. The belief of the committee that the present disorganization of the trade of the United States with Latin America may best be remedied and placed on a permanent satisfactory basis by the adoption of these recommendations is not an academic conclusion but the experienced judgment of business men who know conditions. It is not alone the present emergency which makes the establishment of a direct exchange in dollars desirable. The committee cites the fact that four times in twenty-five years, with a great disturbance of the world's finances, American exporters and importers in South American trade have been injured because of their dependence on London. Whether or not this country in time shall actually substitute exchange in dollars for sterling credits or shall use the new facility merely to supplement the old is of less importance than the necessity that it shall be in a position to act independently if in the future it shall desire so to do. The conservatism with which the committee meets the question of investments is representative of the present attitude of this country toward the unknown opportunities south of us. The statement that "such investments, if judiciously made, would yield an ultimate fair return" is not the promoter's way of attracting capital to unfamiliar risks, but it begets confidence, and the further statement that they "would meanwhile provide a market for American materials which cannot now be sold" is an invitation to manufacturing companies which, either directly or through subsidiaries or friendly banks, can do this financing.



# The News of the Week

## Activities and Events in the Electrical Field— Reports of Meetings—Commission Findings, Etc.

### Federal and State Jurisdiction of Water-Powers

The National Association of Attorneys-General of the United States held its eighth annual convention in Washington on Oct. 17 to 21. Attorney-General Scott Wilson of Maine presented a paper on "Federal and State Jurisdiction of Water-Powers," in which he said that where state and federal interests join there should be confidence and joint action and not jealousy of rights or powers. The present bills before Congress to some degree indicate that the federal authorities appreciate this and are disposed to leave all local matters to the several states where possible. The question of state jurisdiction over water-powers, outside of taxation and the regulation of rates of hydroelectric public utilities, is not a wide field, because there well-recognized private rights are met.

Appreciating the value of this natural resource and the fact that Maine has more undeveloped water-power than all the other New England States together, and the possibilities of long-distance transmission of electrical energy, the Legislature of Maine has declared that it is opposed to the transmission of electrical energy generated by its water-powers out of the State, and the people of the State, Mr. Wilson said, would undoubtedly approve any act that would compel users of the electrical energy developed from her water-powers to locate within the State.

### Injunction Restrains Municipal Plant in Orrville, Ohio

The Court of Appeals at Wooster, Ohio, has issued a permanent injunction restraining the village of Orrville and its officials from selling bonds to raise money or spending money for an electric-light plant or completing a plant already begun. The village may carry the case to the Supreme Court. The Massillon Electric & Gas Company constructed a line to Orrville at a cost of \$30,000 and secured many customers for energy, but the Village Council then called an election to vote on the issue of bonds for a municipal plant. A suit for an injunction to restrain this step was begun in March by the company. The Common Pleas Court refused to grant an injunction, but the company carried the case to the Court of Appeals.

### Pennsylvania Engineers Disapprove Registration

The Pennsylvania Legislature last winter authorized the appointment of a commission to look into the advisability of the registration of engineers. Mr. F. Herbert Snow, Harrisburg, is chairman of the commission, which has held hearings in Pittsburgh, on Oct. 15 and 16, and in Philadelphia on Oct. 19. A final hearing is to be held in Harrisburg on Oct. 28. In order to insure discussion the commission prepared a bill based on that drawn up by members of five national engineering societies. The bill was not recommended for passage but was offered merely to stimulate discussion and to get the views of engineers.

At the hearing in Pittsburgh there were only three or four advocates of registration, the general sentiment being strongly opposed not only to the bill offered but to any licensing bill. At Philadelphia the experience was similar; only one engineer spoke in favor of registration. Previous to the Philadelphia hearing the Philadelphia Association of Members of the American Society of Civil Engineers discussed the matter, and it was represented before the commission by a committee, which presented a report giving the arguments of the association against any form of registration of licensing. Dr. Edgar Marburg, professor of civil engineering, University of Pennsylvania, was chairman of this committee.

The commission expects to present a preliminary report to the Governor about Nov. 1, and a final report at the end of this year.

### Annual Meeting of American Gas Institute

The ninth annual meeting of the American Gas Institute was held at the Engineering Societies Building, New York, on Oct. 21 to 23. Following the general institute meeting sessions of the manufacturing, distribution, chemical, accounting and illumination sections were held. The final session was a meeting of the entire institute. Among the papers on the program were "In Rate Fixing by Commission Should Depreciation Be Deducted from Plant Valuation?" by Dr. A. C. Humphreys, and "Accounting for Depreciation," by Mr. Halford Erickson. The committee on rates, of which Dr. William McClellan was chairman, also made a report. The other committees submitted reports, and a banquet was scheduled for the evening of Oct. 22.

### Convention of Railway Electrical Engineers at Chicago

The seventh annual convention of the Association of Railway Electrical Engineers will be held at the Hotel La Salle, Chicago, Oct. 26 to 30. During the term of the sessions the nineteenth floor of the hotel will be given over to exhibits of electrical manufacturers and supply dealers making a specialty of equipment for car-lighting and railroad service.

Following a reception on Monday evening, Oct. 26, the technical program of the convention will open Tuesday morning, Oct. 27, with an address by the president, Mr. C. R. Gilman, illuminating engineer of the Chicago, Milwaukee & St. Paul Railway, to be followed by the report of Secretary Joseph A. Andreucetti, Chicago & Northwestern Railway, Chicago. At the afternoon session reports will be submitted by the committees on loose-leaf binders for filing specifications and to keep specifications and standards to date, Mr. J. R. Sloan, chairman; on reciprocal relations, Mr. L. S. Billau, chairman; on specifications for wire crossings for potentials above 100 volts, Mr. J. R. Sloan, chairman, and on data and information, Mr. Edward Wray, chairman.

On Wednesday at the morning session reports will be submitted by the committees on standards, Mr. D.

J. Cartwright, chairman, and on headlamps, Mr. C. R. Sugg, chairman, followed by a paper entitled "Communication to and Between Trains by Telegraph-Wireless, Telephone-Wireless and Telephone," by Dr. F. H. Milner, Union Pacific Railway, Omaha, Neb. At the afternoon session reports will be submitted by the committees on industrial trucks, Mr. T. V. Buckwalter, chairman; on electric traction, Mr. H. M. Van Gelder, chairman, and on specifications, Mr. W. A. Del Mar, chairman.

On Thursday at the morning session there will be reports from the committees on axle equipment, Mr. H. R. Bucks, chairman; on head-end equipment, Mr. K. R. Hare, chairman, and on standard rules for car wiring, Mr. S. W. Everett, chairman. At the afternoon session the committee reports on outside construction and yard lighting, Mr. H. M. Warren, chairman; on illumination, Mr. L. S. Billau, chairman, and on shop practice, Mr. G. W. Cravens, chairman, will be presented.

On Friday at the morning session a report is scheduled from the committee on yard facilities for charging, Mr. D. B. Pastorius, chairman, to be followed by the election of officers. The convention will close with a dinner-dance on Friday evening, tendered the members by the Railway Electrical Supply Manufacturers' Association.

### Mr. Taft on New Trust Legislation

Ex-President Taft discussed the new trust legislation in his address as president of the American Bar Association at Washington on Oct. 20. He said that the first part of this legislation adds new machinery for the enforcement of the anti-trust acts. Second, it appears to create new offenses in that field of the law. Third, it imposes, after two years, certain restrictions upon what have been called interlocking directorates in banks and railroads, evidently with a view to prevent temptation to a suppression of competition and to monopoly. Fourth, it brings into the federal criminal jurisdiction embezzlements and other breaches of trust by directors, officers and agents of interstate carriers, and provides other restrictions to secure their fidelity.

It is hard to reach any other conclusion, after consideration of the old legislation and the new, than that unfair competition only includes those methods and practices in interstate trade the effect and intent of which would bring them within the scope and condemnation of the second and third sections of the Sherman act. The same thing is true of several specific offenses denounced in the Clayton act. The words "with the effect substantially to lessen competition" are to be construed in the light of their association with the words that follow them in order to secure some guide to the meaning of "substantially." It is possible to point out specific decisions of the Supreme Court on the anti-trust law in which just such acts as are here denounced are held to be within the Sherman law. The so-called tying provision in the sale of patented articles, as to which the Supreme Court divided, may be an exception. But with this exception, so far as Mr. Taft can see, the field of illegal and criminal effort in respect to restraints of interstate commerce or monopolies of it is not enlarged under the new acts.

The analogy between the functions of the Interstate Commerce Commission and the Federal Trade Commission is not complete. The consideration of the question of unreasonableness and undue discrimination as to rates would seem to vest in the commerce commission a much wider discretion and range of judgment, free from examination and review by the courts, than the trade commission has in finding the facts and making the restraining order as to "unfair competition."

The trade commission is merely to apply the law to the facts as a master in chancery would do.

While Mr. Taft declared that it was not germane to his purpose to discuss the effect of the prohibition of interlocking directorates and the denunciation as federal crimes of breaches of trust by those having control of interstate commerce carriers, he said that the inconvenience they may cause to law-abiding business men of scrupulous honesty will be much more than offset by the substantial good they will do in protection of the public from illegal combinations and in the protection of confiding stockholders from being plundered.

A large part of the address was devoted to the labor feature of the legislation. The great political power that labor combinations are believed to exercise has enabled them successfully, Mr. Taft said, to press upon legislatures the idea that they are politically a privileged class, that the interest of the community lies in making them so, and that their cause is so important that the ordinary means of enforcing the law against their violations of it should be weakened rather than strengthened. To yield to this view is unwise. Between the machinations of the lawless manipulator of capital and the aggressions of the lawless leader or agents of combined labor there is a forgotten man, sometimes described as the "public," for whom government and society chiefly exist, who in the clashes between capital and labor finds himself ground between the upper and the nether millstone.

The changes from existing law which the labor provisions make are not at all radical and most of them are declaratory merely of what would be law without the statute. This is a useful statute in definitely regulating procedure in injunctions and in express definition of what may be done in labor disputes. But what Mr. Taft fears is that when the statute is construed by the courts it will keep the promise of the labor leaders to the ear, and break it to the hope, of the ranks of labor. This will be an additional reason for blaming and attacking the courts. It is really a shifting of responsibility from Congress to the judicial branch of the government that has had to bear so many of such burdens, conceived in political timidity of legislators. However this may be, Mr. Taft added that we should be profoundly grateful that the impairment of the authority of our federal courts has been but small when compared with the very drastic and dangerous changes which were pressed and proclaimed as certain.

### Meeting of Patent Section of American Bar Association

The section of patent, trade-mark and copyright law of the American Bar Association met in Washington on Oct. 20, in connection with the annual convention of the association. Mr. Robert H. Parkinson, of Illinois, chairman of the section, presided. Addresses were made by Mr. Parkinson and by Patent Commissioner Ewing. Mr. Edmund Wetmore, of New York, who was to have presented a paper on "Some Aspects of the Patent Law," was unable to be present, and sent notes, which were read for him.

Mr. Parkinson said there is one modification of the patent laws which he thinks should be seriously considered and which he favors.

"We extend," he said, "to citizens of other countries privileges greatly in excess of those we receive in return. They obtain here an exclusive grant of seventeen years, for which they pay our government in the aggregate \$35. They are free to import throughout that term and are not required to manufacture or provide for manufacture here. When we seek a patent



elsewhere its longest possible term is, in the principal foreign countries, fourteen or fifteen years. The government fees exacted for these shorter terms are many times what is paid here for the longer terms and the patents become forfeited if we import into such countries the patented article after a brief period, or if we fail to work the invention there. What we confer and what we receive are very unequal. The interpretation of commerce incident to the present war thrusts upon our attention the inconveniences which may result from our omission to impose upon patents granted to aliens similar conditions of forfeiture to those imposed upon us by the laws of other countries. But any general system of compulsory license I consider wholly objectionable. Such a system would not merely deprive the franchise of most of its value and destroy inducement to make and introduce invention—it would exact such expense for determining and adjudging the terms upon which each franchise shall be apportioned as neither inventors nor most assignees of patents can afford."

Mr. Wetmore said that one remedy to relieve the delay in patent causes to a sensible degree would be the creation of one division of the equity courts for the hearing of patent causes exclusively. The practical obstacle would be the difficulty of increasing the number of judges required in some, but by no means all, of the districts. Mr. Wetmore continued:

"Another cause of complaint as to the operation of our patent laws is based on the danger believed to arise from the collection of a large number of patents under the same ownership, particularly in the case of corporations, and the fixing of the prices at which patented articles may be sold in passing from the hands of the first buyer, and in making use of the patented monopoly to impose unreasonable restrictions on trade, as in the case of refusing to sell any goods, though not covered by the patent, to those who refuse to buy the patented article or to recognize the patent. It is against these things that hostile legislation has been chiefly and almost exclusively directed. It may all be classed under the head of legislation the violation of which would support a prosecution under the Sherman law. It will be freely admitted that the provisions of the Sherman law may be applied to the way in which the ownership of a patent may be exercised, as well as the ownership of any other franchise, but in the case of patents the extremest care should be exercised that the proper scope of the limited monopoly which our law intended for the protection of inventors shall not be abridged."

### Industrial Safety Congress at Chicago

Safety topics in connection with transportation, public service and manufacturing occupied the Thursday afternoon session of the third annual congress of the National Council for Industrial Safety, held at the Hotel LaSalle, Chicago, Oct. 13 to 15. Mr. Martin J. Insull, vice-president of the Middle West Utilities Company, Chicago, acted as chairman of the public-service session and delivered an address on "Safety as a Means of Bettering the Relations Between the Public and Public-Service Corporations." Mr. Melville W. Mix, president of the Dodge Manufacturing Company, Mishawaka, Ind., spoke on "Safety as an Investment"; Mr. Ferd. C. Schwedman referred to the National Conference on Safety and Sanitation, and Mr. M. W. Alexander, of the General Electric Company, West Lynn, Mass., told of the advantages gained through the co-operation of varied interests in the national conference. At the annual banquet on Thursday evening Mr. W. H. Merrill, Underwriters' Laboratories, Chicago, spoke on the topic of "Service."

## ELECTRIC-VEHICLE CONVENTION

### The Progress of the Electric Vehicle and the Opportunities of the Cheap Electric Car Discussed

The fifth annual convention of the Electric Vehicle Association of America was held in the Bellevue-Stratford Hotel, Philadelphia, Oct. 19, 20 and 21, with a total registration of 443. A number of excellent papers were read and they elicited many interesting discussions. The assembly was markedly enthusiastic and a spirit of optimism, which seemed to be promulgated by a message of felicitation from President Woodrow Wilson, by Mayor Blankenburg of Philadelphia in his welcoming address, and by Mr. F. W. Smith of the association in his presidential address, pervaded the whole conference.

#### President Wilson's Message

Soon after the first session began, on Monday morning, Mr. E. S. Marlow, of the Potomac Light & Power Company of Washington, D. C., presented to the chairman a message which he personally brought from Washington to Philadelphia in an electric automobile from President Wilson. "It is a pleasure," the President said, "to extend my greeting and best wishes to the members of the Electric Vehicle Association of America and to express my earnest wish that their industry and all those which are connected or associated with it may prosper. It is my sincere hope that the business men of America may find for themselves and for their employees in the coming months that reward for every legitimate and intelligent endeavor which they seek and which through their skill and energy they deserve."

#### President Smith's Address

In his address Mr. F. W. Smith, the retiring president of the association, directed attention to the wonderful growth of the society and to its increasing prestige. The possibilities awaiting the American manufacturer in foreign countries, and particularly in South America, Mr. Smith remarked, are most encouraging. In view of general conditions, he continued, the output of electric vehicles during the past year may be said to be satisfactory. Unfortunately authentic figures are not available to indicate the exact number of electric vehicles in use. Mr. Smith also referred to the low-priced electric passenger car, which has interested so many of late, declaring that the one certain solution of the problem of introducing and successfully marketing such a vehicle is quantity output.

#### Report of Committee on Garages and Rates

In the report of the committee on garages and rates it was implied that the association could best be served by collecting and compiling data on the facilities offered for charging electric-vehicles outside the larger centers of population. For this reason the development of a route plan was followed and it was decided to collect information regarding charging facilities along the Lincoln highway first.

Mr. G. H. Kelly, in the discussion following the reading of this report, asserted that the drawback of choosing the route plan is that the public is liable to form the erroneous opinion that the electric passenger vehicle is a touring car, and that therefore the value of publicity obtained in such a way was questionable.

Mr. E. S. Mansfield stated that the committee was looking ahead and had in consideration the possibility of the electric car at some future time becoming suitable for touring purposes.

#### Parcel-Post Delivery

The committee on parcel-post delivery, through its chairman, Mr. James H. McGraw, stated that the electric

vehicle has not received from the postal authorities the consideration that it deserves. Considerable effort has been made to bring the merits of the electric vehicle for such service to the attention of the authorities at Washington, and in this work the committee has co-operated with a committee from the National Electric Light Association.

The paper was discussed by Messrs. W. P. Kennedy and P. D. Wagoner, the former asking central stations and manufacturers to co-operate to obtain consideration for the electric vehicle in thirty cities where mail-carrying contracts are about to expire and the latter telling of conditions in New York, where fifty electric trucks are now used in mail service.

We append herewith abstracts of some of the most important papers presented, reserving the others for publication in a subsequent issue.

#### Stimulating Progress of Electric Vehicles

Mr. James H. McGraw, in a paper entitled "Stimulating Electric-Vehicle Progress," advanced three causes for the retardation of the electric-vehicle industry—first, the novel character of the business; second, the inability of those responsible for the administrative conduct of the business to open new fields; third, the defective collaboration of central-station companies. It is essential, Mr. McGraw stated, to secure for the electric vehicle of either the passenger or commercial type a consideration on utilitarian grounds. The total annual rail tonnage in this country is over a billion and a half, and it is safe to assume that at least one-third of the material transported finally reaches the principal cities and is carted at least twice over a distance of one mile. If electric vehicles were used to transport this tonnage, the electric load available to central stations would be enormous. Assuming that the freight was handled only once for 1,000,000,000 ton-miles at an average energy consumption of 5 kw-hr. per ton-mile, the gross income from energy at a 4-cent rate would be \$200,000,000 per annum. What the situation really needs, Mr. McGraw declared, is a much more serious recognition of the business features of the entire project.

#### Discussion

President Smith remarked in opening the discussion of Mr. McGraw's paper that the author not only pointed out the way, but also suggested a plan of action which in the case of the central station will encourage thought in the development of a greater electric-vehicle load.

Mr. G. H. Kelly declared that there is a dearth of knowledge regarding the performance of electric vehicles. The electric vehicle will come into its own more quickly, he asserted, if its possibilities are advertised from one end of the country to the other. To accomplish this the central stations must co-operate and share the expense of advertising. This burden for the manufacturers alone would be too heavy.

Mr. W. P. Kennedy stated that the average price paid for an electric vehicle is \$2,600 and the average income of the central stations for electricity to charge it is 10 per cent of the initial cost, or \$260 per annum a vehicle. In ten years, therefore, the central stations' income for that car would be equal to its initial cost.

#### Disseminating Electric-Vehicle Information

In his paper entitled "A Wider Dissemination of Electric-Vehicle Information," Mr. T. I. Jones declared that the best way of advertising the electric vehicle is by word of mouth. The manufacturers are accomplishing a good work, but difficulty has been had in persuading them to demonstrate their cars. Mr. Jones avowed that in Brooklyn much success has been obtained by following up letters of inquiry by personal calls. Many central-station men consider the electric pleasure car too ex-

pensive. Of the automobiles registered up to July 1, 1914, Mr. Jones stated that the individual cost of 70 per cent of the gasoline cars was less than \$2,000, while the cost of 85 per cent of the electric cars was in excess of that amount. What the central stations need and will order in large quantities is a cheap electric car. In regard to the battery equipment, Mr. Jones declared that there has not been sufficient research in the chemistry of the batteries, the research heretofore being directed chiefly to the mechanical details. The motor is at present the best part of electric vehicles, and good developments have been made in tires. There has been some complaint regarding high rates for charging, but this, Mr. Jones held, is exaggerated, as all large companies have rates ranging from 4 cents to 5 cents for small consumption and lower rates still for garages.

#### Discussion

Quite an animated discussion followed. Mr. G. H. Kelly stated that demonstrations have proved to be costly and that it is not good business to demonstrate a car. If in earnest, a prospective customer will buy without a demonstration, he said.

Mr. F. A. Whitten stated that in 1912 about 300 demonstrations were given by his company and that 91 per cent of the prospective customers did not buy. Later it was decided to give a demonstration provided the applicant was willing to pay for it. On this basis there were eighty demonstrations and 90 per cent of the prospective customers bought cars. Lately all demonstrations have been abandoned.

Mr. S. G. Thompson suggested that instead of boosting a low-priced car which is not now on the market the higher-priced car of the present which is in successful use should be given every consideration. At present sales suffer in anticipation of a cheaper car.

Mr. W. H. Blood, Jr., told of his experience in building two electric vehicles a number of years ago for \$1,200. With improved facilities he saw no reason why a low-priced car could not be produced.

#### Cost of Electric Vehicles

Mr. Kelly, in his paper entitled "The Cost of Electric Vehicles," asserted that pleasure cars sold at prices ranging from \$1,800 to \$2,000 have never been a success. On account of the many different models, the relatively small production and the fluctuation in demand from month to month it is difficult to build good, reliable, low-priced cars. The tendency is toward a luxurious, sturdy, long-mileage electric automobile, because the public demands such a car, and this is necessarily high-priced. In order to create a demand for electric cars, which would, of course, result in a reduction of price, it is essential, Mr. Kelly stated, to inaugurate an extensive advertising campaign. No one manufacturer, however, nor indeed all the manufacturers combined, could very well finance such a movement. It is necessary, Mr. Kelly averred, that all those interested in the electric-vehicle business co-operate. The one sure way to reduce the price, he declared, is to increase the volume; volume depends upon what the public knows of the electric vehicle and what it will accomplish; knowledge depends in its turn upon education, and education is best accomplished by advertising. A great advertising movement, which would make itself felt throughout the country and place the many advantages of the electric vehicle clearly before the people in a way comparable to that of gasoline-car advertising, would do more than any one thing to reduce the price of electric cars.

#### Discussion

Mr. F. W. Smith declared that it should be the policy of the central station to curtail the "joy-riding" ten-



dencies of its employees by installing electric vehicles. Central-station men who handle energy-consuming devices ought to use electric cars.

Mr. J. H. McGraw stated that the manufacturer is entitled to a large share of the credit for the successful development of the electric vehicle. It is not the fault of the manufacturer that the low-priced car has not yet become a success. He agreed with Mr. Smith that it is the duty of the central-station people to do all in their power to counteract the "joy-riding" tendency.

Mr. F. A. Whitten remarked that many salesmen in his company who were at first prejudiced against the electric car were subsequently converted to its use in preference to the gasoline car as a result of proper education.

#### Election of Officers

The following officers were elected for the year beginning Nov. 1: President, Mr. John F. Gilchrist, of the Commonwealth Edison Company, Chicago; vice-president, Mr. Walter H. Johnson, of the Philadelphia Electric Company; treasurer, Mr. H. M. Edwards, of



PRESIDENT-ELECT J. F. GILCHRIST

the New York Edison Company; incoming directors, Mr. F. W. Smith of New York, Mr. Charles Blizard of Philadelphia, Mr. E. P. Chalfant of Chicago, and Mr. J. H. McGraw of New York.

Mr. John Foster Gilchrist, the newly elected president of the association, has made the electric-service industry his lifework and has won his spurs on merit. He is vice-president of the Commonwealth Edison Company of Chicago and a past-president of the National Electric Light Association. Mr. Gilchrist was born in Chicago, March 14, 1868, and throughout his entire business career has been connected with the Commonwealth company and its predecessor, the Chicago Edison Company. He obtained his secondary education in the Chicago high school and later in the law department of the Lake Forest University. He entered the service of the Chicago Edison Company as an office boy in 1887 and has been connected continuously with the company from that time until now, working up to his present responsible position by his own ability, resourcefulness and energy. From 1894 to 1896 he was assistant to the manager of electrical sales and in the year last mentioned was made contract agent. His record in this capacity was such as to warrant his promotion to be assistant to the president in 1906, and early this year Mr. Gilchrist was elected vice-president of the company.

## THE ANNUAL JOVIAN CONGRESS

Enthusiastic Meeting at St. Louis, with Talks by Representative Contractors, Manufacturers, Jobbers and Central-Station Men—Homer E. Niesz Elected Jupiter

As chronicled in last week's issue, the feature of the first day's session of the twelfth Jovian congress, held at St. Louis, Oct. 14 to 16, was the report of the Mercury, Mr. Ell C. Bennett. This report showed that the number of local chapters has increased from fifty-two to sixty-two, and that during the past year 3723 candidates were initiated. Of that number, Statesman Thomas A. Wynne, Indianapolis, obtained 319 members. The last potential issued this year will be 15,775, and the net membership is now 15,004. The financial statement showed a balance of \$7,918.69 from the eleventh administration and a present surplus of \$2,607.05. Since the amount invested in the Jovian roster was \$2,900 and the cost of operating the commercial division was \$2,535, the order is declared to be on a sounder financial basis than before, despite its smaller balance on hand.

A number of changes in the constitution and by-laws were proposed in the report, and as a result of these recommendations the United States, Canada and Mexico are now divided into fifteen Jovian congressional districts instead of ten. The annual dues of the order were not raised from \$2 to \$3 as was proposed. No roster will be published for the year 1914-1915. A reduction in the number of statesmen-at-large was made from fifty to twenty-five, and the amendment admitting large stockholders in electric companies to the order, regardless of their local occupation, was rejected.

#### Work of the Commercial Division

Among the accomplishments of the commercial division during the last year are the following: 14,504 letters have been written to members; fifty-three hotels have been persuaded to give Jovians 10 per cent discount on lodging bills; the employment bureau has filled numerous important positions and is making many friends for the order; it has been decided to promote intelligently organized and well-managed electric shows in many cities; a Jovian sales and technical educational course has been secured for members at 45 per cent less than such work could be obtained elsewhere; by means of skillfully prepared interviews newspaper publicity for things electrical has been secured in cities where rejuvenations were held; local leagues have been encouraged to participate in civic affairs and institute local co-operative advertising plans for electrical goods; unfavorable ordinances have been eliminated in several cities; architects' co-operation committees are being formed as outlined in the *Electrical World*, and an "efficiency wins" campaign similar to the "safety first" movement is being launched with the expectation of reaching everyone in the electrical business. The commercial division is proud of the work it has accomplished on an expenditure of \$2,535 and the continued applause with which the report of Mercury Bennett was received showed that the delegates, too, were pleased with the practical work which has been done.

At the commercial division sessions a representative of each of the four branches of the electric-lighting industry spoke. Mr. John R. Galloway, president of the National Electrical Contractors' Association, represented the contractor; Mr. P. M. Lincoln, president of the American Institute of Electrical Engineers, represented the manufacturer; Mr. A. C. Einstein, president of the Union Electric Light & Power Company, of St. Louis, represented the central station, and Mr. W. E. Robertson, past-Jupiter of the Jovian Order, represented the electrical supply jobber.

## Past-Jupiters' Fund

Mr. Robertson also made the report for the Past-Jupiters' Association. This body now controls a fund of about \$5,000 derived from collecting and investing 2.5 per cent of the gross receipts of the order and from assessing each past-jupiter initiated a fee of \$100. In years to come it is hoped that this fund will prove a financial bulwark and that the income from it may be used to carry on the work of the order.

Other speakers at the convention were Mr. George B. Muldaur, field representative of the Society for Electrical Development, Inc., New York, and Mr. Elbert Hubbard, East Aurora, N. Y. Mr. Hubbard twice entertained audiences, skilfully painting at one time a word picture contrasting the ancient conquerors of the world riding over bloody battlefields with the industrial conquerors of our country to-day, who are represented in the membership of the Jovian Order. On another occasion, while speaking of the possibilities of the Jovian commercial division, he related, during a few serious moments, a conversation between Dr. Steinmetz and Mr. Henry Ford in the office of Mr. Frank A. Vanderlip. The speaker said that Dr. Steinmetz predicted the ultimate use of the total power of Niagara, the loss of which now costs the nation \$1,000,000 a day. The harnessing of this tremendous power and its application to automobiles as a measure of fuel conservation was considered in the conversation, declared the speaker, and the solution of even such problems as this is not beyond the possible scope of the Jovian commercial division.

## Entertainment

Among the ample and varied entertainment features were a 40-mile automobile tour to Sunset Hill Country Club, followed by dinner and dancing; an inspection trip to the Anheuser-Busch brewery; luncheon for the visiting Jovian members of "rotary clubs"; degreer team competition in which the St. Louis team, with excellent work, won \$250 cash and a loving cup, and in which Mr. Otto Kaburna, Chicago, as Vulcan, won the individual prize, a hundred-dollar jewel; annual rejuvenation, followed by a talk by Twelfth Jupiter W. N. Matthews; a Stentors' contest and a boxing match, and a banquet and vaudeville entertainment at Moolah Temple, which is the home of the St. Louis Shriners.

One of the interesting ceremonies during the convention occurred at Moolah Temple when Mercury Bennett was made the happy and surprised recipient of a five-piece silver service. In making the speech of presentation, Mr. Sam A. Hobson, Chicago, expressed the feelings of all assembled Jovians by stating that the gift was presented in sincere appreciation of services rendered and in the spirit of deep and respectful friendship.

Besides the entertainment for the Jovians, a number of parallel social functions were provided for the ladies, and with Mrs. W. N. Matthews as the able and amiable hostess, these events afforded great delight to every visiting woman. Events on the ladies' program were the automobile tour already mentioned, dedicated to the ladies as "Avenim night"; an automobile trip through Shaw's famous botanical garden, an evening card party, a special luncheon at one of the large department stores, and a theater party.

Each of the winners at the card party received as a prize an electrical household device. The lucky contestants were Miss Blumberg, Chicago; Mmes. Sutter, St. Louis; Burnside, Poplar Bluff, Mo.; Einstein, St. Louis; Hoffmann, St. Louis; Lecock, Toronto; Robinson, Kansas City; Keech, Chicago; Rasmussen, Indianapolis, and Collins, St. Louis.

## Election of Officers

Election of officers, which was announced just prior to the banquet at Moolah Temple, resulted as follows: Jupiter, Mr. Homer E. Niesz, Chicago, and Mercury, Mr. Ell C. Bennett, St. Louis. The following congressmen, elected from Districts 1 to 15, respectively, were awarded the offices which precede their names: Neptune, Mr. A. J. Binz, Houston, Tex.; Mars, Mr. V. C. Bruce Wetmore, Boston, Mass.; Vulcan, Mr. N. A. Oberlauder, New York; Pluto, Mr. J. C. Vogel, Philadelphia; Triton, Mr. A. E. Loeb, Columbus, Ohio; Avenim, Mr. W. R. Hernstein, Memphis, Tenn.; Apollo, Mr. R. S. Stearnes, New Orleans, La.; Hercules, Mr. W. S. P. Mayo, Richmond, Va.; Ajax, Mr. F. B. Uhrig, Kan-



PRESIDENT-ELECT H. E. NIESZ

sas City, Mo.; Argon, Mr. L. H. Cooper, Minneapolis, Minn.; Amphion, Mr. E. A. Wetmore, Boise City, Idaho; Atlas, Mr. H. A. Hibbaid, Denver, Col.; Comus, Mr. J. G. Pomeroy, Los Angeles, Cal.; Chiron, Mr. W. J. Doherty, Montreal, Canada; Cadmus, Mr. W. H. Reynolds, Winnipeg, Man.

## The Jupiter-Elect

Born at Canton, Ohio, Jan. 22, 1868, Mr. Homer E. Niesz attended the common schools of Canton and vicinity and, entering Mount Union College, was graduated in 1886. Specializing in mathematics during his college course, Mr. Niesz was attracted to things electrical, and, seeking practical experience, he entered the shops of the Western Electrical Company, Chicago, as an apprentice in the arc-light-machine manufacturing department and later worked in the testing department. He afterward became connected with the United States Lighting Company, Chicago, working as a wireman's helper, and on going with Messrs. Leonard & Izard, Western agents for the Edison General Electric Company, he assisted in the installation of a number of the early Edison lighting plants. Mr. Niesz accepted a position with the Chicago Edison Company in 1888, in the capacity of assistant superintendent of construction. He was made assistant to the general superintendent in 1899, and later was promoted to the position of assistant to the second vice-president. He resigned in 1909 to become manager of the Cosmopolitan Electric Company, and a year ago, upon the absorption of that property by the Commonwealth Edison Company, Mr. Niesz was appointed secretary of the budget and expense committee of the Commonwealth Edison Company. He says that during his administration of the Jovian Order every officer must be a worker.



# Business Conditions in the Industry

Opinions and Facts Bearing on the Indirect and Direct Effects of the European War on Domestic and Foreign Trade

## H. HOBART PORTER ON BUSINESS

### Average Earnings of Public Utility Companies Holding Up Well Under War Influence

Mr. H. Hobart Porter, of Sanderson & Porter, finds that the average earnings of public utility companies with which he is in close touch are holding up well under the disturbed financial conditions arising from the war. In talking with a representative of the *Electrical World* he spoke particularly of the affairs of the American Water Works & Electric Company, of which he is president, but also of other utilities in which he is interested.

Mr. Porter said that while the rate of increase in gross revenue of the operating properties controlled by the American Water Works & Electric Company is smaller than in previous years, it is still good. Since May 1, the date of formation of the new company, the rate of increase over the corresponding period of last year has been nearly 50 per cent better than the rate of increase in the similar period of 1913 as compared with 1912. Included in the company there are a good many properties furnishing different classes of utility service. Some of these, on account of special influences arising from the disturbance of industry as a result of the war, show actual decreases in business. General observations seem to indicate that the slackening of industry affects transportation companies very early. Of the transportation companies the steam properties, which are so largely dependent upon freight for their great volume of revenue, are affected first. Electric transportation, furnishing the local service in cities and short-haul service between communities, is affected to a lesser degree. Electric central stations are affected to a still smaller degree except where a large amount of the consumption is required in manufacturing industries that are closed down. Water companies have a tendency to show only a decreased rate of growth rather than an actual falling off in business.

### Co-operation from Municipalities

One development of the situation which Mr. Porter mentioned with pleasure was the fact that it has been found that in most cases municipal and other public authorities have co-operated in every way in helping the properties to make the best of the financial conditions imposed upon them by the war. In all such cases, where municipal authorities were acting in the best interests of the public as a whole, they met the companies in a spirit of co-operation and aided them in their necessary effort to make the best of the imperative postponement of construction outlays.

Public utilities, Mr. Porter said, are not affected as much directly as they are through the influence of the financial conditions which up to this time have prevented the sale of securities to provide funds for capital requirements. There is, of course, an indirect effect, arising from demoralization of the market for cotton so far as the Southern States are concerned and from reduced consumption of iron and steel products in the Pittsburgh district. Other similar conditions exist in localities which are largely dependent on products that in some way have their market affected by the war. In some of the sections of the Northwest in which Sanderson & Porter are interested, and in the great central Western States, the agricultural communities gen-

erally are exceedingly prosperous. In the wheat-growing districts of Washington, for instance, farmers are getting \$1 or \$1.10 a bushel for wheat as compared with prices in former years of about 60 cents to 70 cents. Since the cost of production is not over 50 cents, they are making a large profit and are feeling prosperous and spending money freely.

### Holding Companies' Advantage

Mr. Porter added that the present crisis seems to have demonstrated some of the principal advantages due to holding-company ownership of public utilities as compared with independent ownership. An investor in the securities of a holding company has the added protection arising from diversity in the ownership of operating plants. The frequent result of this condition is that the decline in earnings of a plant in one locality is overcome by increased earnings in other plants. Holding companies have found it possible to secure capital for urgently needed improvements for controlled properties at times when independently owned utilities have not been able to do so. In a holding company which controls properties situated in different localities and carrying on different classes of business a large reduction in revenues of the properties as a whole seems to be less likely to take place. The total operating results of the entire system are a merger of the returns from all classes of the business. In the consolidated returns the conditions which cause a falling off in one branch of the business are not so likely to be apparent, because these conditions may have had very little effect upon other branches.

The most important new construction work of considerable magnitude which Sanderson & Porter are carrying on at present is building oil-pipe lines from the California oil field to San Francisco Bay for the Valley Pipe Line Company, a subsidiary of the Shell Royal Dutch Oil Company, and a hydroelectric development at Cohoes, N. Y., for the Cohoes Company. None of the public utilities in which they are interested is undertaking any new construction work. Such construction work as is being carried on at present is that which is absolutely necessary or was under way and almost completed, and therefore required a comparatively small expenditure to be ready for operation.

When Mr. Porter was asked his opinion as to the duration of present conditions, he said that because the situation is so unusual he felt that he could not judge it. The best observers in Europe are talking of a war of comparatively long duration, and if this expectation is borne out by events, it would seem that present conditions must continue or possibly grow worse. If, however, their prediction of a comparatively long war should not be accurate, this would have an immediate and overwhelming influence over all other considerations. In any event, the increased cost of capital must be marked for some time, and this must have a very radical effect on the future course of public utility financing. All over this country rate-regulating public bodies have made decisions which, as a rule, have been based on the assumption that capital could be had at rates substantially less than those experienced in the initial promotion of utilities. If our utilities are to continue to grow under the conditions that now prevail, a much more liberal attitude must be taken by public authorities in reference to rates of return on capital.

## VIEWS OF MANUFACTURERS ON OUTLOOK

## FIRM BASIS FOR LATIN-AMERICAN TRADE

## Prospects for Business and Steps Taken to Develop Export Trade

## Business Men Caution Manufacturers and Outline Safe Plans for Development

Opinions on the outlook for domestic and foreign trade have been expressed by manufacturers for the *Electrical World* as follows:

## Will Increase South American Exports

Mr. J. H. McGill, president McGill Manufacturing Company, Valparaiso, Ind.: "Our sales for June and July were practically equal to the sales for the corresponding months last year. In fact, July, 1914, sales were slightly in excess of July, 1913, sales. Our August sales were 13.48 per cent less than in the corresponding month last year, and indications for our September sales were for a falling off of at least 10 or 15 per cent. As we know of no other reason why our sales should show a decrease, we attribute it to the effect of the European war. In our opinion, the effect of the war will increase export business to South American countries. I do not believe, however, that it will stimulate our export business to Canada. We have not increased or decreased our organization as yet, but are accumulating a stock larger than we usually carry, and unless demand increases we must eventually lay off some of our employees. We hope, however, that by increasing the efforts of our selling organization we may be able to dispose of our specialties in such quantities as will enable us to keep our employees at work. We are not dependent upon European countries for raw materials to any great extent, and on a few items we are fortunate in having a sufficient supply to last us for some time to come. On one item, aniline dyes, it would be hard for us to substitute an American product that would be satisfactory."

## Exhibit as Introduction to South America

Mr. William H. Bristol, president Bristol Company, Waterbury, Conn.: "Demands from South America for our product have been comparatively limited, and we have not as yet taken steps toward increasing our organization to develop the export trade, but are planning for an exhibit at the Panama-Pacific international exposition and count largely upon this as a means of advertising and reaching the South American customers through visits to San Francisco during the period the exposition is open. We estimate that many South American people will visit the exposition instead of going to Europe, and this will give us an opportunity of which we want to take advantage."

## Looks for Boom After Few Months

Mr. Paul J. Kruesi, treasurer and manager of American Lava Company, Chattanooga, Tenn.: "Our opinion as to the effect of the war is that after an interval of a few months, in which manufacturers will adjust themselves to conditions, we shall have a boom such as we never had before. It stands to reason that, Germany's enormous export business in the electrical line being cut off, there will be a fine opportunity for enterprising American manufacturers and no reason why, having once obtained the business, they should not hold it permanently. Believing this way, we do not expect that our own business will be diminished. We have not reduced our organization, but on the contrary have let contracts and increased our facilities since the outbreak of the war."

"We have not taken definite steps to develop export trade in the electrical line, for the reason that ours is a peculiar proposition, our goods being made only for apparatus manufacturers, which makes it impracticable to seek export business, as we could do were we making line insulation, for example."

A report of the Latin-American trade committee appointed by Secretary of Commerce Redfield under a resolution adopted at the informal Latin-American trade conference, called at Washington, D. C., on Sept. 10 by the Secretary of State and the Secretary of Commerce, has been made public. The committee feels that articles appearing recently in the press regarding commercial opportunities in Central and South America have unduly emphasized the promising aspects thereof and have, in most instances, failed to state that our exporters already doing business with these regions find that their sales have been decreased, rather than increased, owing to the war.

It is the belief of the committee that an opportunity is afforded to place United States trade with other American nations upon a firm foundation, supporting a more comprehensive structure which may be built as the situation again more nearly approaches normal. However, there is great danger that merchants and manufacturers unfamiliar with Latin-American conditions may be induced by recent publicity to undertake ventures in that field which not only will be unremunerative but actually disastrous and, in their ultimate result, make for a reaction of the very healthy and much-to-be-desired interest in foreign trade now manifest throughout the United States, an interest which, if well directed, should be of great permanent value.

The committee believes that the present disorganization of the trade of the United States with Latin America may best be remedied and placed on a permanently satisfactory basis as follows:

(1) The establishment of a dollar exchange—(a) by the ultimate creation of a discount market, (b) pending the establishment of a discount market, by the extension of adequate accommodation by banking institutions and the establishment of reciprocal balances in the United States and in Latin America for financing Latin-American trade.

(2) Perfection of our selling machinery—(a) by furnishing additional support to commission houses already familiar with Latin-American business, (b) by forming associations of merchants and manufacturers to be jointly represented in Latin America, (c) by obtaining information as to the possibilities of developing retail stores in large Latin-American cities.

The members of the committee are Messrs. John Barrett, director-general of the Pan-American Union, Washington; William Bayne, president New York Coffee Exchange; W. B. Campbell, president Perkins-Campbell Company, Cincinnati; Robert Dollar, president Robert Dollar Company, San Francisco; James A. Farrell, president United States Steel Corporation and chairman National Foreign Trade Council; William A. Gaston, president National Shawmut Bank, Boston; J. P. Grace, president W. R. Grace & Company, New York; Fairfax Harrison, president Southern Railway; Alba B. Johnson, president Baldwin Locomotive Works; C. J. Owens, managing director Southern Commercial Congress, Washington; Lewis W. Parker, president Parker Cotton Mills, Greenville, S. C.; William E. Peck, president William E. Peck & Company, New York; William Schall, Müller, Schall & Co., New York; W. D. Simmons, president Simmons Hardware Company, St. Louis; Willard Straight, with J. P. Morgan & Company, New York; E. P. Thomas, president United States Steel Products Company; J. H. Waddell, Hard & Rand, New York; Daniel Warren, American Trading Company, New York, and Harry A. Wheeler, vice-president Union Trust Company, Chicago.



## PUBLIC SERVICE COMMISSION NEWS

## New York Commissions

The Second District Commission has granted the application of the village of Bath for authority to supply electric energy to the public from a municipal plant as well as to furnish energy for street lights and other municipal purposes. The application was opposed by the Bath Electric & Gas Light Company, which at present is furnishing energy to private consumers in Bath.

Commissioner Emmet, who wrote the opinion, holds that in this case competition is justified because the private company has not been able for a long time to furnish satisfactory service at satisfactory rates, and while his opinion seems to show that the granting of the present application may mean the wiping out of the private company, he finds no other alternative and declares that it would be fair for the municipality to buy the private plant. The village refused recently to renew its contract for street lighting with the company and began the erection of a municipal plant to supply energy for this purpose. Mr. Emmet points out that the village had a perfect right to do this under the law. The authority of the commission is needed only when the plant does other than municipal business. He finds, however, that there is not enough business in Bath for the successful operation of two electric plants. The opinion says:

"We commence the consideration of this case with the certainty that, whether we grant the present application or not, a municipal plant is to be established. Adverse action merely means that the new plant will have to be limited in the manner I have mentioned. The matter has already gone too far to make it possible that the plant will not be established. The work of constructing the plant has been largely completed. The existing company has apparently never been able to give the people a service which was in the least degree satisfactory to them.

"No matter whether the inhabitants of Bath in deciding to maintain a municipal plant of their own acted wisely or foolishly, the step has been taken. The business of the municipality is already assured to the new concern, and as matters now stand the only hope that individual consumers have of enjoying good electric service in the near future seems to lie in the same direction."

## Ohio Commission

While the commission held, in fixing rates for the Bucyrus Light & Power Company, that a company is not entitled to a return of 6 per cent on the investment if the business has been managed improperly and the expenditures have been greater than required, it also decided that the rates named in an ordinance passed by the Bucyrus City Council are unjust and unreasonable. Some time ago the commission had the property appraised and found a value of \$95,000, which is much less than the company claimed. The commission found that the company could not earn a fair rate of return, even on the valuation found, at the rates named by the Council. No dividends had been paid for some time.

For residences and all commercial consumers using less than 30 kw-hr. per month the rate was fixed at 10 cents per kw-hr. by the commission. The other rates are 7 cents for from 30 kw-hr. to 60 kw-hr. and 3 cents for all above 60 kw-hr. The rate for window lighting is 7 cents and that for motor service from 5.85 to 2.16 cents, according to the amount used. The commission made a reduction from the old rates of about 15 per cent in the commercial service, and also for others using more than 30 kw per month, but motor-service rates were not changed. The new minimum rate is 50 cents per month instead of \$1, as under the old rules.

## Current News Notes

**TAKES NICKELS AND COUNTS THEM.**—Electrically driven machines for taking and counting nickel car fares on the prepayment plan have been installed in the new Boylston Street subway stations, Boston, Mass.

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**THE WISE CHICKENS OF KENTUCKY.**—One of the most pleasurable pastimes enjoyed by barnyard fowl is bug catching, and according to a dispatch from Danville, Ky., the chickens in that little city are in the habit of continuing their search for insect food at night under the city's arc lamps. It is gratifying, according to the local constable, to see that the chickens are taking advantage of the newer type lamps, which are designed so that the bugs have to stay on the outside of the globes. A few years ago, he comments, a chicken under an arc lamp would have starved while waiting for a bug to escape from the lamp itself.

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**MOTOR TRUCKS FOR HAULING FOODSTUFFS.**—In its report to Mayor Harrison, the Chicago Municipal Markets Commission makes the statement that the average cost of hauling in the city by motor truck is 11.25 cents per ton-mile, as compared with 17.75 cents per ton-mile by horse. This shows a saving of 36 per cent in favor of the trucks. The average cost of deliveries by department stores, grocery stores and meat markets, according to the commission, is approximately 8 cents by motor and 16 cents by horse. Analysis further shows that the average cost of operating motor trucks and delivery wagons, including both the gasoline and electric types of machines, is \$10.97 a day, inclusive of all items of operation and maintenance, such as driver garage, interest and depreciation. The average cost of doing equivalent work with horses is \$16.75 a day which represents the expenses of from two to three wagons with drivers.

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## SOCIETY MEETINGS

**SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION.**—The 1915 meeting of the S. P. E. E. will be held at the Iowa State College, Ames, Ia., June 22 to 25, 1915. Dean Anson Marston of this college is president of the society.

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**CONSULTING ENGINEERS.**—At a dinner meeting of the American Institute of Consulting Engineers to be held at the City Club, New York, at 8 p. m., Nov. 12, the subjects for discussion will be: "A Memorial to Alfred Noble," "Legislation for the Registration of Engineers," and "The Coming Constitutional Convention in New York State."

\* \* \*

**WELCOME TO RETURNING JOVE.**—The luncheon of the Chicago Jovian League, Oct. 19, took the form of rousing welcome to the Jupiter-elect of the Jovian Order, Mr. Homer E. Niesz, who is president of the local league. Addresses were made by Jupiter Niesz, Past-Jupiter Sam A. Hobson, Statesman Perry A. Boole, and the tribune for Chicago, Mr. Victor Toulse.

\* \* \*

**ILLINOIS CONVENTION POSTPONED TO 1915.**—The Illinois Electric Association has postponed until some time next summer the meeting originally scheduled to be held the latter part of this month at Starved Rock Park, near Ottawa, Ill. A one-day session had been planned, with three hours' discussion on general topics. The change in plans is announced by the secretary, M. H. E. Chubbuck, vice-president executive of the Illinois Traction Company, Peoria, Ill.

## Hydroelectric Development on Bishop Creek, Cal.—II.

Difficulties encountered and overcome in construction of the Hillside Tunnel—The layout and equipment of generating stations A and No. 1. By C. O. Poole

AS before stated, both the Middle Fork and the South Fork reservoir sites were natural lakes formed by glacial action. When the hydrographic survey of the South Lake was made, it was discovered that the lake was quite deep, and as the bed of the stream below the dam site dropped off precipitously, it was apparent that there was an opportunity to drive a tunnel from below the dam site and tap the lake at a considerable depth below the outlet pipes of the dam. Calculations were made, and it was found that a tunnel 2000 ft. in length would tap the lake 65 ft. below the base of the dam.

Work on this tunnel, known as the Hillside Tunnel, was commenced in the fall of 1908. A temporary water-power plant was installed, utilizing the fall in the creek directly below the dam site, and an auxiliary steam plant was constructed for driving air compressors, ventilating fans, etc. The tunnel was started in the bed of the creek, 600 ft. below the dam site, at the foot of a gran-

ite cliff, which, in the shape of a huge hog's back, extended north and south under the dam site and into the lake. The tunnel was started in the side wall of the cliff, and it was necessary to drive it into the ridge at an angle to insure a rock wall strong enough to withstand the pressure of water to which it would be subjected. Where the tunnel reached the proper point on the line with the survey, it was straightened and driven to the nearest point in the lake to give the required depth. The tunnel was made 5 ft. wide and 6 ft. high and ran on a grade of  $2\frac{1}{2}$  ft. per 1000 ft. At a point 1000 ft. upstream above the dam the ridge referred to is 30 ft. above the outlet pipes of the dam and forms an island in the lake, which is submerged about 40 ft. when the reservoir is full.

In order to expedite the work of driving the tunnel, a shaft was sunk on this island in line with the tunnel and work started in both directions from this shaft. The shaft also served as an additional safeguard for the

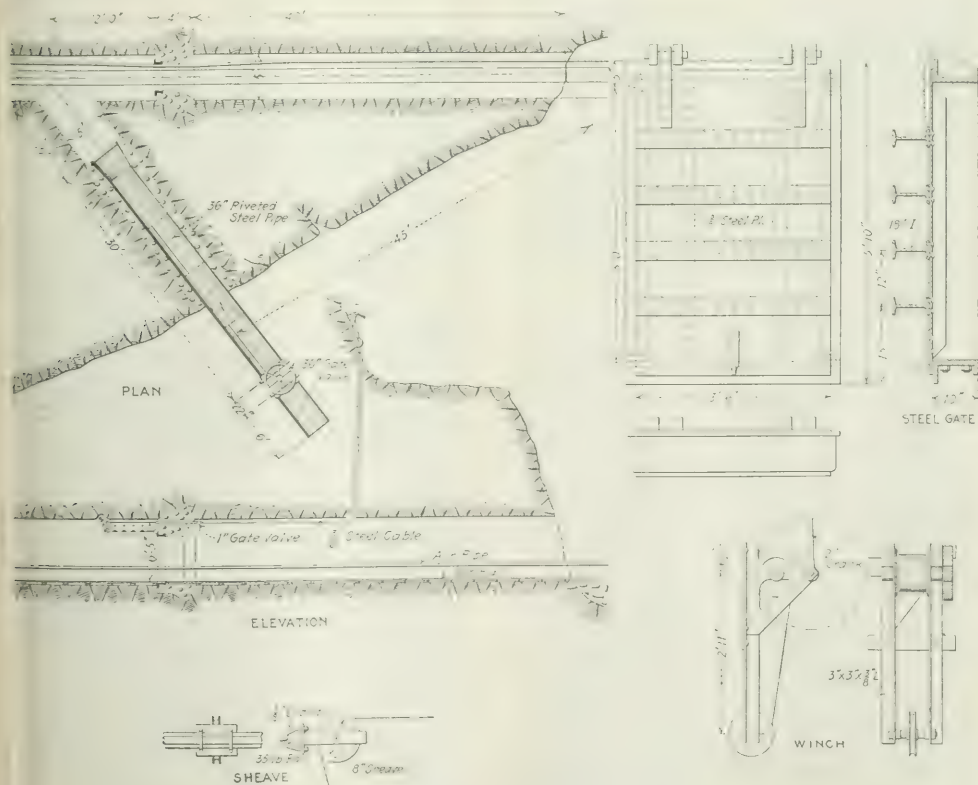


FIG. 9—BULKHEAD AND TUNNEL OUTLET



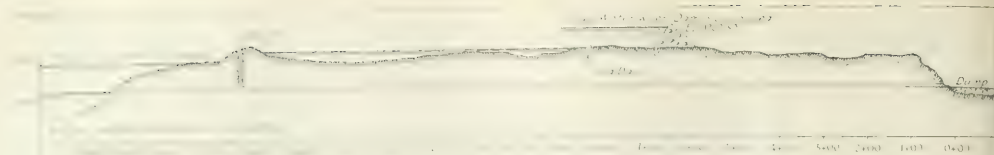


FIG. 10—PROFILE OF TUNNEL

men at work in the tunnel. Careful soundings were made of the end of the ridge, where the tunnel was to break through, and the profile was plotted. There was, however, one uncertain element to deal with, because it was not possible to determine whether or not the end of the bank was solid or shattered rock, as the soundings were made by cutting holes through 2 ft. of ice and sounding through 65 ft. of water. It, therefore, became necessary to use extreme care in driving the tunnel as it neared the breaking-out point.

When the face of the tunnel was within a distance of 50 ft. of the finish a drill hole was kept ahead of the face from 10 ft. to 15 ft. Within about 20 ft. of the survey terminus bad loose ground was encountered and mud and water came through the fissures in the rock, so it was considered unsafe to proceed further. This was in December, 1910, and the lake was frozen over with nearly 2 ft. of solid ice, the temperature being near zero. For several weeks prior to this time the special powder house was kept heated with steam to prevent the powder from freezing. Calculation was

made as to the amount of powder that would be required to blow the opening through the remaining wall of rock, assuming it to be solid. The tunnel was gouged out on each side at the face for a distance of 5 ft., leaving the end of the tunnel in the shape of a "T," 15 ft. across the face. As considerable water flowed, it was necessary to drain this off while the charge of powder was being placed, and, the temperature of the water and tunnel being below the congealing point of the powder, the charge had to be placed as quickly as possible and fired before the temperature lowered to a dangerous point. Some 4-in. by 4-in. timbers were laid across the tunnel at the face, and the powder was placed upon these timbers to keep it away from the bottom of the tunnel and the water. The explosive in the regular 50-lb. boxes was placed one box on top of the other, with the covers off. The greater part of the powder used was 40 per cent giant, with about 1000 lb. of 20 per cent stump powder and about 500 lb. of 60 per cent gelatine powder in addition, making 5200 lb. in all. Before placing the powder two 3-in. iron pipes reaching outside the



FIG. 11—LAKE END OF HILLSIDE TUNNEL



FIG. 12—INTAKE END OF HILLSIDE TUNNEL

tamping were laid in the bottom of the tunnel for a distance of 40 ft., to drain the water away from the powder.

The charge was primed by using twelve detonation caps placed in two sets of six each in a stick of 60 per cent powder, and each of these sticks was placed in a

The method employed to control the water in the tunnel is shown in the diagram Fig. 9. A side tunnel was driven into the solid rock wall for a distance of 35 ft., intersecting the main tunnel at an angle. In this branch tunnel was placed a 36-in. diameter bell-end steel pipe  $\frac{3}{8}$  in. in thickness. This pipe was securely

concreted in the rock tunnel, and a cast-iron gate was placed on the outer end of the pipe. At a point in the main tunnel 10 ft. outside the intersection with the branch tunnel was placed a trap gate supported upon a heavy cast-iron frame, embedded in the tunnel walls and secured there with concrete. The trap gate is of  $\frac{5}{8}$ -in. plate steel, heavily reinforced with steel "T" beams, as shown in Fig. 10. The opening is 3 ft. wide by 5 ft. in height, large enough for the rock cars to pass through, as they did for months before the tunnel was completed.

The branch tunnel and pipe were also completed long before they were needed. The trap gate was hinged at the top of the framework and opened toward the lake, a hole was drilled through the roof of the tunnel directly above the gate, and the gate was held up against the roof by means of a  $\frac{3}{8}$ -in. steel cable handled by a small winch.

box of the same kind of powder. Two sets of wires were carried out through tamping in 2-in. iron pipes, the ends of the wires being carried up through the shaft to a safe distance on shore and attached to separate exploders. In addition to this priming, two sets of three fuses were brought out in the same way, so that if the battery failed the charge could be fired with the fuses. The tunnel was hurriedly tamped with fine muck for a distance of 30 ft. back of the powder, and a space of about 6 ft. was left next to the powder for a gas chamber.

A very serious problem here presented itself: If the charge should explode and blow out into the water and at the same time not blow out the tamping, it would be a difficult and hazardous task to remove the tamping to allow the water to flow into the tunnel. To lessen this danger four boxes of powder were placed in the tamping, spaced about 5 ft. apart, and wires were brought out so they could be exploded if the main charge did not clear the passage. Fortunately, however, the main charge exploded the tamping charge, for no unburned powder was afterward found in the tunnel. The charge, moreover, fired on the first stroke.

Before firing the charge powder was used to break the heavy ice directly over the end of the tunnel to give it more freedom. The shot threw a column of black mud, water and rock to a height of 300 ft.

O.D. Diameter Pipe, Inches. = I.D. Diam. + Twice Thickness of Pipe

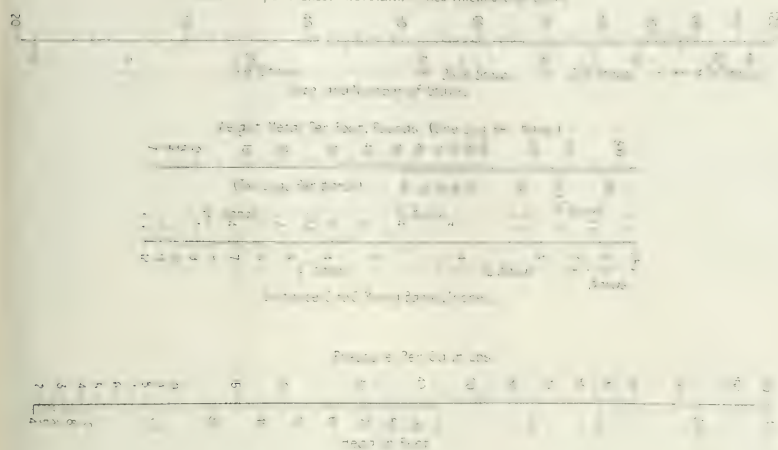


FIG. 13—DIAGRAM FOR WOOD-STAVE PIPE CALCULATIONS

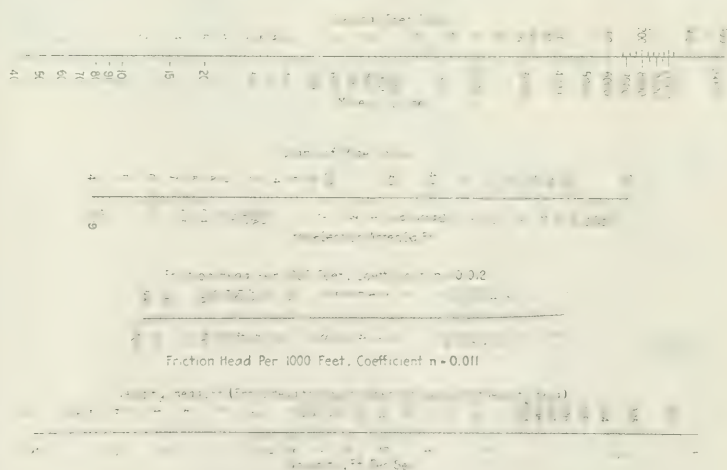


FIG. 14—DIAGRAM FOR DETERMINING FLOW OF WATER IN PIPES

When the shot was ready to fire, the trap gate was left wide open, and the 36-in. outlet gate was left about half open. A man was placed at each gate with instructions to close the gates as soon as the shot was fired and he heard the water rushing in the tunnel, the object being to trap sufficient air in the tunnel to cushion the shock on the gates and prevent any possibility of their



being carried away. The instructions were carried out to the letter, and the water was successfully controlled without any damage to any part of the system.

As an additional safeguard in controlling the water in the tunnel, a large gate, 3 ft. by 5 ft., was placed in the tunnel at the shaft on the island and operated by means of a vertical shaft reaching up to within 10 ft. of the surface. By the use of this gate the water pressure can be kept off the tunnel. In order to keep the water out of the shaft when the island is flooded, a water-tight manhole is provided at its surface and taken off each season when the water is drawn to this level by the pipes through the dam. Fig. 10 is a profile of the tunnel.

Fig. 11 shows the lake end of the tunnel where the final shot was fired. Considerable work was necessary to clear out the opening and make it safe for again submerging. The rock was found to be badly shattered and decomposed. A deep cut had to be made in the cliff and the tunnel timbered with heavy mine timbers, the

end of a meadow that is one-half mile in length up and down the creek, and which furnishes an excellent storage forebay for Plant No. 1. The intake dam for Plant No. 1 will back the water up to the tailrace of Plant A, thus preventing any loss of head.

#### Generating Station No. 1

The generating stations on the stream are numbered consecutively in their order, looking down the stream from the reservoirs, Plant A being the highest one up the stream. Plant No. 1, the plan of which is shown in Fig. 16 herewith, will be situated on the Middle Fork of the creek at No. 2 intake, and the tailrace of this plant will discharge directly into the forebay of Plant No. 2. All three branches of the creek are to be utilized in this plant. A reinforced-concrete forebay dam will be constructed at the lower end of the meadow referred to and will impound 2000 acre-ft., with a 30-ft. dam. The water will be led directly from the dam through a 54-in. wood-stave pipe, 22,600 ft. in length, laid on a bench

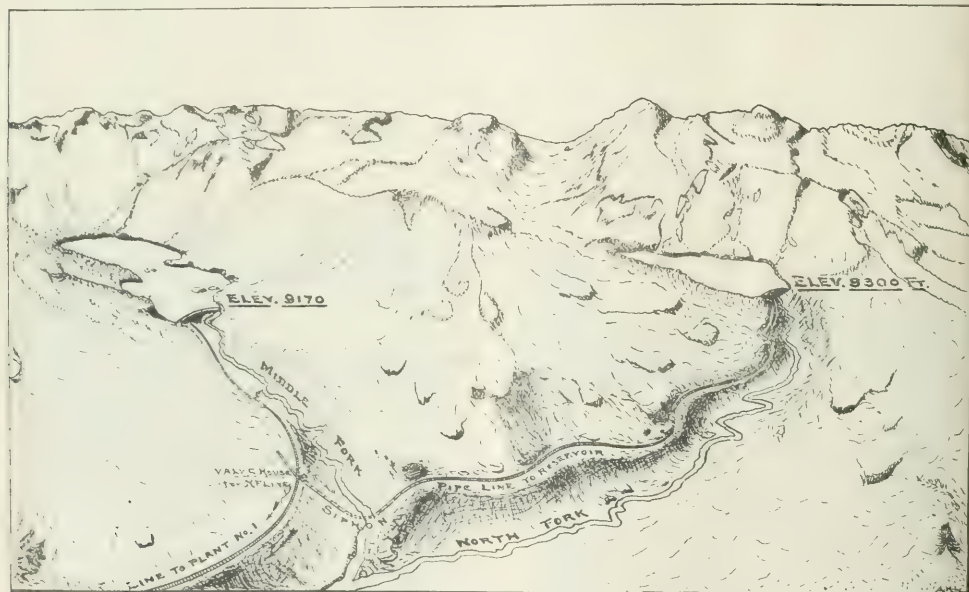


FIG. 15—SIPHON CONNECTION BETWEEN NORTH AND MIDDLE FORKS

top and sides being filled with rock. Fig. 12 shows the lake entrance as it was finally finished.

#### Generating Station A

Plans are made for the installation of two power plants connecting directly to the reservoirs. On the South Fork provisions are made to connect the flow pipe directly to the outlet pipe of the Hillside reservoir tunnel. By carrying this flow line on a grade of 4 ft. per 1000 ft. for a distance of 5500 ft. a drop of 550 ft. can be obtained. With a pressure pipe 1300 ft. in length this plant will utilize the reservoir pressure in addition to the natural fall of the creek, making a total available head of 650 ft. This plant is designated as Plant A in the development and will comprise one generating unit rated at 3000 kw. Using impulse wheels and a 2200-volt, three-phase, sixty-cycle generator, the voltage will be raised to 87,000 volts and ultimately to 140,000 volts by means of three 1000-kw transformers.

The generating station will be situated at the upper

excavated on the side hill through rock and earth. This bench will be 9 ft. in width and have a uniform grade of 2 ft. per 1000 ft. The banding of the pipe will be graded to suit the pressure, the spacing of the bands varying from 8-in. centers at the upper end to 3½-in. centers at the lower end. The staves will be of California redwood, 2½ in. thick, and the bands will be of ⅝-in. soft steel, having 60,000 lb. tensile strength and an elastic limit of 30,000 lb. The bands will be made up in two pieces, and two malleable-iron shoes will be used per band. The spacing of the bands is based upon a factor of safety of four in the steel, taking into consideration initial stress. It has been found by experience, however, that the initial stress in wood pipes disappears after a few months' use under pressure, as the bands are found quite loose when the pressure is taken off the pipe.

Fig. 13 is a diagram evolved for wood-stave pipe calculations and found quite useful. After the water is turned into the flow line and the leaks are taken up, the

pipe will be covered with earth to a depth of 10 in. A hand-placed rock wall will be erected on the down-hill side of the pipe to keep the earth in place. The writer has found that if wood pipes are kept covered with earth to a depth of 9 in., even in warm climates, the evaporation from the surface of the staves will be retarded sufficiently to permit the staves being kept moist on the outside all the time, and, being saturated clear through, the staves are not subject to rapid decay. One pipe has been in use nine years, and the staves are in fair condition to-day.

At three different points along the flow line there will be installed 54-in. steel stand pipes, placed in the ground on the steep hillside. These pipes will extend 20 ft. above the water level in the intake and will serve as surge pipes to prevent dangerous over-pressure occurring in the pipe line. At every 1000 ft. along the pipe there will be placed an 8-in. inlet gravity air valve to prevent the pipe from collapsing in the event of a break in the pipe.

In addition to the water from the reservoir, this pipe will carry several small streams that enter the forebay. The normal carrying capacity of this pipe will be 100 second-ft., based on Kutter's value of  $N = 0.012$ , which the writer finds in practice is quite safe. Fig. 14 is a straight-line diagram based on Kutter's formula, which has been evolved by the engineers.

The flow line will terminate against a precipitous rock cliff on the bank of the Middle Fork of the creek, having passed over the ridge that divides the two streams. It was first intended to extend this flow line around this cliff a half mile and intersect the flow line coming from the Middle Fork reservoir, and to use one pressure line to the generating station; but because of the different lengths of flow lines and the excessive cost of the extension it was deemed best to use a separate 40-in. pressure pipe for each flow line, and the designs are made in this way.

The generating station will contain one 7500-kw two-bearing generator, with an overhung impulse wheel on each end of the shaft, each wheel to have a maximum rating of 5000 kw. The South Fork pressure line will lead directly to a single nozzle controlled by a 30-in. steel gate. The stream to the wheel will be controlled by a hand-regulated needle, and governing will be accomplished by stream deflectors actuated by directly connected oil-driven governors, one governor controlling the South Fork and the Middle Fork nozzles by means of rock shaft and cranks.

The Middle Fork flow line will connect directly to the outlet pipes of the reservoir, the three pipes being joined together and connected to a 48-in. wood-stave pipe after passing through a double by-pass pressure screen, which will be so arranged that one of the two sets of screens can be cleaned without interfering with the flow of the water. The flow line will be 13,500 ft. in length, laid on a grade of 4 ft. per 1000 ft., and will have a carrying capacity of 100 second-ft. with the rated pressure. The total static head at the lower end will be 120 ft. with the reservoirs full.

The North Fork reservoir is 1.5 miles from a convenient point on the Middle Fork flow line, at an elevation of 220 ft. above the level of the flow-line grade. This branch of the stream will be brought into use by carrying the water through a 30-in. steel pipe intersecting the Middle Fork flow line at a distance of 4000 ft. below the Middle Fork dam. At the point of intersection a 48-in. steel standpipe will be erected, laid in the ground on a steep hillside, the top of this standpipe to extend 20 ft. above the high-water line in the Middle Fork reservoir, thus preventing the extra pressure of the North Fork reservoir from coming on the wood-stave flow line. At the point of intersection of the two pipe lines there will be a gate in the North Fork line and a gate in the Middle Fork flow line, placed between the standpipe and the generating station, for use in case of necessity for regulating the flow of water. In the event of the water being cut off at the generating station and the North Fork gate being open, the water would flow back through the Middle Fork flow line and enter the reservoir without throwing excess pressure on the pipe or spilling at the standpipe. By this same

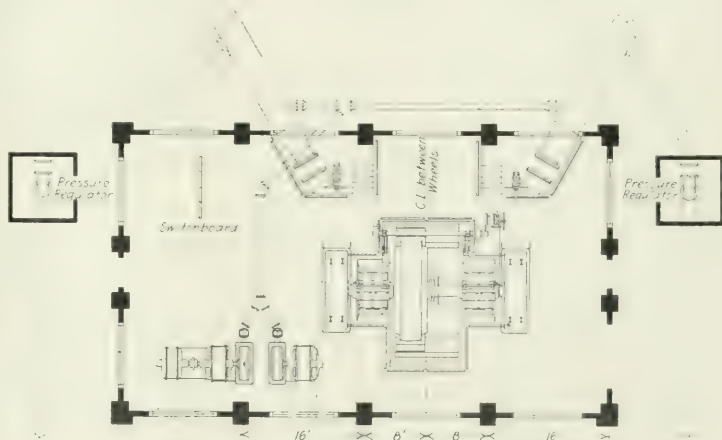


FIG. 16—PLAN OF STATION NO. 1

means the storage between the two streams can be equalized. Fig. 15 shows the arrangement. At the lower end of this flow line there will be placed a second 48-in. standpipe to act as a surge tank. The wood pipe will connect to a 48-in. steel gate, the 40-in. steel pressure pipe connecting to the other side of this gate. The flow line, like the South Fork line, will be provided with 8-in. drop air valves every 1000 ft. The upper section of both pressure lines will also be provided with air valves. The pressure line will terminate in a single nozzle, like the South Fork line, the lines being duplicated in every respect.

The general layout of the station is shown in Fig. 16. The generator will be wound for 2300 volts, three-phase, sixty cycles, and operate at 240 r.p.m.

There will be two 60-kw, 110-volt exciters, one driven by a single impulse wheel and the other driven by an impulse wheel and also directly connected to a 100-hp, 2200-volt, three-phase induction motor. The unit without the motor will be controlled by a waterwheel governor and the voltage will be governed by a Tirrill regulator. The switchboard will consist of simply one generator panel and one double exciter panel. Leading directly from the switchboard bus will be the feeders to the transformer bank, consisting of three 2250-kw water-cooled, single-phase transformers of outdoor type.



# Air-Gap Reluctance and Tooth Ampere-Turns

A method of accounting for the phenomenon caused by the presence of air-gap in computing the ampere-turns required by the teeth of a dynamo. By John F. H. Douglas

AT this date the best method of computing the ampere-turns required by the teeth of a dynamo is that of Parshall and Hobart.<sup>1</sup> They assume that the circular cylinders passing through both the tips and the roots of the teeth are both equipotential. By this means they obtain curves of real and apparent flux density. This method is open to a serious objection in

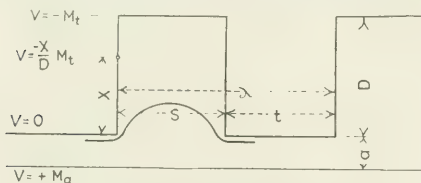


FIG. 1—DIAGRAM OF FIELD OF FORCE

that the equipotential surfaces near the tips of the teeth dip deeply into the slots, somewhat as in Fig. 1. This phenomenon is due to the presence of the air-gap. It is the purpose of this article to show how this effect may be allowed for.

For the reluctance of the air-gap of an electric machine an exact solution has been given by Mr. F. W. Carter.<sup>2</sup> He gives a curve in his article for finding the amount of fringe to be added to the width of each tooth, or the amount of each slot that is effective in carrying flux.

The solution desired is easily obtained by combining a uniform field and the field solved by Mr. Carter in the proper proportions by means of the principle of superposition. According to this principle, if two fields separately are in equilibrium, the resultant field is in equilibrium, the potentials and fluxes add algebraically, and the intensities of the field add vectorially.

The field of force in Fig. 1 represents the case to be studied.  $M_a$  and  $M_t$  are the mmf drops between the tips of the teeth and the armature surface and the roots of the teeth respectively. The total flux per tooth pitch is  $\varphi_t$ . It is to be noted that the mmf consumed in the air-gap is different at a point opposite a tooth from what it is at a point opposite a slot. In Figs. 2 and 3 the field is divided into its two components, the solution for each of which is already known. If the two fields be superposed and the potentials added, it will be seen at once that they are equivalent to the original field. Consequently, the total flux  $\varphi_t$  is the sum of the two component fluxes  $\varphi_1$  and  $\varphi_2$ .

In Fig. 2 the teeth are supposed to be of the same permeability as the air, so that the field is uniform throughout, and the solution is well known. Thus the outlines of the teeth are shown dotted since they are without influence upon the distribution of the flux. In Fig. 3 the teeth are supposed to be of infinite permeability

and in this case the solution is obtained from Carter's curve. It may seem that contradictory assumptions have been made; however, the following points will show that this is not so. First, the permeability of the teeth is actually intermediate between the two assumptions; second, the numerical relation derived are dependent upon the flux distribution in the air parts only; third, even in the iron parts one would be justified in superposing the two fields provided that he used the value of the ampere-turns for the total real flux density and not for one of its components. The real density can be ascertained from Hobart's curves in the usual way.

The notation here employed will be appreciated by reference to Figs. 1, 2 and 3 with the additional information that  $L_g$  is the gross length of the armature and  $L_e$  the effective flux-carrying length.  $R_a$  is the reluctance of the air-gap for the space of one tooth pitch. The relations are as follows:

$$M_a - \frac{a}{D} M_t = \Phi R_a = \varphi_t R_a - \varphi_r R_a \quad (1)$$

$$\Phi \frac{1}{\mu \lambda L_g} = M_t \quad (2)$$

Substituting  $\varphi_r$  from equation 2 into equation 1

$$M_a - \frac{a}{D} M_t = \Phi R_a - \frac{M_t}{D} \mu \lambda L_g R_a \quad (3)$$

The reluctance of the air-gap per tooth pitch  $R_a$  is

$$R_a = \frac{K_a a}{\mu \lambda L_g} \quad (4)$$

where  $K_a$  is the air-gap factor, and  $K_a a$  is the apparent air-gap. Substituting for  $R_a$  and solving for the total mmf

$$\begin{aligned} M &= M_a + M_t, \\ M_a + M_t &= \Phi \frac{K_a a}{\mu \lambda L_g} + \frac{M_t}{D} [D - K_a a + a] \\ &= H_a K_a a + H_t [D - (K_a - 1)a], \end{aligned} \quad (5)$$

wherein  $H_a$  is the apparent ampere-turns per centimeter in the air-gap and  $H_t$  is the ampere-turns per

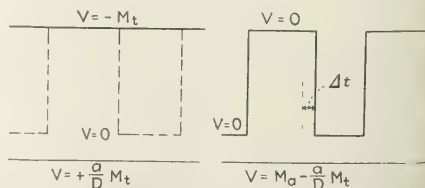


FIG. 2—WHERE TEETH ARE OF SAME PERMEABILITY AS AIR

FIG. 3—WHERE TEETH ARE OF INFINITE PERMEABILITY

centimeter in the teeth. While  $H_a K_a a$  is not equal to  $M_a$ , the mmf used up in the narrowest part of the air-gap, yet since the mmf of the gap is somewhat indefinite, being independent of the tooth saturation, it may be called the mmf of the gap. The remainder of the total mmf may be called the mmf of the teeth though it is less than  $M_t$ . The effect of the slots upon

<sup>1</sup>Engineering, Vol. 56, page 130, "Electric Generators." See also Hobart's "Elementary Principles of Continuous Current Dynamo Design," page 47.

<sup>2</sup>Electrical World, Vol. 38, Nov. 30, 1901, page 884. See also Hawkins and Wallace, "The Dynamo," fifth edition, Vol. 1, page 450.

the air-gap reluctance is the same as though the air-gap were increased by the amount  $(K_a - 1)a$ , and the effect upon the teeth is as if they were shortened by the same amount.

The air-gap factor  $K_a$  is obtained by a simple calculation. If  $\Delta t$  is the amount of the slot which is effective in carrying flux, the apparent width of the teeth is  $t + \Delta t$ , and the reluctance is

$$R_a = \frac{a}{\mu L} \left( \frac{t + \Delta t}{t} \right)$$

On the other hand,

$$R_a = \frac{K_a a}{\mu L} \quad \text{also,}$$

Hence

$$K_a = \frac{L}{L} \frac{t}{t + \Delta t}$$

and approximately,  $(K_a - 1) a = \frac{\Delta t}{t} \frac{a}{t} \quad (6)$

In conclusion, it may be said that if the air-gap ampere-turns be calculated in the usual way the effect of the air-gap reluctance upon the tooth ampere-turns is equivalent to shortening the teeth by the amount  $(K_a - 1)a$ , and to lengthening the air-gap by the same amount. The mmf of the teeth is to be estimated from curves of real and apparent flux density drawn for the particular grade of iron employed. In this connection it is noteworthy that the grade of iron assumed in Mr. Hobart's book is much better than seems to be obtainable commercially. If his curves are empirical, the discrepancy is explained, in part at least, by the theory developed in this article.

## VALUATION REPORT FOR OHIO UTILITIES

### Joint Committee Advises Companies on Elements of Value That Constitute the Property

The report of the joint committee on valuation of Ohio Public Utilities has been mentioned previously in these columns. The report was prepared after the issue of an order by the Public Utilities Commission addressed to the companies and requiring the inventory and valuation of properties. Those who formed the committee, which was appointed by the different associations representing the utilities concerned, were as follows: Messrs. Robert Lindsay, chairman, vice-president and general manager Cleveland Electric Illuminating Company; Frank C. Dunbar, district attorney American Telephone & Telegraph Company; Allard Smith, general manager Cleveland Telephone Company; Rollo R. Stevens, Ohio State Telephone Company; J. C. Martin, president Ohio Water Works Association; F. W. Coen, vice-president and general manager Lake Shore Electric Railway, and M. B. Daly, president East Ohio Gas Company. Mr. Andrew P. Martin was secretary for the committee.

In interpreting the intent and scope of the order of the commission the committee says that it is important to remember that the property of a utility comprises both its plant and its business. To the cost of the physical property and the overhead costs must be added the cost of establishing the business and any other elements which enter into the total value of the property.

All property, whether used and useful or not used and useful, is to be included in the inventory and valuation and is to be appraised upon the basis of its reproductive cost as of a certain date. The classification must be based on the operating records and the judgment of the management. Among the five classes of property specifically embraced in used and useful are that class which of necessity may seldom if ever be used but which prudence and good management deem essen-

tial as a part of the reserve capacity of the plant and as a safety measure to guarantee constant service, and that class which good management and judgment deem it necessary to acquire in advance of immediate needs.

The cost of reproducing the property of a utility is made up, the committee says, of the cost of reproducing the plant and the cost of reproducing the business which was attached at the time of the investigation.

The outline of the inventory is divided into: (1) Reproduction cost new of preliminary work, physical plant and established business; (2) any other elements of going value or good will; (3) all other elements of value.

The section on unit costs says that the following are the elements which enter into the cost of any unit: Cost of unit f.o.b. point of supply, costs of purchasing and inspection, freight, switching, expressage or cartage to point of delivery or to utility's storeroom or yard, cost of unloading, cost of any work at point of delivery or in shop, storeroom or yard in preparing unit for use, cost of hauling to point of use whenever different from point of delivery, shop, storeroom or yard charges, labor including expenses of transportation, board and incidentals, and foreman's time and expenses in performance of all work at point of use, including lost time and delays in work, tools and appliances, incidental material, breakage, loss and waste, construction superintendence, employees' liability insurance, and public liability insurance. This schedule contemplates that the work will be done by the utility's own organization.

Some of the elements of expense which enter into the cost of reproducing the business are as follows: (1) Cost of organizing and training the operating force and all employees whose work requires skill peculiar to the business of the utility, such as exchange operators, motormen, conductors, dispatchers, roadmen, signal operators, meter readers, installers, linemen, troublemen, and repairmen; (2) cost of organizing the clerical force; (3) cost of organizing and training the selling force; (4) cost of securing customers, including expenses of solicitors, advertising, printing, free wiring or other inducements; (5) cost of commercial engineering; (6) cost of printing all forms, records, books, schedules and directories; (7) rent of commercial offices (where not owned); (8) any cost, not included above, necessary to the development of the business found to exist on the date of the inventory.

The committee believes that depreciation as used in the order may properly be defined as the reduction in value caused by physical deterioration and any present obsolescence or lack of utility if such exists.

The committee objects to the determination of depreciation by the theoretical straight-line or sinking-fund methods and favors the actual inspection method. It concludes that the statute appears to require the adoption of the inspection method. In the opinion of the committee, the depreciation of preliminary and overhead costs, if any exist, at a given time, is so small that it is impracticable to compute it, and the utilities are justified in ignoring it in making up their inventories. The depreciation of contingencies and omissions may be estimated to be the same as the average for the entire physical property.

The committee advises utilities to insert the following on the last sheet of the inventory above the signature: "This inventory and appraisal has been made in an effort to comply in all respects with the commission's order No. 176, by listing the items of property owned by this company and stating their reproduction cost new less depreciation. The company reserves the right, in any appropriate proceedings involving the value of said property or any part thereof, to offer any other or additional evidence of value."



## Pole and Tower Transmission Lines

Characteristics of wooden poles—Types of steel towers, their design and advantages—Pleasing outlines and inconspicuousness necessary—Locating a line. By R. D. Coombs

**W**HILE wooden poles are still the most common form of support for electric circuits, particularly low-voltage lines, they have several objectionable features in that they deteriorate rather rapidly, will not resist fire and are becoming more expensive. Under certain conditions, however, the use of the wooden pole is still economically sound construction even for high-tension lines, although the time is not far distant when wood will be no longer considered for first-class installations.

### Characteristics of Wooden Poles

In changing from wood to metal one may profitably pause to consider some of the characteristics of timber poles which have rendered possible the progress in line construction. In theory as well as in fact the wooden pole is a precedent for the metal structure, and a too violent divergence from some of its good features may result in the design of structures not relatively so excellent as the wood they replace. A well-selected timber pole is very nearly ideal for line support owing to the fact that stresses imposed upon it during growth were almost identical in nature with those in pole-line service. It should not be forgotten that a wooden pole has equal strength in all directions, both with and across the line, and in addition has comparatively great strength in torsion. These qualities tend to resist the effect of accidental loads or stresses overlooked in design. Again, wooden poles have considerable elasticity but not complete flexibility, a characteristic which enables them to deflect enough to equalize most unbalanced loadings and oppose forces which might cause damage if added to the existing

stresses in other parts of the line. This semi-flexible feature of a wooden pole, which is also obtainable in steel and to a less degree in reinforced concrete, is probably of much greater advantage than is generally realized. The final general characteristic of wooden poles is that they are not easily injured in handling and can be installed by men of ordinary intelligence. Moreover, they contain no long, thin sections which may be bent and rendered useless. That the above good qualities have been largely instrumental in establishing the excellent record of wooden poles in line work cannot be doubted by the analyst.

### Steel Poles and Towers

The more permanent types of support may be divided into the rigid wide-base steel tower, the semi-flexible pole (either of steel or reinforced concrete) and the flexible steel pole or frame. Apart from their relative costs for any given line, there is to be considered the ultimate adaptability of each type. Adaptability will involve questions of protective coating, rights-of-way, freedom from serious interruptions to service, and, finally, and to the writer's mind of very considerable importance, the relative prominence given the installation.

### Selection of Support

In the progress of a rapidly growing industry there is always a tendency to apply methods of work to sections of the country to which they are less adapted than the locality of their previous successful application. It is injudicious to adopt the so-called windmill tower in the more densely



FIG. 1—FLEXIBLE A-FRAME



FIG. 2—BENDING TEST, CONCRETE POLE



FIG. 3—SEMI-FLEXIBLE POLE

populated regions of the East where the climatic conditions are severe. In such places there are two things to be considered beside cost. These are the undue prominence of the line and the great importance of failures. The windmill tower is rather noticeable, but it provides a type of support which confines failures to practically one span. The flexible frame is not so noticeable, but it has little or no strength in one direction and will therefore presumably be susceptible to damage from less severe stresses. The semi-flexible pole or tower, occupying a position about midway between the two types of structures just mentioned, has at least a theoretical advantage over the others. While some flexibility is useful in a narrow-base structure, in order to permit "pull back" by adjoining span wires, the amount of the movement of the pole top need not be excessive. In actual service heretofore this movement could not have been very great, for the simple reason that the commonly used attachments did not possess sufficient strength to transmit such unbalanced wire tensions. The desideratum is perhaps a certain elasticity rather than extreme flexibility. In fact, a reasonable bending or semi-flexibility is obtainable even in reinforced concrete.

#### Considerations in Designing Towers

In sparsely settled country or where the right-of-way is for any reason not accessible or not subject to cultivation, the spread of tower bases is unimportant. If more than one high-voltage line is to be placed upon a private right-of-way, the separation of the lines will depend upon factors other than the spread of the bases. When land is valuable the installation of wide-base towers may be impracticable. For instance, it may be necessary to install transmission lines on interurban

railway rights-of-way. The development is natural and necessary, but railroad rights-of-way do not provide space for wide-base construction.

Wide-base towers and semi-flexible poles should, when properly designed, provide maximum security against interruptions to service caused by insulator or wire failure. The greater strengths attainable in such structures allow the use of longer spans, with a consequent reduction in the number of insulators. The probabilities of insulator failure are also lessened thereby. Whether due primarily to insulator failure or not, the spread of wire failure along a line is usually arrested before it has had time to influence more than one or two spans.

The relative prominence of various structures in the landscape may prove of considerable subsequent importance. The writer does not mean to imply that a transmission line should be made decorative, but rather that it be made inconspicuous. Even in regard to decorative effect, it is not absolutely necessary that it be an ungainly blot upon the landscape. Some regard to pleasing outlines is not amiss, and most structural engineers realize that a graceful design is also usually economical. If lines situated in settled communities are to remain undisturbed for any considerable period of time, they will have to be either unobjectionable in appearance or invisible.

The design of steel or reinforced-concrete poles and towers is fortunately becoming less hampered by demands for excessive cheapness, and the regulations current in other structural work are no longer entirely disregarded. The wisdom of observing these rules should be apparent when it is considered that a few hundreds or thousands of dollars saved on line construction may jeopardize the efficiency of an investment of mill-



FIG. 4—TOWER OF RIGID TYPE



FIG. 5—RIVER-CROSSING TOWER



ions of dollars. It is true that thus far existing construction has given fairly satisfactory service, but it is equally true that the more extended use of faulty designs would eventually bring disrepute upon the industry, and through failures invite the enforcement of severe regulations by various authorities. In any type of support the importance of eliminating long unsupported members and of providing a firm, rigid base is now becoming more generally recognized in the erection of tower lines.

#### Location Plan and Profile

After the general location of the line has been determined from a study of maps and inspection of the ground, the prompt completion of the location plan is essential. The rate at which this work can be carried on will depend upon whether the line is to occupy, either entirely or in part, a strip of private right-of-way, highways, foreign rights-of-way, or pole rights. In most cases quite accurate preliminary data as to the plan view of the route can be obtained from the right-of-way plans of foreign properties such as those of steam or electric railroads, canals, highways, etc. When a private right-of-way has not been entirely secured, some changes in alignment may be expected, and the location plan is to that extent preliminary. Except for the desirability of a correct permanent record, there is no particular need to determine by accurate survey the exact distance that intervenes between widely separated points.

After the plan has been brought to a semi-final stage, the profile should be drawn upon the same sheet. In plotting the profile considerable future annoyance may be avoided by drawing a true profile and breaking the view at the turns in the line, so that corresponding points will occupy their correct relative position in plan and profile, and both the center line and datum line will remain parallel to the bottom of the drawing. In some cases the distances in the profile have been measured along the inclined surface of the ground and then plotted horizontally, which results in a false profile and compels constant reference to plan and profile to identify a given point in each.

#### Clearance Over Obstructions

It does not make a particle of difference in the excellence of a given section when completed whether the distance between the corners is 4000 ft. or 4050 ft., but it is important that small steep hills, etc., be correctly located from one end of the section in order that the poles may be placed so as to give proper clearance over the hill.

The tentative, or paper, location of the supports can now be made upon the drawing and scrutinized in the field by walking over the line. It is assumed, of course, that in the preliminary location reasonable care has been taken to avoid natural or artificial obstructions, side hills, swamps, flood lands, or undue interference with private property or its natural use by the owner. Minor changes will always be necessary to fit the paper location to the ground, and local surveys can be made to plot cross-profiles at side hills, crossings, encroachments, etc.

In general, some supports will have certain fixed locations—that is, at turns in the line—so that the locating of other supports is reduced to distributing poles or towers between the fixed points. In a line having many changes of direction and elevation it may be impossible to assume a standard span. The problem is then one of ascertaining the economic or desirable span length for a given series of short sections having fixed ends and various hills or other obstructions between them.

### Electrical Development on Pacific Coast

At the recent convention of the Northwest Electric Light and Power Association at Spokane, Wash., the history of electrical development on the Pacific Coast and the opportunities for future growth were brought out in a paper on "Electric Power Development on the Pacific Coast," by Mr. W. E. Herring, of the Puget Sound Traction, Light & Power Company. The author called attention to government reports that 26,736,000 hp is available in this country by utilizing water-power. Of this nearly 43 per cent is available in Washington, Oregon and California. So far as the practical utilization of power is concerned, the author declares these figures too high. Up to the present time 841,000 hp has been developed in hydroelectric plants in these three states. The paper also contained data on the horse-power developed by water and steam in the large Pacific Coast plants and gave an idea of the territory served by each with the capitalization of the organizations. One-fourth of the entire generating capacity of the United States is used west of the Rocky Mountains to serve one-seventeenth of the country's population, which is contributing one-seventh of the aggregate income of the electrical industry. On the average, 527 kw-hr. of energy are consumed per capita per annum, the revenue per capita being \$7.50 a year as compared with \$3 east of the Rockies.

#### Silicidized Carbon-Silfrax

At the convention which was held at Niagara Falls this month by the American Electrochemical Society Mr. F. J. Tone, of the Carborundum Company, presented a paper on silicidized carbon-silfrax. When solid carbon is acted upon by vapors of silica or silicon there is formed a silicon-carbide product of the same shape as the original carbon but differing from carborundum in essential characteristics. To distinguish this form of silicidized carbon commercially, it has received the name "silfrax." The properties and characteristics of the product vary with the temperature of formation. If the carbon article is heated in the amorphous zone of a carborundum furnace, the temperature range of this zone being 1550 deg. to 1820 deg., the product is amorphous in appearance, showing no crystals except under high magnification. It has a yellow color and a lusterless fracture. If the carbon is heated in the crystalline zone of the furnace, the temperature of this zone ranging from 1820 deg. to 2220 deg., the material is of great density and plainly crystalline. Upon fracture it shows a steel-black color and a metallic luster.

The depth of the silicidizing action is mainly a function of the time of reaction and the concentration of silicon vapor present in the furnace atmosphere. To obtain the best conversion a large excess of silicon vapor must be present, and the mixture should contain silica largely in excess of the theoretical carborundum mixture. Under regular conditions with articles of pure carbon the maximum penetration is about  $\frac{1}{2}$  in. Articles composed of a mixture of carborundum and carbon can be readily converted to a greater depth.

The commercial applications of silfrax are as refractory materials, electrical heating elements and chemical ware. It has all the chemical and heat-resisting properties of carborundum and possesses great density and toughness. Heretofore the articles produced have been of small size. Pyrometer tubes are now made 24 in. in length, but by special furnace construction it will be possible to make much larger sized articles for special refractory vessels and chemical apparatus of various kinds.

# Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods and Current Practice Among Successful Utilities

## Simple Window Display Carries Helpful Suggestion

In a window display recently arranged in the office of the Noblesville (Ind.) Heat, Light & Power Company the only "properties" needed were an art-glass portable table lamp, a few school books and a placard. Simple sentences on the card pointed out the fact that the resumption of studies called for efficient home lighting so that the children might not harm their eyes. The rays from the reading lamp falling on the books in the otherwise darkened window attracted the attention of many passing parents who wished to encourage their offspring to spend industrious evenings at home while at the same time they recognized the grave injury often done to the pupil's eyesight because of bad lighting.

## "Electric Light Is Safer"

The Kansas City (Mo.) Electric Light Company is taking timely advantage of the national safety-first movement to point out through newspaper advertisements the dangers of using exposed-flame illuminants and to recommend electric lamps as far safer. One of the advertisements, conceived in humorous vein, represents a man falling down stairs with a broken oil lamp in flames on the floor below. Beneath the picture is the legend "Electric light is safer," and on a disk bearing the outline of an incandescent lamp bulb are the words "Safety first."

## Accounting Methods for Stockrooms

As one of the greatest sources of loss to a company is in the storeroom, it is highly important that proper accounting methods be provided for that department as well as others. In Mr. Edward A. West's paper on "Balance of Stores System," read before the late convention of the Northwest Electric Light and Power Association, was described the method of handling, accounting and issuing of stores used by the Portland Railway, Light & Power Company. In brief, this system consists of keeping records of stock on hand, on order, apportioned, available and issued. In addition, the records show the maximum and minimum amounts to be kept in stock and indicate the consumption of each item during any period. The system of symbols employed shows where the materials are located in the storerooms. The author divided stock into three classes—classified, unclassified and idle equipment. He also described the methods of ordering, purchasing, receiving, replenishing, transferring and returning materials. Stock-issue requisitions, credit memoranda, bin cards, balance cards, purchase orders, invoice forms, material slips, check-balance sheets and requisitions on purchasing department were described and illustrated. The operations of each department having business relating to the storeroom were also described. The stores record can be used to answer the purpose of price cards and also take the place of purchasing records.

## Prosperous Electric-Vehicle Garage at Danville, Ill.

Danville, Ill., with a population of only 40,000 inhabitants, is supporting a garage for electric vehicles exclusively, and the proprietors and operators of the enterprise are enjoying a profitable and continually increasing business. The Linne Electric Garage, taking its name from the owners, Messrs. Harry A. Linne and H. E. Linne, furnishes service to about fifty-five regular customers. There are in all about sixty electric pleasure cars and no trucks in Danville. In addition to its electric-vehicle clientele a number of owners of gasoline automobiles are regular patrons, knowing that the Linne garage specializes in electrical charging and equipment. All work done on these gas cars, though, is of a purely electrical nature, no attempt having been made to care for gas-engine troubles. It is explained that the owners of gasoline cars, coming from a radius



INTERIOR OF ELECTRIC-VEHICLE GARAGE ESTABLISHED IN A CITY OF 40,000 PEOPLE

of 40 miles, supply about 25 per cent of the gross business of the company, the remaining 75 per cent being due to vehicles driven by electric energy.

Rates for garaging electric vehicles at Danville are quite reasonable, \$25 a month being the standard charge for energy, washing, care of tire troubles, and delivering. Some of the customers elect not to make use of the full service, and for their convenience other rates are made ranging down to \$5 a month for dead storage. All charging of cars is done as the cars stand at their stalls; as many as twenty-five batteries can receive energy simultaneously if desirable. A 110-220-volt direct-current service from the lines of the Danville Street Railway & Light Company makes the use of rectifiers and motor-generator sets unnecessary, the energy being distributed from a single panelboard to the individual service outlets in the concrete wall. In addition to its garaging business the Linne Electric Garage also holds the agency for electric automobiles in Danville.



### Protection for Farm-Line Transformers

Early in its present successful rural-customer campaign the Noblesville (Ind.) Heat, Light & Power Company found that some sort of renewable fused cutout must be developed to protect the farmers' transformers. The design which has been universally adopted for all of the company's lines is shown in the accompanying sketch. Copper wire, a piece of broom handle and a light fuse wire are the only materials employed in its construction. The broom handle is cut to a convenient length, approximately 1 ft., and five gimlet holes are bored through it as indicated by the dotted lines. In the end holes No. 8 copper wires are fitted, and one protruding end of each wire is then fashioned into a hook. The other ends of these wires extending upward and outward are used as the supports about which the fuse wire is wrapped. No soldered joints are employed.

Of course the rural customer's transformer installation must be designed to receive this cutout, and pri-

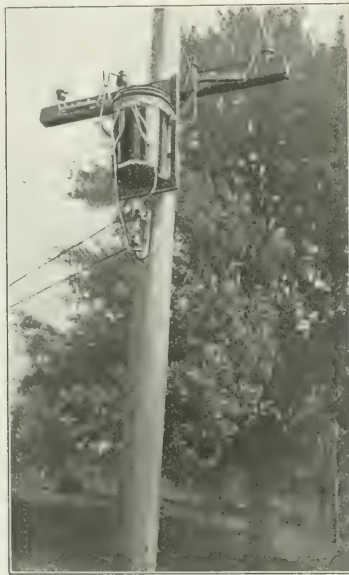


FIG. 1—RURAL TRANSFORMER INSTALLATION, SHOWING BROOMSTICK CUTOUTS

marily it is important that the transformer itself be hung near the ground. In most cases a clearance of 8 ft. is left beneath the bottom of the transformer. The primary leads are then dropped from the main line to the outside pins of the secondary cross-arm, and the end of the high-tension wire, after being wrapped around the insulator, is bared and fashioned into a hook similar to those carried by the cutout. On the inside pins other hooks are fastened and connected to the high-tension leads of the transformer. When the secondary lines from the transformer have been carried into the house and the inside wiring has been completed, the installation is placed in service by hanging two of the fused cutouts on the hooks extending from the secondary cross-arm. If lightning or an overload makes it necessary to renew a fuse, the cutout can be lifted from its position by means of a spiked or forked pole in the hands of the customer on the ground. All patrons of the company are taught this simple operation by the company's linemen.

Mr. John T. Kester, manager of the Noblesville com-

pany, states that the use of these devices has saved many transformers, and he believes that the rural populace, as a rule, is careful in handling the cutouts when renewing the fuses. Most of the company's primary

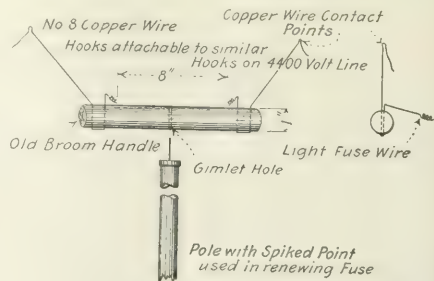
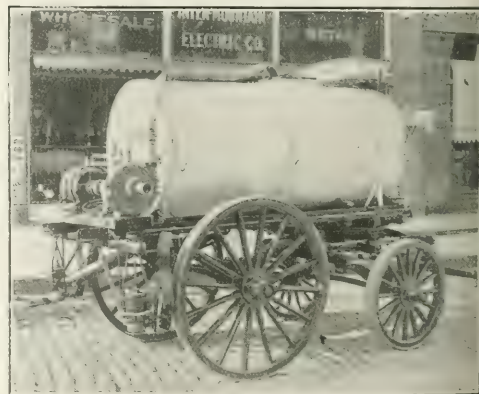


FIG. 2—CUTOUT WITH REMOVABLE FUSE DEVELOPED FOR FARM SERVICE

lines operate at 4400 volts, and the contact between the hooks, although scarcely more than a point, is sufficient for the small current flowing at this high potential.

### Central-Station Energy for Filling Sprinkler Tank

The electric plant at Springville, Utah, makes a peculiar use of its distribution lines extending along the public highways in the vicinity of the city. A portable pumping plant attached to the rear end of the city's new road sprinkler is employed to fill the water tank from wayside irrigation ditches (of which there are many). The pumping apparatus consists of a 1.5-in. Worthington centrifugal pump directly connected to a 3-hp, three-phase Westinghouse induction motor operating at 1700 r.p.m. When the sprinkler tank has to be filled the wagon is drawn up at a place where an irrigation ditch and electric-service wires are available. The suction pipe of the pump is then dropped in the ditch and the motor connected to the distribution circuit by a flexible conductor. This pumping equipment takes the place of the several isolated pumping stations for-



SPRINKLER TANK FILLED BY ELECTRICAL PUMPING

merly used and eliminates the necessity of investing money in elevated storage tanks. The electrical equipment was installed on the wagon by the Inter-Mountain Electric Company.

## Illumination and Wiring

### "White-Way" Posts Painted for 55 Cents Apiece

Under the direction of the South Park Commissioners, Chicago, the 12-ft. by 5-in. single-lamp ornamental lighting posts along ten miles of boulevards have been painted, greatly enhancing the beauty of the standards. The work is being done by a local painter at a contract price of 55 cents a post. Each standard is wire-brushed and receives a coat of red lead and a second coat of black, producing a smooth and attractive finish. A complete description of the lighting system of which these posts are a part was published in the *Electrical World*, July 11, 1914.

### Star-Spangled-Banner Centennial at Baltimore

BY ROSCOE SCOTT

The one hundredth anniversary of Key's writing of "The Star-Spangled Banner" was made the occasion of a city jubilee in Baltimore during the week beginning Sept. 21. Incidentally the illumination of the city's public buildings and monuments during the celebration presented certain features that were strikingly successful. The original flag that stirred Key to the writing of his famous song was kept flying at Fort McHenry, and at night the historic old banner was illuminated by two 500-watt stereopticon-type tungsten-filament lamps in projectors.

One of the best known of Baltimore's many landmarks is the George Washington Monument on Calvert Street. During "Star-Spangled-Banner Week" this shaft was illuminated by four 1000-watt stereopticon-type tungsten-filament lamps, temporarily installed on the roofs of four buildings, supplemented by four 400-watt lamps near the base, the light from which was pro-

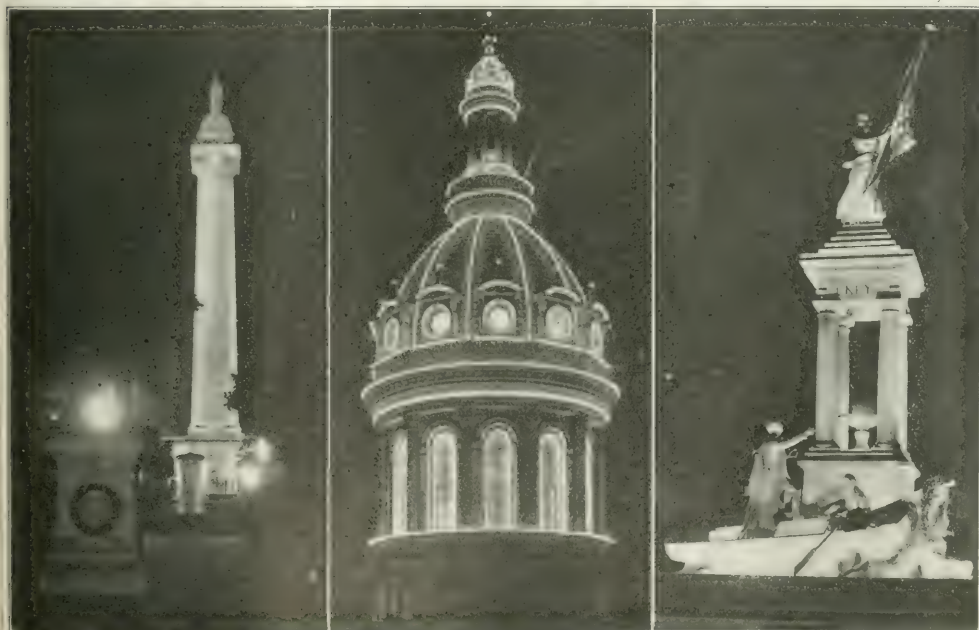
jected upward on to the column by angle steel reflectors.

One feature that is not evident in the illustration deserves mention. There are eight large urns, two at each entrance to the monument, and in these urns were placed red-bulb lamps, as well as certain chemicals reacting continuously to produce smoke. The red light playing on the particles of smoke produced a singular "incense" effect that was as gratifyingly successful as it was daring in its conception.

Particular interest centered around the Francis Scott Key monument. Here, again, flood-lighting was employed to "snap out" the statue against the black background of the sky. Four 400-watt tungsten-filament lamps in angle-steel reflectors produced the result shown in the picture. When the lighting was first tested there was a particularly dense and objectionable shadow under the chin of the uppermost figure, but this was later eliminated by localized lighting, a small lamp being placed in a concealed position on the statue itself.

Some experimenting was also necessary before the effect shown in the photograph of the City Hall dome was secured. The dome was first outlined with 3500 15-watt tungsten-filament lamps, but the appearance at a distance was too conventional and failed to reveal the architecture of the dome. Accordingly, the outline lighting was supplemented by flood-lighting from twelve 1000-watt lamps. To the lay eye the lighting appears to come entirely from the small lamps on the dome.

With the exception of the City Hall dome lighting, which was installed under the direction of Mr. James Baggett, of the Baltimore Lamps and Lighting Department, all of the above-mentioned electrical work was carried out under the supervision of Mr. J. Harry Gross, of the Baltimore Park Board. Mr. V. M. Yates, of the Colonial Electric Division, Warren, Ohio, gave valuable advice and assistance in the special lighting effects. All lamps and equipment were furnished by the Baltimore Electrical Supply Company.



FIGS. 1, 2 AND 3—ILLUMINATION OF WASHINGTON COLUMN, CITY HALL DOME AND FRANCIS SCOTT KEY MONUMENT AT BALTIMORE CELEBRATION



### Sealed Sectional Service Board

In certain cases it is a disadvantage to have the entire service board for a building a unit structure, as building owners expect electric-service companies to furnish this apparatus free of cost on the theory that it is necessary to the delivery of energy. Under such circumstances the expense of the apparatus is an important item and it becomes desirable to differentiate between the parts which the central station may be properly called upon to furnish and the parts which the building owner should furnish.

To reduce difficulties of this nature to a minimum Mr. Nels Joleen, of the Commonwealth Edison Company, Chicago, has invented a sectional service board constructed so that the central-station company may supply the lower section shown in the illustration herewith and the building owners may supply as many other sections as tenants demand from time to time. As will be seen from the drawing, the base section consists of an insulating panel carrying incoming lead connections, a switch and fuses inclosed in a metal cabinet. The upper sections contain busbars, fuses and customers' connections.

In practice the lower section is installed by the power company and electrical connection is made between the main switch and the service conductors. Before leaving the premises the company's representative closes the top of the base section and seals the front door. Busbars in the base section are then alive, but no access can be had to them without detection. When the house wiring has been completed and tenants are ready for electric service the company's representative has only to remove the partition between the lower and second sections and insert the three short strips of busbar; then the installation is complete.

This type of apparatus has the further advantages of preventing electricians from using free electrical energy during the time they are wiring a building and of permitting future extension.

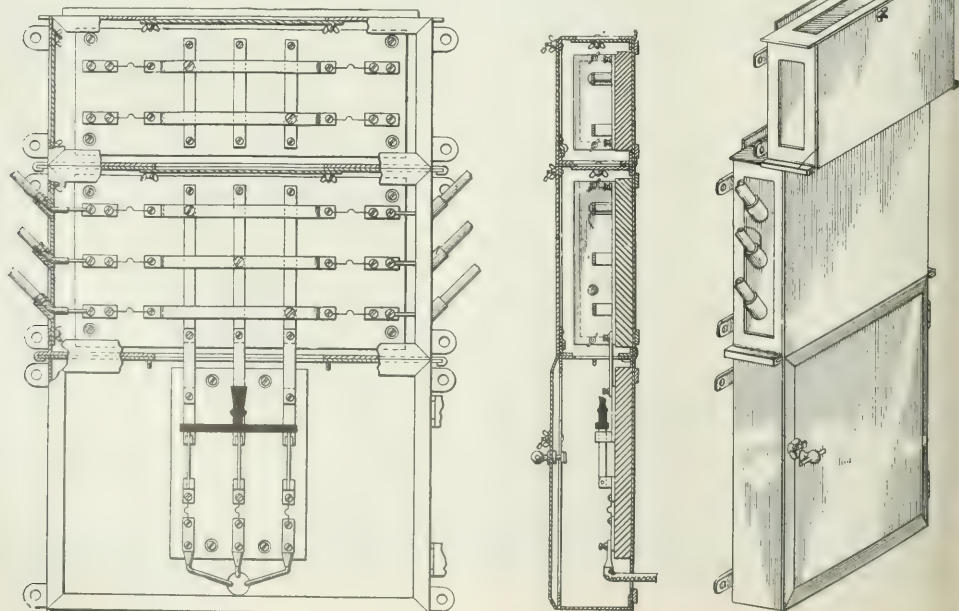
### Musical House Buys Mammoth Electric Sign

An electric sign that is one of the largest in Chicago has been in operation to advertise the goods of Lyon & Healy, manufacturers and dealers in musical instruments. Measuring 68 ft. wide and 40 ft. high and carrying approximately 4000 5-watt and 10-watt tungsten lamps, this sign stands at the corner of Park Row and Michigan Avenue within full view of persons on the latter street for about 1.5 miles. The steel work supporting the sign on the buildings at this corner weighs 23 tons.

The border of the sign simulates a lyre within which a Confederate and a Northern soldier are marching side by side, one with a drum and one with a horn. Out of the horn the words "Marching 50 Years" are blown by the soldier, this expression being appropriate since the firm has been in business for fifty years. In addition to these flashing words there is a changeable-letter feature within the sign to allow different departments of the company's business to be exploited. Both the sign and the 15-ft. flasher used to operate it were built by the Thomas Cusack Company, Chicago.

### Series-Relay Protection Against Overloads with Crane Motor Circuits

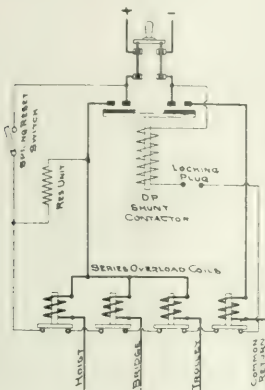
The accompanying diagram shows one of the simplest methods of connecting series relays to protect crane motors from overloads and feeders from grounds. In the positive feeder to each motor and in the common negative return feeder is a series overload relay all of whose contacts are connected in series with the main circuit-breaker solenoid across the terminals of the supply switch. If any motor is overloaded, the positive feeder grounded in the plant or the negative feeder on the



FIGS. 1 TO 3—VIEWS OF SECTIONAL SERVICE BOARD

crane, one of the relay contacts will open, de-energizing the shunt contactor, which in turn opens the main circuit. The circuit will also be interrupted if the voltage drops low enough to de-energize the shunt contactor. By closing the spring reset switch after the circuit is broken the main-circuit contactor will be closed if the conditions are correct. On releasing the reset switch the contactor will be held closed by current flowing through the resistance shown in the diagram.

This method of connecting series relays so as to



RELAY CONNECTION FOR PROTECTING CRANE MOTOR

provide protection for crane motor circuits was suggested in a paper presented by Mr. Stewart C. Coey at the convention of the Association of Iron and Steel Electrical Engineers held recently at Cleveland, Ohio.

## Letter to the Editors

### The Cost Theory of Rate-Making

*To the Editors of the Electrical World:*

SIRS: It is apparently not understood that the people who have been attempting to impress on the rate-makers the importance of the value of the service also believe just as strongly, if not more strongly, in the importance of the cost of the service.

The objections to the rates that claim to be based only on costs are not to the cost theory itself but to such dangerous assumptions as that the cost per kilowatt-hour is always the same or that the cost may be computed from certain formulas. It is not to the cost theory that objection is made, but to particular methods of calculating costs.

The cost theory itself is right and may be said to form the foundation of all rates, and the value theory is used only when costs alone fail to give rates most advantageous to the public. This may be brought out most easily by seeing how motor service and lighting rates are made. For the sake of simplicity we will assume that power and light are not used at the same time, but that the motors are used in the daytime and the lamps at night time. A certain amount of expense is involved by each kilowatt-hour used, this being chiefly for coal. Such expense is obviously part of the cost of either the energy for motors or that for lamps, and must form part of the rate. In addition, there are all the expenses for installation and maintenance of the plant, which go on whether the plant is used or not.

Some of these depend on the maximum demand on the plant, but there are others, as, for instance, the cost of digging a conduit, which are practically independent of whether 1 kw or 1000 kw is intended to be the maximum load.

If only the lamps are used, lighting must stand all these costs; if only the motors are used, motor service must stand all these costs. So far the cost theory is absolutely right. When, however, both the lamps and the motors are used, these costs are not increased, and if the rates are made the same as when only the motors or only the lamps are used the central-station income will be much above costs.

Hence when joint use is made of the same equipment by two different customers or classes the rates to each must be below what the cost and rates would be if either alone used the service.

The joint costs may be divided in all sorts of ways, as per kilowatt-hour, per lamp-hour, etc. When the joint costs are small they are often divided by adding a percentage for overhead or general expense to the direct costs.

Obviously, the greater the number of users served without increasing the joint costs, the less will be the burden on each user. If an attempt is made to charge any prospective user more than he can get the service for otherwise, he will not take advantage of the offer, and consequently will not become a contributor to the joint costs.

Hence, if after establishing the rates by the cost theory any part of the investment is unutilized, any additional user who really cannot afford to pay the rates established on the cost basis should be permitted to use the idle plant and make some contribution to the joint costs. No matter how little he contributes, he reduces the share of the others.

However, since he is to pay less than the other users pay, he should be made to pay all that he can afford so that he may have no greater advantage in competing with the first customers than if he secured the equivalent service by other means.

The above is all the value-of-service theory amounts to. The value theory does not dictate the charging of all the traffic will bear, but suggests making each and every rate as low as possible consistent with the costs. The value theory is based on the initial assumption that the total rates must be equal to and no more than the total costs, and involves reducing all rates to the minimum by getting more customers to share in the joint costs.

In considering any rates the idea of value need not be introduced until the total rates are made equal to the total costs. The idea of value may then be applied in two ways. First, no customer should be allowed to pay too little. Second, when any part of the plant or expense is unutilized and customers who would pay something toward joint costs are failing to use it because the price asked is too high, then it is better to have them pay something—that is, pay the value to them and reduce the rates to the others—than it is to have the plant idle.

According to the cost theory, the prices are dependent on the number of customers that can be secured. Other customers obtained in accordance with the value theory make the prices lower still, and yet since none of those who get low prices should (if the value theory is followed) get any lower price than they would pay for equivalent service elsewhere, the low prices give them no advantage that they would not have anyway. The value theory makes the actual rates always as low as, and usually very considerably lower than, the cost theory makes them.

Lynn, Mass.

WILLIAM ADAMS.

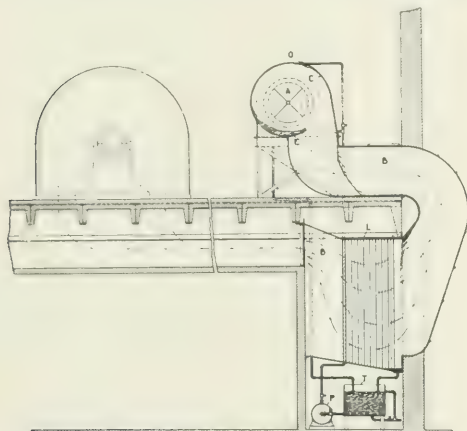


# Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

## Ventilating Turbo-Generators and Transformers with Washed and Cooled Air

Apparatus for washing, cooling and drying the air-ventilating turbo-generators at the Gold Street station of the Brooklyn (N. Y.) Edison company is shown in the accompanying diagram. Air leaving the blower



AIR WASHER FOR 22,000-KW TURBO-GENERATOR

blades *A* at high velocity picks up water from the pool *E* in the bottom of the fan casing and forces it to flow around the casing *C* and along the walls of the duct leading to the generators. Additional water is supplied at the top of the fan case *O* through a perforated pipe. Any dust or solid matter which may be present in the air when thrown against the film of water maintained on the walls of the air duct will be entrapped thereby and conveyed to a settling tank below the air drier *L*. The water on its way to the tank falls across the duct just below the fan and at the entrance to the drier, thus presenting a thin sheet of spray to the passing air, which is cooled and also cleansed by contact therewith. The drier consists of a number of sheet-metal baffles which separate the water from the air by subjecting it to several sharp changes in direction. The clean, dry air is delivered from the drier direct to the duct leading to the generators. A small centrifugal pump *P* draws water from the tank *T* and delivers it to pool *E* and perforated pipe *O*. Similar apparatus is employed at the Thirty-ninth Street substation of the New York Edison Company for supplying cool, clean, dry air to transformers.

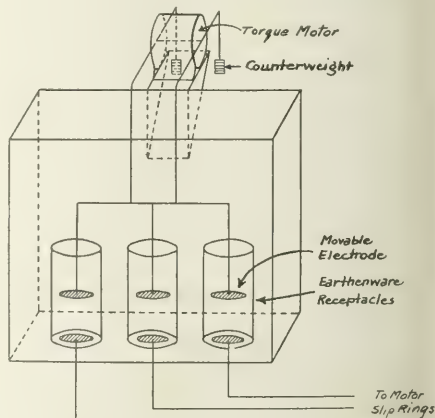
## Protect the Eyes from Flashes When Opening Switches

Careless switchboard attendants have had their sight impaired by failing to turn their heads away from switchboards when opening a switch carrying a large

current. When it is necessary to open a switch under these conditions the operator should protect his hands with gloves and should turn his head and eyes away from the switch to avoid being injured by any possible flash. The ocular strain caused by witnessing an arc at close range may sometimes cause permanent eye weakness and a burn from an electric flash is generally slow in healing.

## Automatic Motor Acceleration with Liquid Rheostat

A wound-rotor induction motor can be automatically accelerated if its secondary terminals are connected to a variable-resistance liquid rheostat the position of whose electrodes is regulated by an auxiliary motor in series with the main motor's supply circuit. The accompanying diagram represents a method of accomplishing this result. The movable electrodes are electrically and mechanically connected and supported by a counterweighted lever fastened to the auxiliary motor's shaft. This motor should be connected so that it tends to raise the electrodes when the primary current of the main motor increases. With full-load current flowing, the torque of the rheostat motor plus that caused by the counterweight should be sufficient to balance the electrodes. Any increase or decrease in the current should cause them to separate or approach each other respectively. By limiting the downward motion of the electrodes the full-load speed of the motor can be maintained at any desired value. Used with a moto



AUTOMATIC MOTOR-OPERATED LIQUID RHEOSTAT

equipped with a flywheel to carry short peak loads the apparatus will prevent excessive current flows and permit using a motor rated at the average load which has to carry. This method of speed control was described by Messrs. Wilfred Sykes and G. E. Stolz at the Association of Iron and Steel Electrical Engineers' convention held recently at Cleveland, Ohio.

### Detecting Defective Insulators

On the system of the Puget Sound Traction, Light & Power Company, of Seattle, Wash., Mr. M. T. Crawford, in charge of the transmission lines, has devised a convenient and rapid means for detecting defective insulators. The scheme was outlined briefly at the Pacific Coast meeting of the A. I. E. E. in Spokane, Wash. Recently the porcelain pin insulators used on one of the company's lines began to give a great deal of trouble. Investigation showed that the insulators do not usually have a large radial crack, but that a small crack starts on the head or in the side groove and extends around on the top of the insulator. These cracks enlarge until a leakage current starts through the top two or three shells and discharges over the surface of the lower shell. The tendency of a brush discharge to pass in the

advanced stage of deterioration before this condition was reached, and frequently failed, causing an arcing ground that punctured other insulators, a heavy charge against maintenance resulted because of the emergency nature of the repair work. In locating defective insulators at first, use was made of a megger, but unless the testing wire was over the leaking crack and this crack extended clear through to the pin, the result was unsatisfactory. After considerable experimenting, a device was perfected by which these insulators could be located at an early stage of the depreciating process. This enabled them to be replaced economically and before they finally broke down and damaged other insulators or interrupted service.

The device used for this purpose is shown herewith. It consists of a pair of 2000-ohm wireless-telegraph re-



FIG. 1—TESTING LINE FOR DEFECTIVE INSULATORS

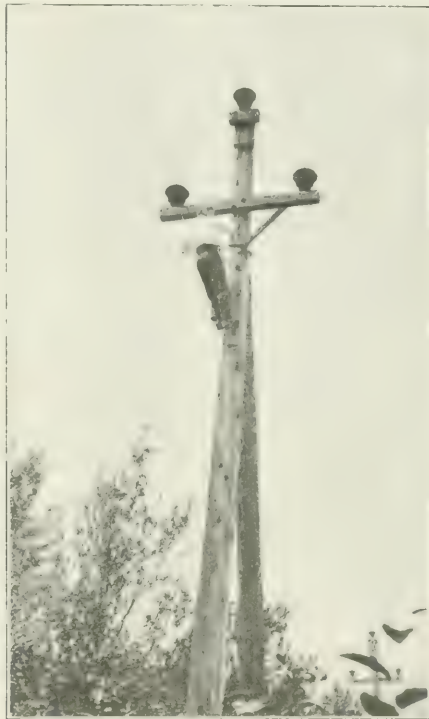


FIG. 2—LOCATING DEFECTIVE INSULATOR

sitive direction more than in the negative has a rectifying effect on the leakage current. This results in a bidirectional current from the bottom shell to the pin, and signs of electrolytic corrosion of the pinhead in cement have frequently been found. Once started, it will soon crack the entire insulator, as the high tensile stress put on the porcelain by this internal expansion will lower its dielectric strength. In many cases insulators have been found which were leaking noisily, and when the line was killed and an examination made the insulator was found intact, although a number of cracks were visible. As soon as the tie wire was removed, however, the entire insulator fell apart.

The expense of replacing all of the insulators was prohibitive, and the practice heretofore was to replace them one by one when the leakage became so great that it could be heard from the ground. As they were at an

ceivers fitted up for the convenience and safety of the inspector in testing. A hand pick is driven into the pole about 7 ft. from the ground, and a pin is driven into the ground several feet from the pole. The receiver set is connected between these two, and if all insulators are sound, there is a clear audible hum of the same tone as the telegraph line due to the shunting of a part of the capacity current of the insulators on the pole top. If, however, an insulator is leaking, a scratching noise is superimposed on the hum which comes and goes as the neutral shifts to and from the wire on the defective insulator. The inspector then climbs the pole and tests between each insulator pin and the center of the cross-arm and thus locates the defective insulator. The device can be used in a similar manner on steel tower lines. Insulators can be found in this way which have only a very small crack started and which will not puncture on the



test below 100,000 volts. Insulators with a crack clear around the head were taken off and tested, puncturing at from 60,000 volts to 65,000 volts, but no sound was audible from them while on the line without the use of the detecting set. One or two lower petticoats were usually found intact, the leakage current passing over their surface during the test until the puncture point was reached. In the device used on the Puget Sound lines the hand pick consists of an insulated tube with a sharp-pointed steel terminal on one end which is thrust into the pole or cross-arm. The other terminal, which is driven into the ground or in the pole under the cross-arm in locating the insulator, consists of a sharp steel pin. A fuse and short-circuiting jack with plug on the receiver set is inserted in the circuit if there is any probability of a considerable voltage to ground.

### Cinder Catchers at Waterside Stations, New York

Many of the electric-service companies in the larger cities of this country are doing everything possible to eliminate smoke and cinder discharge from power-house chimneys. The accompanying drawing shows the cross-section of a cinder catcher used with back-to-back boilers at the Waterside station of the New York Edison Company. *B* is a horizontal flue extending along the backs of several boilers. Smoke entering at *AA* strikes baffles *CC* and dampers *DD*, which cause it to flow downward to *MM*, where it is sharply deflected and loses its entrained cinders in the water at the bottom of the tank. The dampers *DD* are movable so that they can be lowered for light loads and raised for full loads. They are supported by drums *FF* with chains and counterweights. By rotating *FF* the opening at *MM* can be changed.

Considerable solid material is also removed from the gases when they strike the dampers by the sheets of water flowing over them. The water is used over and over again by pumping it out of the bottom back into perforated pipes *KK* with a low-head centrifugal pump. About 75 gal. a minute per boiler is circulated over the dampers and about 8 gal. a minute per boiler is added to make up for evaporation and for the water-spray which is carried away with the gases. The faster the gases pass downward toward the pool of water the more cinders will be removed. It is estimated that in this installation the entrained cinders and ashes are projected to-

expanded metal. They may also be made of cypress lumber, as it is unaffected by acid and will stand heat as long as water is kept flowing over its surface. Tests made on the flue gas under ordinary conditions without the cinder catchers have shown that the smoke contains ashes and cinders amounting to 1 per cent or 2 per cent of the weight of the coal fired. With the cinder catcher operating about 95 per cent of the solid matter is removed.

### A Turbo-Exciter Safeguard

As a safety measure a Michigan generating station has covered the open end of an exciter situated on the end of a 7500-kva turbine shaft with a circular piece of asbestos board. This insulating material, held in place by three machine screws, prevents employees or occasional visitors from touching live parts of the commutator or brush holders. Although the potential of these parts is admittedly low, there is possible danger, and it was deemed wise to guard against it.

### Braking Induction Motors by Reversing Primary Connections

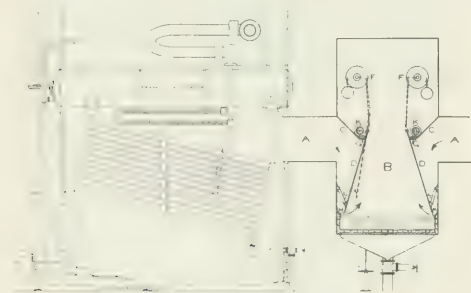
According to a paper presented by Messrs. Wilfred Sykes and G. E. Stolz at the recent convention of the Association of Iron and Steel Electrical Engineers, one of the most satisfactory methods of braking a wound-rotor induction motor is to reverse its primary connections. As this will induce double voltage and frequency in the secondary circuit, it is essential that the insulation be capable of withstanding the increase. Moreover, the resistance connected across the slip-rings should limit the current to a safe value. If the ordinary starting resistance will not do this, an auxiliary resistance may be connected permanently in series with it and shunted when the motor is being accelerated. The allowable current will depend on the design of the motor and to a great extent on the disturbing effect which the braking current will have on the rest of the system. The simplicity of control for this method of braking will generally warrant the added expense of extra insulation on the secondary windings.

### Steam Versus Electrically Driven Auxiliaries

What is considered to be the best practice in driving the auxiliary machines in power houses? Are electrically driven auxiliaries making much headway against the steam-driven machines?

H. P. P.

Many of the best engineers of the country hold that electrically driven boiler-feed-water pumps, air pumps, exciters and circulating-water pumps are not advisable in a power plant from any point of view, as they form a link in the chain and any one of these links may be the means of shutting down the entire system. Investment in thermal efficiency and reliability all indicate steam-driven auxiliaries for power plants. There is a tendency, however, to install electrically driven apparatus for regular operation with duplicate steam-driven apparatus in reserve. This does not apply to all the auxiliary machines. The feed-water pumps and others in the more modern stations are usually driven by steam turbines, the exhaust from which is used in heating the feed water. Motor-generator sets are used for supplying excitation to the main generators, turbine-driven exciters being held in reserve. The circulating water pumps are also sometimes electrically driven. And large, the auxiliary machines in power stations are steam-driven.



DESIGN OF CINDER CATCHERS

ward the water with a velocity of about 50 ft. per second.

As considerable sulphur-dioxide gas is present in the smoke the water is gradually acidified, and the tank had to be protected against corrosion. It has been found that the best material for the baffles and bottom of the tank is cinder concrete. The baffles are stiffened with

# Digest of Current Electrical Literature

## Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

### Generators, Motors and Transformers

**Bearing Currents.**—E. G. MERRICK.—An article illustrated by diagrams on the destructive effect of currents in bearings. The author's analysis shows that where the number of poles is a multiple of twice the number of joints an electromotive force may be expected to occur in the shaft. If the number of poles is not a multiple of twice the number of joints, the joints will be evenly distributed between the two flux circuits; therefore there will be no variation in flux around the shaft and consequently no electromotive force induced in it. These conclusions are based on a symmetrical distribution of the frame joints. Mechanical considerations, however, sometimes require an unsymmetrical arrangement of the joints, and this, under certain conditions, may be such as to reverse the rules just stated. As regards the generation of shaft currents, the only difference between machines in which the field is produced by direct current and those in which the field is produced by alternating current lies in the fact that in the former type a shaft electromotive force can be generated only when the machine is running, whereas in the latter type an electromotive force is present whether the machine is running or at rest, its magnitude depending on the relative values of the stator fluxes for the standing and running conditions. Induction motors are especially susceptible to the effect of unsymmetrical conditions in their magnetic circuits. One method of preventing damage due to bearing currents is as follows: Brushes are placed on both ends of the shaft and are either grounded on the bearing pedestals or connected together by a heavy copper conductor. The result in either case is to shunt more or less of the shaft current through this path and thus reduce the amount passing between the shaft and bearings. The protection thereby afforded is uncertain. A second method is as follows: In the case of horizontal machines insulation is inserted between one or more of the bearing pedestals and the machine base, the number of points at which the circuit is to be broken depending on the number of bearings and the number and type of machines mounted on the same shaft. This method applied to vertical machines necessitates the placing of insulation between the upper bearing bracket and the armature spider and the insulating of holding-down bolts. In addition it is, of course, necessary to insulate all piping, stairs, hand-rails, etc., which would otherwise complete the electrical circuit. This method, if properly applied, provides an absolute protection.—*Gen. Elec. Rev.*, October, 1914.

**Three-Phase Commutator Motor.**—An illustrated English translation in abstract of the German article by H. K. Schrage, noticed some time ago in the *Digest*, on a three-phase commutator motor with shunt regulation by brush displacement, built by a Swedish company.—*London Elec. Review*, Sept. 25, 1914.

### Lamps and Lighting

**Manufacture of Tungsten Wire.**—A note on a recent British patent (No. 20,122, 1913) of C. Gladitz for a method of making tungsten wire of uniform tensile strength. The wire is cold-drawn, and the cross-section

is reduced approximately 20 per cent by each drawing operation. When the original cross-section has been reduced by about 50 per cent, the wire is wound on bobbins and is annealed by being passed through a heating chamber in an atmosphere of inert gas, where the temperature is gradually raised from 250 deg. to 400 deg. C. and then gradually reduced to its initial value. The bobbins are placed on a conveyor belt which carries them at the required speed from one end of the furnace to the other, thus insuring uniform treatment.—*London Elec. Eng'ing*, Sept. 17, 1914.

### Generation, Transmission and Distribution

**Irrigation Dams.**—E. KILBURN SCOTT.—A long abstract of a paper read before the recent Australian meeting of the British Association. The author discusses the building of large irrigation dams and the utilization of the water not only for irrigation but also for developing hydroelectric power. Examples are given from practice in Argentina, the United States, Egypt and Australia. The author refers to working with variable heads. For heads varying from two or three to one, or, say, 150 ft. down to 50 ft., the difficulty can be met by a suitable design of turbine, although, of course, the turbine cannot work so efficiently as when it is under a constant head. For constant voltage and frequency the turbine must run at a fixed speed to suit the lowest

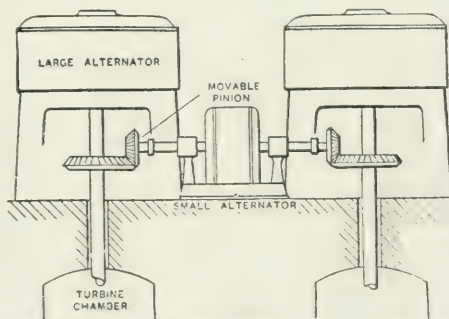


FIG. 1.—PROPOSED ARRANGEMENT OF MACHINERY AT ASSUAN DAM

head, and above that the extra head is lost. Of course, less water is required at the higher heads, but the power possibilities of the dam are reduced considerably. A method which has been considered for Assuan is to have two electrical generators and one turbine, as shown in Fig. 1, the large alternators to be mounted on the top of vertical shafts, umbrella fashion, and the small alternator to be horizontal and driven by bevel gearing from the turbine shafts. When the large alternators are connected to the circuit the small alternator is thrown out of use by moving the pinions out of gear. When the small alternator is in circuit the large alternators run around as well, and merely act as flywheels. Of course, when the small alternator is in use the turbine speed is reduced. The uses of power are discussed with special reference to electrochemical applica-



tions and the manufacture of fertilizers.—*London Electrician*, Sept. 18, 1914.

*Three-Phase Systems*.—CHARLES FORTESCUE.—A paper in which the author discusses relative advantages of several common methods of connecting transformers for use on polyphase systems. His conclusions are as follows: For a transmission emf below 44,000 volts transformers with either star-connected or delta-connected high-tension windings may be used. The delta connection has a slight advantage owing to its greater flexibility. For a transmission emf above 44,000 volts transformers with star-connected high-tension windings should be used. These conclusions are based not so much on theoretical considerations as upon the results of actual experience in the manufacture, installation and operation of transformers on systems employing both the delta-delta and delta-star connections. The delta-star system has been consistently advocated for high-voltage transmission for more than a decade. During the early part of the history of the electrical industry, at a time when very few high-voltage transmissions existed, this attitude was subject to much criticism, but time and experience have provided the justification of the system.—*Elec. Journal*, September, 1914.

### Traction

*Rail Welds*.—An illustrated account of recent improvements in making the "thermit" insert joint. The lower part of the rail is welded together into one homogeneous mass by means of the superheated thermit steel poured around it, while the head of the rail is butt-welded to a small insert of rail steel. The most important recent improvement is the method now used for making the molds and luting them by means of molasses where they butt against the rails so as to prevent the superheated thermit steel, which is exceedingly liquid, from running out. By this and other improvements it has become possible to reduce both the time of the weld and the amount of thermit required.—*Reactions*, No. 3, 1914.

*High-Voltage Direct-Current Traction*.—P. AMSLER.—Translations in abstract of his two recent German papers on electric traction with high-voltage direct current and on a converter for car lighting for use with this system.—*London Electrician*, Sept. 25, 1914.

*Charging Plug for Electric Vehicles*.—An illustrated description of a charging plug and receptacle recommended by the (British) electric-vehicle committee for standardization for use in connection with the charging of batteries of electric vehicles in central stations or in garages where charging current is available.—*London Electrician*, Sept. 25, 1914.

### Installations, Systems and Appliances

*Liquid Resistor*.—A note on a recent British patent (No. 18,000, 1913) of Brown, Boveri & Company. The electrodes are suspended in a vessel the lower end of which is sealed by liquid contained in a tank beneath. This tank is suspended on ropes which pass over pulleys and is counterbalanced by suitable weights, so that it may be raised or lowered easily. Raising this tank decreases the resistance. No flexible leads or rubbing rings and brushes are needed. The specification also describes a method of maintaining the required quantity of liquid in the tank by means of a float valve.—*London Elec. Eng'ing*, Sept. 3, 1914.

*Small Central Station*.—C. F. WEILAND.—A translation in abstract of his recent German article on a new type of small central station for lighting a city of 2000 inhabitants. Two 10-kw, three-phase generators are used, together with a battery for the requirements at night. The battery is operated in connection with a 2.3-kw, three-phase generator, a direct-current machine

for charging and an induction motor of 8.5 hp.—*London Electrician*, Sept. 25, 1914.

*Operation of Machinery*.—E. C. PARHAM.—An account of various practical experiences in the operation of electrical machinery under the following headings: alternator paralleling kink; armature bands breaking; an effect of low frequency; rotor resistor heating; motor starting blew circuit-breaker; reversed compensator coil, and graduating resistance steps.—*Gen. Elec. Rev.*, October, 1914.

### Wires, Wiring and Conduits

*Copper*.—L. ADDICKS.—A paper presented before the American Institute of Metals on the commercial classification of refined copper. Electrolytic cathodes generally run about 99.95 per cent copper, much of the missing 0.05 per cent probably being hydrogen. The metallic impurities generally total about 0.02 per cent. The second part of the paper deals with the uses of copper. Electrical uses immediately impose a conductivity requirement which rules out everything but electrolytic and high-conductivity Lake, which are practically identical coppers. Most of the electrolytic refineries figure on averaging about 100 per cent soft in the electrical conductivity (on Matthiessen's standard) of their outputs. Occasional lots may reach nearly to 101 per cent and some may approach 99 per cent, while 98.5 per cent is the usual rejection limit; but it is very unusual for a refinery to ship anything for electrical use which is below 99 per cent. No distinction is made between cakes, wire-bars and ingots, more than one shape often being cast from a single furnace charge, so that there is nothing to be gained by ordering wire-bars and then cutting them up when ingots are desired.—*Met. and Chem. Eng'ing*, October, 1914.

### Electrophysics and Magnetism

*Villari Critical Point in Ferromagnetic Substances*.—S. R. WILLIAMS.—A brief abstract in an American Physical Society paper on the change in length effect due to magnetization and the change in magnetization arising from a longitudinal pull. The first phenomenon is known as the Joule magnetostrictive effect and the second as the Villari reversal effect. The results indicate that for those substances in which a reversal of the Joule effect occurs there also appears a Villari reversal. Specimens showing only an elongation for all field strengths exhibit only an increase of magnetization due to a longitudinal pull, while those rods in which contraction for all field strengths appears manifest a decrease of magnetization due to a longitudinal pull. Nickel is the most interesting of all the specimens studied. It can be made to exhibit or not exhibit a Joule reversal and also a Villari reversal effect, depending upon whether or not complete demagnetization has been previously secured. This is an important point and will clear up the controversy between the various investigators of this subject.—*Phys. Review*, September, 1914.

### Electrochemistry and Batteries

*Primary Battery*.—A brief note on a French patent for a primary battery of the Leclanché type where in the positive electrode of dioxide of manganese and graphite the graphite is replaced by lamp-black obtained from the decomposition of acetylene. When acted upon by an electric spark discharge, gaseous acetylene decomposes to hydrogen and carbon, this giving a chemically pure carbon. Its density is only 0.9, while that of graphite is from 2.17 to 2.30. In this way it is possible to increase the proportion of dioxide of manganese and obtain a more regular working of the cell than with natural graphite, whose composition is variable. The finely divided state of the acetylene carbon is also held to give a more intimate mixture with the dioxide, and hence a better result. Another patent relates to a method of

working batteries of the above type so as to use considerable current from them and at the same time not to run the battery down. The inventor treats the usual dioxide and graphite mixture by adding to it an oxide of mercury, preferably red mercuric oxide, and in such case the output of the cell may be increased several times and the battery can thus give heavier currents than before, while still maintaining the voltage. He further strengthens the battery by using an alkaline electrolyte, such as caustic soda or potash.—*London Electrician*, Sept. 18, 1914.

#### Units, Measurements and Instruments

**Standard of Field Strength.**—R. BEATTIE.—An illustrated article on the use of an electromagnet as a standard of field strength, with special compensation for variations in the exciting current. It is only necessary

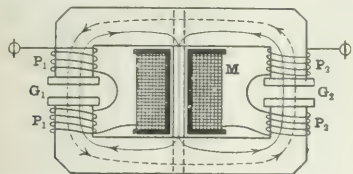


FIG. 2—ELECTROMAGNET FOR MAINTAINING CONSTANT MAGNETIC FLUX

to impose on the main flux in the magnet gap an opposing or compensating flux created by an auxiliary series winding the number of turns of which is so adjusted that the compensating flux increases or decreases with changing current at the same rate as the main flux. To provide a path for this compensating flux the magnet must be furnished with auxiliary poles  $P_1P_2$  in parallel with the main poles  $P_1P_2$  (Fig. 2). Both sets of poles may carry compensating windings  $N_1$  and  $N_2$  turns respectively. These are joined in series with each other and with  $M$ , the main winding,  $N_1$  being connected up to oppose the main flux in gap  $G_1$ , and  $N_2$  to aid the flux in gap  $G_2$ . The compensating windings, therefore, act together in maintaining a flux round the local circuit indicated by the dotted line in the figure, this flux being superposed on the main flux, which divides between the main and auxiliary gaps and follows the paths shown by the arrow-marked full lines. If the ratio of  $N_1$  to

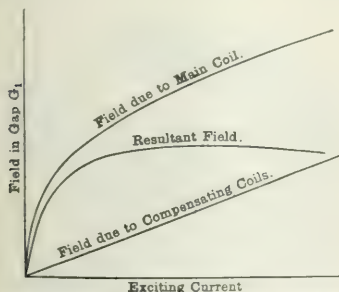


FIG. 3—COMPONENTS OF FLUX ACROSS CONSTANT-FIELD GAP

$N_2$  equals the ratio of the reluctances of gap  $G_1$  to gap  $G_2$ , the compensating flux is entirely independent of the main flux, following the dotted path in the figures and not entering the main magnetic circuit at all. With a main magnetic circuit of small section, and therefore easily saturated, the field in  $G_1$ , due to the current in  $M$  is represented by the upper curve of Fig. 3, while the

field in  $G_2$ , due to the compensating coils, being linear in relation to the exciting current, is represented by the straight line. The resultant field in  $G_1$ , or the difference between the two, is represented by the middle curve. By choosing  $N_1$  and  $N_2$  so that the line representing the compensating flux is parallel to the general slope toward the end of the upper curve, it is easy to get a resultant curve with a very flat maximum corresponding to a constant field in  $G_1$  over a wide range of exciting current. In experiments with this arrangement the author found there was no special difficulty in getting the field in the main gap constant to within one or two parts in a thousand over a range of variation in the exciting current amounting to 100 per cent or more. With a suitable winding the magnet may thus be connected up to the ordinary lighting circuit, and it may be relied on to maintain a practically constant field in spite of variations in the supply voltage or variations in the exciting current due to the heating of the magnet coils.—*London Electrician*, Sept. 18, 1914.

#### Telegraphy, Telephony and Signals

**Telephony.**—HANS CARL STEIDLE.—The first parts of an article pointing out that for the fullest utilization of a telephone network special attention should be paid to small subscribers by making use of automatic exchanges of smallest sizes for small groups of subscribers. The system is compared with party lines.—*Elek. Zeit.*, Aug. 6 and 13, 1914.

**Resistance of the Spark.**—J. STONE STONE.—A mathematical paper on the resistance of the spark and its effect on the oscillations of electric oscillators. This paper was presented before the British Institution of Radio Engineers.—*London Electrician*, Sept. 18, 1914.

## Book Reviews

**DIE QUARZLAMPE, IHRE ENTWICKLUNG UND IHR HEUTIGER STAND.** By Dr. J. C. Pole. Berlin, Germany: Julius Springer. 84 pages, 47 illus. Price, 4 marks.

This little volume gives much useful technical information in condensed form concerning the quartz-tube mercury-vapor high-temperature lamp. It is intended for electrical engineers, students of illuminating engineering and the technically informed inquirers into this comparatively modern illuminant. The book is divided into seven chapters, dealing respectively with the following topics: Introduction, theoretical principles, technical principles, the direct-current quartz lamp, the alternating-current quartz lamp, the ultraviolet radiation from the quartz lamp, quartz lamps for ultraviolet rays in practice. This book is clearly written and well illustrated.

**ELECTRIC COOKING, HEATING AND CLEANING.** By Maud Lancaster. American edition, revised by Stephen L. Coles. New York: D. Van Nostrand Company. 329 pages, 305 illus. Price, \$1.50 net.

A practical, interesting and popularly written manual of electricity in the service of the home. The large number of illustrations, especially of American household electrical devices, and several simply prepared charts should be of great help to the layman who has not seriously considered the manifold uses of domestic electric service as well as to those whose homes are only partly equipped electrically. Mrs. Lancaster, who for a number of years has used electricity exclusively in the operation of her home in England, writes from a full practical experience in her subject, and her book should make a strong appeal to the progressive housewife.

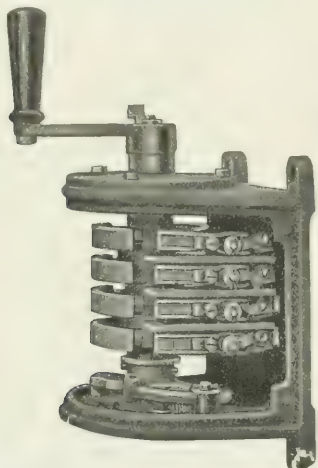


# New Apparatus and Appliances

## An Illustrated Descriptive Record of Recently Developed Manufactured Products of Interest to Electrical Readers

### Inclosed Reversing Switches for Squirrel-Cage Motors

Inclosed drum-type switches designed to reverse small squirrel-cage motors have recently been developed by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis. The switches are operated by means of a handle or by ropes. In the latter case the switch may be installed on the ceiling or otherwise out of reach. These switches are adapted for use on small alternating-current elevator equipments driven by high-resistance rotor squirrel-cage motors. The inclosing

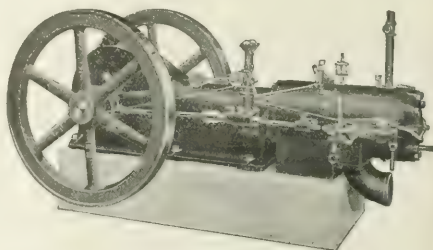


REVERSING SWITCH WITH COVER REMOVED

case protects the switch contacts from dust and dirt and prevents accidental touching of the live parts.

### Two-Stroke-Cycle Oil Engine

A two-stroke-cycle, low-compression, single-cylinder oil engine, operating with low-grade fuel, is being made by the Chicago Pneumatic Tool Company, Chicago, Ill. This engine is built in sizes with ratings of 12 hp, 18 hp, 25 hp and 45 hp. The cylinder is of the valveless type, water jackets being cast integral with the cylinder. The piston is connected to the flywheel shaft through a crosshead. Ignition is accomplished by means of a thin circular plate attached to the piston which becomes hot after the engine is started and instantly gasifies and ignites the fuel injected against it. The fuel nozzle is a combination ball check valve and nozzle and is made of bronze. Water is injected into the oil through a needle valve which is automatically controlled by the governor. The smaller engines can be started by hand, but for the largest size, and for the smaller when desired, a small vertical single-acting air compressor driven from a pulley bolted to the flywheel is used. This compressor delivers air to a stor-

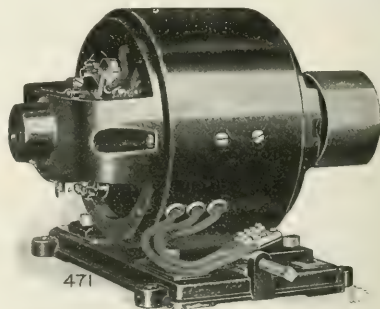


ENGINE OPERATING WITH LOW-GRADE FUEL

age receiver designed for a working pressure of 150 lb. per sq. in. By means of a lever-operated air starting valve, the engine can be run on air until the firing of the fuel has taken place in the cylinder.

### Steel-Frame Direct-Current Motors

In the illustration herewith is shown one of several types of direct-current motors recently placed on the market by the Robbins & Myers Company, Springfield, Ohio. The motors are equipped with cast-steel frames and are designed for service where space is restricted or where light and compact construction is desirable for any other reason. The motors are of the bi-polar type and are made with four different frame sizes with ratings of  $\frac{1}{8}$  hp,  $\frac{1}{4}$  hp,  $\frac{1}{3}$  hp,  $\frac{1}{2}$  hp,  $\frac{3}{4}$  hp, 1 hp, 1.5 hp and 2 hp. They are built for operation with all standard voltages and are provided with the open-type, the semi-inclosed, the fully inclosed or the grid type of frame. The motors may be equipped with idler-pulley attachments or back gears where either construction

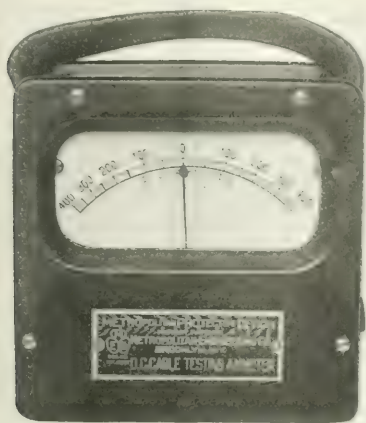


OPEN-FRAME-TYPE 1-HP MOTOR

is desired. Each motor is provided with a sliding base pulley and no-voltage-release starter. The bearings are of phosphor bronze and are lubricated by oil rings. The pole pieces and armature core are built up of steel laminations. The armature coils are wound directly into the slots. The brush holders are mounted on an adjustable rocker and are of the sliding-box type.

### Direct-Current Cable-Testing Ammeter

A direct-current cable-testing ammeter designed to measure the current in a conductor without disturbing the circuit has recently been developed by the Metropolitan Engineering Company, Brooklyn, N. Y. In principle the instrument is similar to those of the D'Arson-

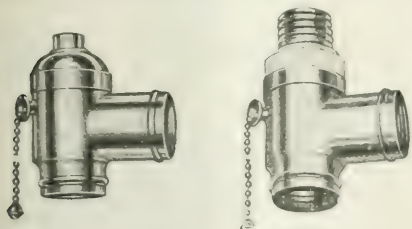


DIRECT-CURRENT CABLE-TESTING AMMETER

val type, excepting that in place of the permanent magnet there is a detachable iron loop and the moving-coil circuit is energized by a small auxiliary battery. When the iron loop incloses an energized conductor the flux in the magnetic circuit of the instrument is proportional to the current in the conductor, and as the moving coil is energized from an independent source, the current from which is constant, the deflections of the pointer on the scale are proportional to the current in the conductor. The calibration of the instrument is simple as it is only necessary to insert in the loop an energized conductor the current in which is known and regulate it by means of a resistor of variable resistance provided in the moving-coil circuit. The instrument is compact and weighs 4.5 lb.

### Twin Pull Sockets

Pull sockets with outlets for two lamps are being made by the Bryant Electric Company, Bridgeport, Conn. Aa attachment plug, of course, may be substi-



PULL SOCKETS WITH TWO OUTLETS

tuted for one lamp or two attachment plugs may be used instead of two lamps. This socket is made in two types. In one type both outlets are simultaneously turned on or off by successive pulls of the chain. In the other type the straight outlet alone is affected when the chain is pulled, the lamp in the angle outlet being on all the time. The first type is useful where it is

desirable to turn on and off two energy-consuming devices at the same time or where one outlet holds a lamp which serves as a pilot lamp for an appliance connected to the other outlet. The second type is useful when it is desired to equip a lamp or other energy-consuming device with its own switch connected to the angle outlet. A shade holder can be attached to either outlet and can be held in its normal position relative to the lamp.

### Electric Bungalow Range

A range designed for use in small apartments and dwelling houses has been developed by Wells, Mowbray & Newman, Inc., 125 West Forty-second Street, New York. The range is equipped with a surface heater and a combined oven and salamander. When using the oven for baking or roasting a baffle plate is placed immediately below the top element. For broiling this plate is removed and a grid is placed in the oven on guides. The switches are of the indicating single-push-button type and are equipped with pilot lamps. The surface cooker is provided with two heats. The oven heater also has two heats. The body of the range is of sheet steel.



RANGE FOR SMALL APARTMENTS OR HOUSES

the facings of polished Russia iron and the trim of polished sheet aluminum. The dimensions are 24 in. front, 24 in. deep and 33 in. high. The oven is 14 in. by 14 in. by 16 in. The outside cooking surface is 20 in. by 20 in. A large hood is provided, as shown in the accompanying illustration, which when connected to a ventilating system removes the fumes from cooking.

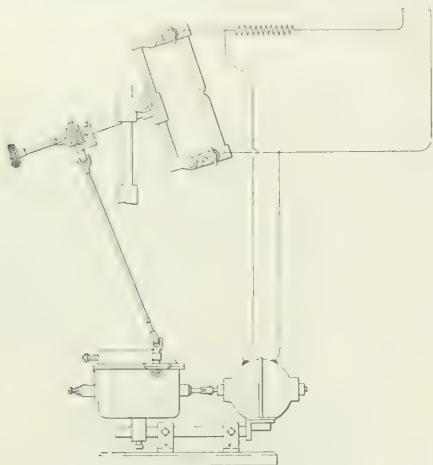
### Controller for Arc-Lamp Feed

A device for controlling the feed of arc-lamp electrodes for motion-picture purposes is illustrated in the accompanying diagram. The controller itself consists of a set of gears running in an oil bath and is connected directly to a 1/16-hp motor. A toggle-joint rod connects the controller to the feeding arms of the lamp.

The armature of the motor is connected in shunt with the arc-lamp circuit. The motor is so designed that its speed is susceptible to all changes in voltage; therefore, as the electrodes burn away and the voltage rises as a result, the speed of the motor and consequently that of the controller is increased. This increase in speed when above a certain predetermined amount causes the



toggle-joint rod to move and to bring the electrodes together just enough to compensate for the increased voltage. It is claimed by the manufacturers that the controller moves the electrodes by average feeds of 0.0005 in. per electrode. The manufacturers also assert that the principle embodied in the controller described



MOTOR-DRIVEN CONTROLLER FOR ARC-LAMP FEED

above is applicable to the control of air brakes, speed of vehicles, output of generating stations, etc.

The controller is being made by the Speed Controller Company, 257 William Street, New York.

### Receptacle for High Candle-Power Lamps

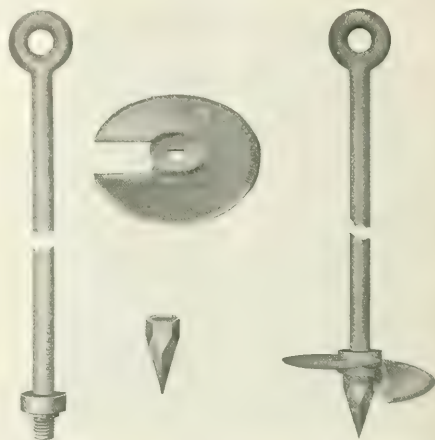
A rugged cleat receptacle designed for use with large-sized incandescent lamps has recently been developed by Pass & Seymour, Inc., Solvay, N. Y. The manufacturers declare that the energy-carrying parts are not only ample but are also exceptionally strong from a mechanical standpoint. The device is illustrated herewith.



EXTRA-STRONG RECEPTACLE FOR LARGE-SIZED LAMPS

### Screw Guy Anchor

An all-steel screw guy anchor with interchangeable plates to provide for different soil and load conditions is being manufactured by Hubbard & Company, Pittsburgh, Pa. Fig. 1 shows a disassembled and Fig. 2 an assembled view of this device. The anchor is provided

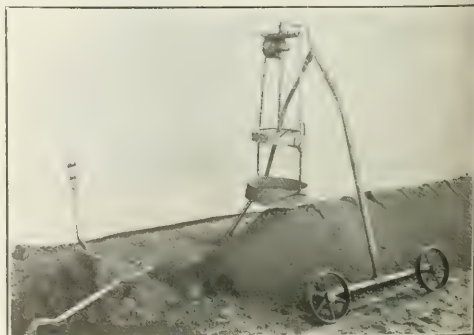


FIGS. 1 AND 2—GUY ANCHOR DISASSEMBLED AND ASSEMBLED

with a large bearing surface. It is of open-hearth steel and is galvanized by the hot-dip process. The wings are made in three sizes with diameters of 6 in., 8 in. and 10 in. respectively, and they are equipped with rods 0.75 in., 1 in. and 1.25 in. in diameter. All the rods are 5 ft. 6 in. long. A drop-forged cap screws on the end of the rod to hold the plate in place. To install this anchor, it is first necessary to remove a shovelful of earth to give it a start; then a bar is thrust through the eye of the rod and the anchor is screwed in place.

### Gyratory Foundry Riddle

The foundry riddle or sand screen made by the Great Western Manufacturing Company, Leavenworth, Kan., consists of a 1/6-hp motor driving an unbalanced weight attached to a vertical shaft. The motor shaft operates at 1750 r.p.m. and drives the vertical shaft at 250 r.p.m. by means of an inclosed worm-reducing gear. An ad-



MOTOR-DRIVEN GYRATORY SAND SIFTER FOR FOUNDRY WORK

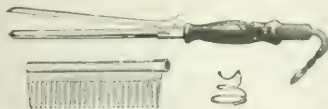
justable unbalanced weight attached to a horizontal arm at the lower end of the vertical shaft gives the suspended riddle a sharp jerk at each revolution. The gyratory riddle exclusive of its support weighs approximately 100 lb., making it easily portable. This device, the manufacturers declare, will sift continuously as much sand as two laborers can shovel into the riddle.

### Sealing Wax for Electrical Fittings

Two grades of sealing wax, one with a melting temperature of 150 deg. Fahr. and the other of 200 deg. Fahr., are being made by the Insulating Materials Company, Detroit, Mich. Either grade may be colored red, brown, black or white as desired. The wax is used for sealing screw heads, nuts, bolts and other live parts used in electrical apparatus. It has been approved by the Underwriters' Laboratories, Inc.

### Combination Curling Iron and Drying Comb

To enable the user of an electric curling iron to combine its functions with a hair drier, Landers, Frary & Clark, New Britain, Conn., recently placed on the market the curling iron and drying comb illustrated herewith. The outfit takes only 20 watts and is finished in nickel. The heating element of the curling iron is of the flanged, flat type, fitting closely to the shell, the de-



ELECTRIC CURLING IRON AND DRYING COMB

sign providing for expansion and contraction. The comb, made of aluminum, slides upon the iron and snaps into place with a small pressure of the finger. With this equipment women need no longer wait for a sunny day before shampooing their hair. The combination equipment greatly simplifies electric hair drying.

### Lock Plug

A plug designed for use with screw-base sockets or outlets which can be locked when in place is being



LOCK PLUG FOR SCREW-BASE SOCKETS

made by the Yost Electric Manufacturing Company, Toledo, Ohio. After inserting the plug in place a slight turn is made to the right. Before turning a slight pressure is exerted to compress a plunger. The

plug is disconnected by reversing this operation. It is known as the "lockfast" plug. By means of a quick-make-and-break connection the manufacturers assert that the circuit can be instantly opened or closed. The insulating material used in the manufacture of this device is a substance called "thermoplax," which, it is declared, will not burn or soften at a temperature of 600 deg. Fahr. By depressing a small spring with a pointed instrument or a piece of stiff wire the interior part of the device can be slipped out of the shell. After wiring the interior can be replaced and then is automatically locked.

### Portable Wagon and Truck Loaders

For loading loose materials such as coal, sand, stone, gravel, etc., from ground storage to wagons or trucks, various types of electrically operated portable loaders have been developed by the Link-Belt Company, Chicago, Ill. In Fig. 1 is shown a diagram of one of these loaders designed for use with anthracite coal. The apparatus includes a shaking screen at the head, which can

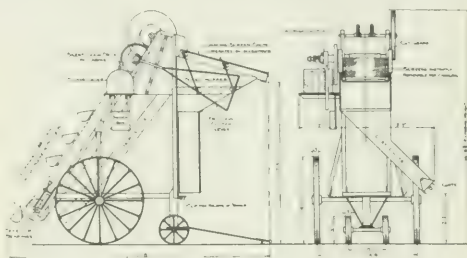


FIG. 1—DIAGRAM OF CONSTRUCTION

be of any mesh desired. At the foot of the conveyor is another conveyor for feeding the coal to the buckets. The elevator consists of double-strand chains attached to malleable-iron buckets, 16 in. by 6.5 in. The total weight of the apparatus is 2700 lb. The conveyor is operated by a 3-hp motor.

For use in yards where it is necessary to move the loader under a load shed or from one side of a low trestle to the other, the collapsible, bituminous-coal loader shown in Fig. 2 has been developed. The bucket-elevator part is pivoted nearly in the middle, and by turning a crank which operates a worm gear the foot



FIG. 2—PORTABLE WAGON LOADER FOR ANTHRACITE COAL

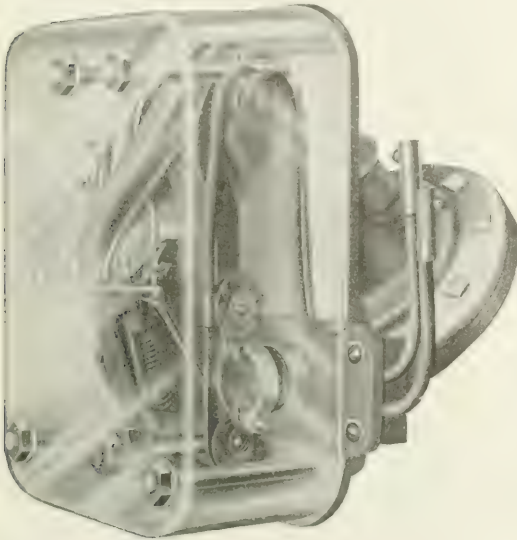
of the machine is raised and the head lowered, thereby reducing the height so that it will pass under the obstruction. The total weight of this loader is 4900 lb., and it is operated by a 5-hp motor.



### Controller for Electrically Operated Pneumatic Water System

An automatic controller for a motor operating a small pneumatic water system or an air compressor is being manufactured by the Leader Iron Works, Decatur, Ill. The controller is light and compact and can be mounted on any piping which is substantially supported. The

in-head type with ratings of from 1 hp to 325 hp. Each generator is provided with a sliding base for taking up belt slack. The battery is equipped with either open or glass cells. The switchboard is of marble mounted as shown in the accompanying illustration on angle iron and is 60 in. high. It contains the meters, switches, circuit-breaker and controlling rheostat.

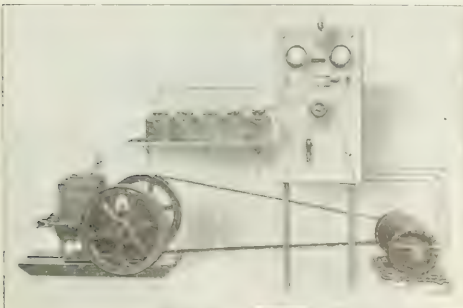


ELECTRIC CONTROLLER FOR MOTOR-DRIVEN AIR COMPRESSOR

actuating parts are a diaphragm and spring which operate a switch. The switch contacts are carbon disks 1 in. in diameter and are mounted in brass collars. The controller can be set to operate at a minimum pressure of 5 lb. per sq. in. and a maximum of 150 lb. per sq. in. All working parts are incased in a glass cover.

### Small Lighting Outfits

Lighting plants varying in rating from 0.25 kw to 200 kw are being made by the Main Electric Manufacturing Company, 219 South Beatty Street, Pittsburgh, Pa. The generators are driven by gasoline engines of the horizontal, four-stroke-cycle, hopper-cooled, valve-



SMALL LIGHTING PLANT

### Adjustable Lighting Fixture for Shaving

A portable lighting fixture equipped with a mirror and provided with a hinged joint so that the lamp and reflector can be adjusted through a wide range of angle is shown herewith. The mirror is 6 in. in diameter and is supported by three clips which hold it flush with the



LIGHTING FIXTURE FOR SHAVING

opening of the reflector. The mirror is surrounded by an open space of 1 in. through which the light is diffused. Although the fixture is designed primarily for shaving purposes, by removing the mirror advantage can be taken of its adjustable features for use as a piano or desk lamp. The fixture is equipped with a hook in the base so that it can be hung on the wall. The device is being manufactured by the Holophane Works of the General Electric Company, Cleveland, Ohio.

### Flat-Type Quick-Heating Toaster

A toaster being marketed by the T.-J. Electric Heating Company, 714 Postal Telegraph Building, Chicago, is notable for its light and inexpensive construction and for the rapidity with which the heating elements reach their normal operating temperatures. The device measures 7 in. by 4 in. by 1.5 in. and weighs 31 oz. It has 450-watt heating elements, composed of five 6-in. 0.125-in. nichrome 26-gage wire helices, come to a heat in less than ten seconds after they are placed in circuit. The frame of the toaster is of nickel steel, and the base upon which the heating element is mounted is formed of an asbestos composition.



TOASTER, SHOWING ARRANGEMENT OF HEATING ELEMENTS

# Jobber, Dealer and Contractor

## Legislation as It Affects the Electrical Contractor

In addressing the first convention of Massachusetts Electrical Contractors at Worcester recently, Mr. A. J. Hixon, of Boston, Mass., pointed out that so-called constructive legislation designed to build up business can not properly be put upon the statute books, the securing of such business being largely a matter of constitutional rights. The recent license law in Louisiana was declared unconstitutional because it attempted to create constructive out of corrective legislation, and hence the whole structure of what should have been a most satisfactory law was lost. There is an opportunity to legislate to the advantage of the electrical contractor upon his relations with the general public to protect the latter and establish responsibility for installations. Suitable license laws should serve to identify the responsible party rather than to specify how the work should be done. It should be made a criminal offense to do irresponsible work. License laws should be state laws, mandatory and enforced by city police departments. A wise license law, carefully enacted and wisely administered, will do more than any other single thing to improve the status of the electrical contractor. Public officials should be required to let all natural sub-contracts separately, and the practice of awarding general contractors widely inclusive contracts should be prohibited on all work not of a private nature. A law to this end has been enacted in New York, Pennsylvania and New Jersey. The American Society of Architects has also condemned the practice of letting unit general contracts. Efforts will be made to secure a new license law at the next session of the Massachusetts Legislature, as well as a law in relation to segregated contracts.

## Business Building

When an electrical contractor secures the name of a customer on the dotted line of an agreement stating that he is to receive a specified sum of money for installing a certain number of lamp outlets, the contractor is usually quite sure that a percentage of profit will come to him from the work. That profit as a rule is not great when figured on the basis of percentage of the gross amount of the contract. Keen competition has made the contractor bid low to get the work.

When he has secured the job, however, advantage is taken. He can disprove the belief sometimes prevalent that wiremen make a home look as if the plumber had been there. He can cultivate the customer's closer acquaintance and tell him about the latest electrical household labor saver. Contractors know of these things but sometimes fail to realize the electrical ignorance of the average householder and to appreciate the householder's desire for electrical knowledge. It is the salesman who can tell his customer something new that wins admiration and respect, and the contractor can do this. He should make it a rule to tell every customer of some electrical device of which the latter has not known before. Then when electrical goods are to be bought for the home or for gifts the man of the house will say: "That contractor, Jones, keeps posted on all new electrical things. Wife, you had better call at his shop before you buy."

So it is with lamps. The contractor who, having been courteous and prompt in carrying out his wiring agreement, calls attention to the good grade of lamps he handles seldom fails to get renewal orders when the 100-hour period has passed. One lamp purchase at the

contractor's shop leads to another, for every person is a persistent follower of habit. The lamp business is not to be despised, for contracts may come and contracts may go, but the lamp trade continues as long as there is a clerk behind the counter who never forgets to say "Thank you" when he takes a buyer's money. Clerks in a well-known chain of red-front cigar stores never forget that phrase, and the chain has grown apace with the number of "Thank you's" dealt out with 5-cent and 10-cent purchases.

Thus business building with the wiring agreement as the basis can profitably be made the aim of electrical contractors. A worthy motto is, know your customer and let him know you before his wiring contract is completed.

## Window Electric-Cooking Demonstration

In order to determine to what extent the public would be attracted, Wells, Mowbray & Newman, Inc., 125 West Forty-second Street, New York, recently installed, at the request of the Hershey Chocolate Company, one of their electric "bungalow" ranges in the window-display space of the Hershey showroom in New



WINDOW DEMONSTRATION OF ELECTRIC COOKING

York, and demonstrated to passers-by the simplicity and cleanliness of cooking by electricity. Each operation was explained by means of the blackboard which is shown in the accompanying illustration. Cocoa and chocolate constituted one of the ingredients in everything cooked. Considerable interest was shown in the demonstration, and it elicited many inquiries. The accompanying illustration shows a typical group of spectators, in which housewives are prominent.

## Regulation of Electrical Work in Cincinnati

An ordinance providing for a board of examiners of electrical contractors, to consist of two contractors and a journeyman electrician, has been introduced in the City Council of Cincinnati for the purpose of regulating electrical work in that city. The measure is in reality designed as a revenue producer and provides for the payment by all contractors within sixty days of its enactment of a license fee of \$25, with an annual fee of \$5. Provision is also made for the payment of a fee of \$1 for a permit on each job. A bond of \$1,000 will also be required as a guarantee of the faithful performance of contracts. The proposed new department will be under the supervision of the office of the city building commissioner.



# Industrial and Financial News

## Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

**Washing-Machine Company Increasing Manufacturing Space.**—The Dodge & Zuill Manufacturing Company, Syracuse, N. Y., has increased the size of its plant to take care of the large number of orders for washing machines being received. This company carries on many demonstrations of its machines, and the operators are both men and women who are experienced in selling.

**Portable Fixtures for Christmas Gifts.**—The Weintraub Brass Manufacturing Company, 27 Bleecker Street, New York, has on hand a number of artistically designed fixtures which are proving popular for the holiday trade. These fixtures are of brass with silk linings in various colors, and the larger fixtures are equipped with cut-glass prisms. The company's manufacturing establishment is being kept busy to fill the numerous orders recently received.

**Storage-Battery Company's Plant Working Night and Day.**—The Philadelphia Storage Battery Company is very busy and the plant at Philadelphia is kept in operation day and night to take care of the large number of orders being received. This company has service depots all over the country and is opening many new depots in the Pacific Coast territory. In New York City a sudden increase in business has been noted. This is owing to the fact, it is said, that owners of electric vehicles are preparing for winter.

**Reduce Cost of Refilling High-Voltage Fuses.**—The firm of Schweitzer & Conrad, Inc., of Chicago, manufacturers of S & C fuses, has made arrangements to refill its fuses at about two-thirds of the former re-fusing cost, thus making the maintenance expense very small. When the glass tubes are returned to the manufacturers in good condition fuses for 33,000-volt lines and higher pressures are refilled for 15 per cent of the list price of the device, 22,000-volt units for 25 per cent, and 4400-volt and 6600-volt fuses for 30 per cent.

**Bronze-Plated Ornaments.**—Various kinds of bronze-plated ornaments are being made by the Bronze Depositing Company, 348 West Forty-second Street, New York. The ornament is molded out of plaster of paris and then is coated with a metallic paint. It is next dipped in an electrolytic bath and receives a bronze covering. As a result a light ornament is made which in all outer aspects resembles the more expensive solid-bronze articles. This class of goods is particularly well adapted for holiday trade and the above company is being kept busy filling orders for the coming season.

**Good Demand for Motors and Arc-Welding Apparatus.**—The C & C Electric & Manufacturing Company, of Garwood, N. J., reports that there is a continued demand for its motors for driving fans, blowers, pumps, etc. Contracts have been signed for supplying a large number of motors to the Yale Club, the Grand Central Station, the Aetna Life Insurance Company and other large buildings in New York City. It is also reported that the sales of automatically controlled electric arc-welding equipment are good and that the export business in motors, generators and welding apparatus is increasing.

**Vacuum Cleaners for Cleaning Generators.**—Several vacuum cleaners made by the Duntley Products Company, Erie, Pa., were recently installed in Ehret's brewery, New York, to clean four 250-kw generators and the switching equipment. Autumn is one of the best seasons for the vacuum-cleaning industry, and the Duntley company has been very busy as a result. The plant has been in operation night and day this fall, and recently the manufacturing space has been increased 30 per cent to take care of the large number of orders received. During the past month, it is reported, over 1500 cleaners have been sold.

**High-Duty Centrifugal Pumps for Philadelphia.**—The two turbine-driven centrifugal pumps recently purchased by the city of Philadelphia and mentioned in these columns on Oct. 10 are remarkable because of the high duty which has been guaranteed for this type of pump. It is declared that they will be capable of performing 145,000,000 ft.-lb. of work with a consumption of 1000 lb. of steam. The importance of these pumps was underestimated in our note regarding them because of a typographical error. Instead of being able to supply only 2,000,000 gal. a day, as stated, each one will be capable of delivering 20,000,000 gal. a day.

**Two-Motor Concentric-Gear Drive for 1000-lb. Truck.**—A 0.5-ton wagon equipped with two-motor concentric-gear drive has recently been developed by the Commercial Truck Company of America, Philadelphia, Pa. Heretofore this type of drive has been used only on the 1-ton and 2-ton trucks made by the company. Two General Electric motors are used. The wagon develops a speed of 13 miles an hour and will run from 40 miles to 60 miles on one charge. One of the advantages of this type of drive, it is claimed, is the elimination of differential gear. The above company has also developed a so-called gasoline-electric truck which promises to be successful.

**Electricity for Photographers.**—The increasing importance of electricity in photography was pointed out in various demonstrations carried on by the photographic bureau of the New York Edison Company at the recent New York electrical show. Portraits were made, using both a 1000-watt nitrogen-filled lamp and mercury-vapor lamps. A fully equipped dark room was maintained, and electric printing and drying apparatus was used. A new motor-driven print drier made by the Eastman Kodak Company was placed on exhibition for the first time. The Edison company sent out invitations to a large number of New York photographers to visit the electric studio, as the booth was called; a register was kept and over 1800 photographers are said to have signed their names in it.

**Weighing and Counting Machines for Electrical Industry.**—Electric companies, it is said, are the largest users of the counting and weighing machines and elevating trucks manufactured by the National Scale Company, Chicopee Falls, Mass. Because of the widespread movement for greater industrial efficiency the business of the above company, it is declared, has increased 50 per cent the past year. The elevating truck is a device designed to eliminate unnecessary handling on loading and unloading. The counting machines operate on the ratio-of-weights principle, whereby a given ratio is employed to obtain a unit, the product of its multiple or any fractional part thereof. The contents in numbers of any box, barrel, bag, truck or barrow containing an unknown number of like parts or pieces can be determined quickly and accurately without any calculations.

**Electric Fountains and Baskets.**—Electric fountains with out connections for water mains are being made by the Electric Fountain Company, 348 West Forty-second Street, New York. These fountains are portable and are manufactured in various sizes, the largest being operated by a 1-hp motor and the smallest by a 1/30-hp motor. The motor is connected directly to a small pump. These fountains are now installed in the following New York establishments: the Keith theaters, the Strand theater, the Loew theaters, the Fox theaters, Hotel Plaza, Hotel Astor, Hotel Ritz Carlton, Hotel Martinique, Rector's, Tiffany's and Gorham's. When operated with iced water one of these fountains will cool the surrounding atmosphere considerably. The water may be perfumed or a mild antiseptic may be added to sterilize the air. The above company is also making electric flower baskets and various electrically illuminated flowers. Business in these devices is very good.

**"Fall Festival Electric" at Kansas City.**—A so-called fall festival was held in the offices and showrooms of the Kansas City (Mo.) Electric Light Company, Oct. 1-10, and it is declared that over 10,000 visitors were entertained. Among the interesting features of the festival were the daily demonstrations of baking by the Hughes Electric Heating Company in co-operation with the Ismert-Hincke Milling Company, of Kansas City, which provided the material and the bakers. It is said that on one day (Oct. 9) fully 100 bakers were present to witness the operation of the electric ovens. Other prominent exhibitors were the General Electric Company and the Hotpoint Electric Heating Company. During the festival the electric-light company reduced the prices on all its heating appliances 20 per cent, and as a result a number of sales were made.

**Largest Single Commercial Load Carried by Keokuk Plant.**—The largest single commercial load which has ever been secured by the Electric Company of Missouri, distributor of energy generated at Keokuk, Ia., has been contracted for recently by the Continental Portland Cement Company at Continental, Mo. The connected load will be approximately 4000 hp, and the annual revenue will exceed \$110,000. To serve the company it will be necessary to construct a substation containing three 1000-kva transformers. The Arrow Engineering Company received the contract for erecting the substation, which is expected to be so near completion that energy can be supplied by Jan. 1. By electrification Mr. Marks, president of the cement company, estimates that the output will be increased about 20 per cent. Twenty-five hundred barrels are turned out daily now.

**Demand for Battery-Charging Devices.**—Mr. H. P. Hill, Eastern agent of the Electric Products Company, Cleveland, Ohio, manufacturer of the "Wotton" vertical rectifier for charging electric-vehicle batteries, states that the business of the company in New York City for September was double that for the corresponding month of 1913. The business for the company throughout the country for the same month, it is reported, is twice as much as that for September of last year and four times that of the same month in 1912. The Electric Products Company has a number of service stations in various cities and also has so-called service men who are continually traveling from place to place and examining installations of the company's machines. The company is also manufacturing a machine for use with motion-picture apparatus which converts alternating-current energy into direct-current energy. A large number of these machines have recently been sold.

**Improvements in Edison Dictating Machine.**—In addition to bringing out the telescribe, which was described in the Oct. 10 issue of the *Electrical World*, Thomas A. Edison, Inc., Orange, N. J., has developed the transophone and improved its dictating machines so that their operation is almost entirely automatic and their field of use considerably widened. A hook for holding the mouthpiece tube has been attached to a switch on the front of the machine so that when it is not being used the energy supply is cut off. On raising the hook, however, the circuit is completed and the operating motor made to revolve. Another improvement has been made by inclosing the gears. By using the transophone a copyist transcribing a dictation on a typewriter can make the machine repeat the dictation by gently touching a button switch attached to the keyboard of the typewriter. The ordinary type of transcribing machine can be easily converted to give the same results with but few additions.

## Corporate and Financial

**Initial Dividend.**—A meeting has been called of directors of the Pacific Gas & Electric Company for Oct. 31, 1914, for declaration of the initial dividend of 1½ per cent upon the full-paid first preferred stock. The board will also be asked to declare the regular quarterly dividend of 1¼ per cent on the original preferred stock.

**Bankers See Improvement.**—Lee, Higginson & Company, of Boston, have sent out the following letter dealing with present conditions: "The sudden outbreak of the European war caused good bonds intrinsically unaffected in value to drop sharply in price so that bonds which ordinarily sell at prices to yield 4 per cent to 5½ per cent can to-day be bought to yield 5 per cent to 6½ per cent. At first we were facing a situation commercially unknown. Many were alarmed. Business was disarranged. Money was 8 per cent and hard to obtain. The last few weeks have brought improvement. Merchants are securing accommodations. The banks have strengthened their position as the weekly returns prove. Rates have fallen and, in short, confidence and courage are returning. To-day it is still the buyer's market."

**Opportunities Arising from the War.**—The October issue of *Facts and Figures*, issued by C. D. Parker & Company, of Boston, says: "It must have become evident to those who have studied events since the European war started that our own country, with its location, its large manufacturing establishments and its enormous natural resources, occupies a unique position in relation to the rest of the world that promises a great future. We believe that the next few years are going to be years of prosperity for this country. Money for investment has been accumulating for some time, but especially since the declaration of war. This accumulation of funds for investment must, by this time, have reached a very large figure. This money will seek investment as soon as conditions begin to show a marked improvement. During the past few days the demand for securities has shown a decided increase. This indicates that discriminating investors have already begun to buy."

## ELEVEN FUNDAMENTAL PRINCIPLES

**Public Utility Bonds of This Country Proved Safe and Substantial by Economic Laws.**

Public utility bonds of this country are established as safe and substantial investments by eleven fundamental principles contained in a booklet issued by P. W. Brooks & Company, of New York. The figures in the booklet were taken from an address delivered before the Finance Quorum at the West Side Y. M. C. A., New York, April 27, 1914. The eleven fundamental principles as established are those of demand, relation of supply and demand, efficient management, supervision by commission, analysis of condition, attitude of national banks, successful operation, tested by time, panic and war, free from competition, denominations of bonds and bond certificates, and yield proportionate with cost of living.

The principles are developed as follows: "Dependent upon population, public utilities companies have become absolute necessities for our large and ever-increasing population. It is an established fact that the volume of lighting and electric power business is in direct ratio to the population served. It is readily accepted that when the demand for an article is greater than the supply the price is not only sustained but increases until supply and demand have equalized. Every building that is built, whether for commercial or domestic purposes, means an increased demand for gas, electric light and trolley service. Efficiency and economy are best judged by results. The results of efficient management are best shown in the excellent annual reports of public utilities companies. When a company can pay 5 per cent to 6 per cent interest on its bonds and 7 per cent to 8 per cent on its stock, and lay by a surplus, efficiency and economy in management has certainly been established.

The introduction of public service commissions in almost every state also has done much to place all public service companies on a firm footing, inasmuch as under these com-

### NEW YORK METAL MARKET PRICES

	Oct. 13	Oct. 20
Copper:		
Prime Lake	11.57 to 12.00	11.57½ to 11.62½
Electrolytic	11.60 to 11.70	11.20 to 11.30†
Casting	11.50 to 11.60†	11.10 to 11.20†
Copper wire base	13.00 to 13.25	12.75 to 13.00
And	3.50	3.50
Nickel	40.00 to 45.00	40.00 to 45.00
Sheet zinc, f.o.b. smelter	8.50†	8.00
Melting, spot	4.90 to 5.00	5.10 to 5.15
Strait tin	31.00	29.00
Aluminum, 98 to 99 per cent	18.00 to 18.50	18.00 to 18.50

### COPPER EXPORTS

Total tons to Oct. 20.....13,154

†Nominal.



missions the companies are not heckled by petty local politicians or forced to pay interest to an organization under threat of competition. These commissions are a distinctive and added force of security for the investor in public utility bonds. The products of public utility companies, such as light, heat and power, go direct from manufacturer to consumer. Complete and comprehensible reports on the conditions of any company are, therefore, easily obtainable. The opinion of an expert is one of the most important factors in investing. For the past two years national banks have been increasing their holdings of public utility bonds, and decreasing what they have on hand of railroads and industrials.

Public utility companies have been successfully operated, as a whole, for the past thirty years. A careful compilation of figures for that time fixes this fact by a comparison of net earnings of railroads, industrials and public utilities. Net earnings in per cent of capital invested: Steam railroads, 4.25 per cent; industrials, 7.79 per cent; public utilities, 8.45 per cent. The above is a positive proof of successful operation. Let us take the worst side of the proposition and establish a negative proof. For the same period of time figures have been compiled showing the liability of companies to get into difficulties. This is called risk of receivership, and the following results have been deduced: Risk of receivership in per cent of capital invested, steam railroads, 1.84 per cent; industrials, 2.07 per cent; public utilities, 0.37 per cent. This shows that the liability of a steam railroad going into the hands of a receiver is five times as great as a public utility company. In a word, for the past thirty years public utility companies show net earnings of 8.45 per cent against 4.25 per cent for railroads, and the risk of receivership in railroads is five times greater. From 1907 to 1911, a period of panic, the following figures, showing a comparison of net earnings are even more emphatic: Per cent increase of net earnings 1907-1911, gas and electric, 60 per cent.; electric railway, 20 per cent; steam railway, 5 per cent. Steam railways show but 5 per cent increase in net earnings for 1907-1911, and in 1907-1908 their earnings decreased 20 per cent. Net earnings of industrials from 1907-1908 ran from 20 per cent increase down to 25 per cent decrease, a downward percentage of 45 per cent.

In any state which has a public service commission the utility companies have been given a practical monopoly in the district served. The reason for this is that the commissions have approximated the lowest cost of production and operating expense. This is an advantage enjoyed by no other class of privately owned enterprises. In no other class of security is there such a large proportion of bonds in denominations of \$100 and \$500, and many houses will issue certificates in any amount from \$20 upward, yielding the same rate of interest as the bonds themselves.

This gives public utility bonds two important advantages over other securities: (1) They offer 5 per cent to 6 per cent to the investor on savings which have not yet reached the amount necessary to invest in other bonds. (2) They have a very broad, if not the broadest, direct distribution. This means that more people are interested in and affected by this class of security than any other. This is an excellent economic factor.

A great deal is heard these days about the high cost of living which means nothing more than that we have learned to want more, need more, and get more things. Fifty years ago 4 per cent was a sufficient rate of interest to meet the wants and needs of that day. We want to hold and increase our prosperity, and in public utility bonds is to be found the opportunity for accomplishing this purpose. They return an income of 5 per cent and 6 per cent, with a high degree of safety.

In conclusion, the business of public utility companies is not only an established necessity but is growing more than twice as fast as the railroad business. The railroads must extend and will, but the communities served by railroads will grow within themselves much faster than the railroads will extend. To meet the increase in demands of the public for public utility services it is estimated that \$1,200,000,000 of new capital per year will be required, or \$4,000,000 per working day. Now is the time, therefore, to invest in the securities of companies which are not only established but have begun an era of progress that will increase with the growth of the country."

## EFFECT OF WAR ON EASTERN UTILITIES

Atlantic States Not Affected—Approximately the Same Rate of Growth Is Shown During August as Was Shown in July

The first month of the war saw very depressing conditions in this country, but these conditions have had little effect on the operations of the central stations of the Atlantic States. This will be noticed if a careful study is made of Table I. While the figures there are not strictly comparable, they will suffice for our purpose. The greatest lighting loads come in December, and from then on the load gradually diminishes until July, when the total daylight begins to decrease again. Thus August outputs ought to be greater than those for July, and by a glance at the 1913 column it is seen that the difference is not a great one. While the August figures are not in excess of the July figures by amounts so large as they would be under normal conditions, still the fact that they are greater shows that the effects of the war during the first month, in that region at least, were by no means injurious to the electric utilities. Only five companies showed output decreases during the month, three of which reported output decreases during July. One company which showed an output decrease in July showed a gain in August. While two of the companies reporting an output decrease for August were large com-

TABLE I—RETURNS RECEIVED FROM CENTRAL STATIONS IN THE ATLANTIC STATES OVER A SEVEN-MONTH PERIOD

	INCOME DERIVED FROM SALES OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
February ('54 per cent of industry).	\$7,288,792	\$6,655,011	9.8	231,790,165	205,726,060	12.6
March ('60 per cent of industry).	6,021,269	5,661,027	6.4	246,306,123	223,156,161	10.5
April ('65 per cent of industry).	6,731,495	6,106,634	10.3	261,133,882	252,069,127	3.5
May ('68 per cent of industry).	6,492,767	5,628,718	14.5	259,098,542	238,733,320	8.4
June ('70 per cent of industry).	6,067,780	5,728,381	6.0	244,936,886	221,315,464	10.8
July ('70 per cent of industry).	6,152,169	5,583,309	10.2	263,580,299	235,068,939	11.8
August ('71 per cent of industry).	6,224,896	5,755,515	8.2	264,717,319	237,954,895	11.2

panies, the actual decrease was very small. Only two companies reported a decrease in income. One of these supplied phosphate mines with its entire output.

The figures in Table II are comparable figures over a seven-month period and show the operations of three large companies, one in New York, one in New Jersey and one in Pennsylvania. During the seven months the companies have by no means had an even growth. The average growth is closely approximated by the August figures, and while these figures for growth are not so good as the July figures they are better than most of the other months.

Figures from over 60 per cent of the industry of the Middle Atlantic States showed the income for August, 1914 to have been \$5,159,385 and for August, 1913, to have been \$4,795,770, or an increase of 7.7 per cent. The output figures showed an increase of 8.3 per cent, from 182,357,792 kw-hr. to 197,608,176 kw-hr. Thus the conditions governing the industry were practically the same all over the Middle Atlantic States. The large companies showed practically the same rate of growth that the 60 per cent of the section showed. Returns from approximately 80 per cent of the industry of the South Atlantic States gave income figures for August of this year as \$1,065,511 and for last year as \$959,745, or an increase of 11.1 per cent. The output figure

increased from 55,627,103 kw-hr. in 1913 to 67,109,143 kw-hr. in 1914, or 20.6 per cent.

The returns for July and August have been broken up into companies of large, medium and small size. In this way the companies can be further compared during periods of peace and war. Seven large companies in July, 1914, had an energy-sale income of \$4,175,462, against \$3,807,435 in the previous year, or a 9.7 per cent growth. The same companies in August had a 7.5 per cent growth, from \$3,840,052 to \$4,128,374. The July figures from this group for output showed a growth of 9.7 per cent, from 161,623,852 kw-hr. to 177,330,634 kw-hr. In August the growth was 8.3 per cent, from 162,372,591 kw-hr. to 175,929,369 kw-hr.

The figures from the group of medium-sized companies were compiled from the returns from eighteen companies. The total income in July, 1914, was \$1,275,379 and in the previous year was \$1,153,263, or a growth of 10.7 per cent. In August the growth was 7.6 per cent, from \$1,211,970 to \$1,304,586. The output figures from the same companies in July showed a growth of 16 per cent, from 41,137,364

territory with headquarters in Detroit. F. J. Passino, hitherto the company's representative in Michigan, has been chosen to represent the company in the Southwest, and he will succeed H. F. Finney, who has been transferred to the general sales offices of the company in Chicago.

The Indianapolis Engineering Company, with offices at 328 American Central Life Building, Indianapolis, Ind., has been organized by Messrs. R. M. Cass and E. Darrow, of that city, to do general work in the public-utility field. Among the company's present contracts are the appraisal of the properties of the Connersville (Ind.) Gas & Electric Company, appraisal work for the Oakland municipal plant, engineering for the new municipal plant at Tell City, Ind., rebuilding of the North Vernon Electric Light & Water Company, and engineering supervision for the French Lick and West Baden properties. The company also owns and manages the Brownstown Water & Light Company, which is now extending its lines to Medora and Vellonia, in Jackson County, Ind.

TABLE II—COMPARATIVE FIGURES SHOWING THE MONTHLY OPERATIONS OVER A SEVEN-MONTH PERIOD OF THREE LARGE COMPANIES IN THE MIDDLE ATLANTIC STATES, REPRESENTING 35 PER CENT OF THE CENTRAL-STATION INDUSTRY OF NEW YORK, NEW JERSEY AND PENNSYLVANIA

	INCOME DERIVED FROM SALE OF ENERGY		ENERGY OUTPUT IN KW-HR.			
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
February	\$3,766,823	\$3,497,945	7.8	112,892,266	105,302,262	4.4
March	3,492,149	3,386,190	3.1	118,987,901	114,136,574	4.2
April	3,437,634	3,194,160	7.6	112,894,803	105,328,705	7.2
May	3,113,526	2,476,781	28.2	108,171,896	104,267,718	3.8
June	2,952,454	2,844,643	3.7	103,013,271	97,628,941	5.7
July	2,933,019	2,648,625	10.8	106,607,151	97,459,526	9.5
August	2,906,057	2,692,408	8.0	107,656,963	100,753,254	6.8

kw-hr. to 47,674,315 kw-hr., and 15.7 per cent growth in August, from 40,261,184 kw-hr. to 46,576,942 kw-hr.

The third group contains seventeen small companies. The July figures from this group showed a 16.4 per cent increase in income, from \$194,042 to \$225,999, and the August figures showed an increase of 18.7 per cent, from \$187,817 to \$223,199. In July the output grew from 1,281,418 kw-hr. to 7,958,020 kw-hr., or 9.3 per cent. In August the output grew from 6,737,446 kw-hr. to 8,071,397 kw-hr., or 19 per cent.

The small companies were the only companies whose August growth surpassed the July growth. This was to be expected, especially at the beginning. The companies which we would expect to suffer at this time would be those supplying large industrial regions. In the large industrial enters a financial crisis is always a sufficient excuse for immediate curtailment. So much of the business depends on loans and credit that any trouble in the money market necessarily means for them a retrenchment. The small electric utility companies depend more upon the lighting load or their income, and the industries which they supply are at other times immediately affected by a sudden financial depression.

## Business Notes

The Walpole Tire & Rubber Company, Walpole, Mass., as appointed I. W. Penniman Western sales manager, with headquarters in the Brooks Building, Chicago.

The Cadillac Electrical Manufacturing Company, of Cadillac, Mich., owing to expansion of business, has taken larger quarters in the Masonic Block. This company, which builds electric stoves and toasters, will be enabled to turn at 100 stoves a day in its new quarters.

The Independent Pneumatic Tool Company, of Chicago, Ill., has appointed V. W. Robinson in charge of Michigan

## New Industrial Companies

The Sharfink Electric Manufacturing Corporation, of New York, N. Y., has been incorporated with a capital stock of \$10,000 by M. F. Finkelstein, 740 Kelly Street, the Bronx; F. Schwartz, Brooklyn, and B. Kaplan, Astoria.

The Boulevard Light & Post Company, of Chicago, Ill., has been chartered with a capital stock of \$2,500 to manufacture and deal in lamp-posts, etc., and to do general construction work. The incorporators are Robert J. Ralston, Joseph J. Rice and Daniel J. O'Connor.

The Van Har Electrical Company, of New York, N. Y., has been incorporated by C. B. Van Allen, 95 William Street; E. M. Harroun and T. J. Meehan, New York, N. Y. The company is capitalized at \$50,000 and proposes to carry on a general electrical contracting business and to deal in electrical supplies.

## Trade Publications

**Electric Signs.**—Various sign installations are illustrated in a catalog sent out by the Haller Consolidated Company, Chicago, Ill.

**Varnish.**—The Murphy Varnish Company, Newark, N. J., has issued a booklet describing a varnish which the company calls "univarnish."

**Automatic Sprinklers.**—The General Fire Extinguisher Company, Providence, R. I., in its Bulletin No. 78 describes the Grinnell automatic sprinkler.

**Insulating Materials.**—The Canfield Rubber Company, Bridgeport, Conn., has issued a leaflet describing a friction tape and a rubber splicing compound.

**Washing Machines.**—Electric washers are illustrated in colors in an attractive catalog recently issued by the Grinnell Washing Machine Company, Grinnell, Ia.

**Electric Mimeographs.**—Motor-driven rotary mimeographs are described and illustrated in a bulletin published by the A. B. Dick Company, 730 West Jackson Boulevard, Chicago, Ill.

**Fans.**—Electric fans of the propeller type for ventilation purposes are described and illustrated in Bulletin No. 28 published by the L. J. Wing Manufacturing Company, 352 West Thirteenth Street, New York.

**Controller for Air Compressors.**—A folder describing an automatic controller which starts and stops a motor by variation of pressure of air, water or other fluid has been issued by the Leader Iron Works, Decatur, Ill.

**Electric Appliance Shop.**—A reprint of an article entitled "An Attractive Electric Appliance Shop," which appeared in the *Electrical World* of August 8, 1914, is being sent out by the Electric Appliance Shop, Springfield, Mass.

**Tools.**—Mathias Klein & Sons, 562 West Van Buren Street, Chicago, have issued a fall "trade stimulator" pointing out the need of stocking up to meet the demands of electricians, linemen, and central stations, which increase as the fall lighting season begins.



## Personal Mention

Mr. Henry L. Doherty sailed for Europe on the steamship *Lusitania* on Oct. 14. He expected to be in London four days and to be in this country again about Nov. 1.

Mr. L. E. Marshall, formerly general superintendent of the Illinois Northern Utilities Company, Dixon, Ill., has been appointed manager of the Lexington (Mo.) properties of the Missouri Gas & Electric Company.

Mr. Frank Fuller has resigned as superintendent of the power department of the Albany-Southern Railroad Company, Hudson, N. Y., to take a similar position with the New York & Queens Electric Light Company.

Mr. E. Darrow, formerly manager of the Merchants' Heat & Light Company, Indianapolis, Ind., has with Mr. R. M. Cass formed the Indianapolis Engineering Company, engineers and operators of public utility plants.

Mr. A. S. Lowrie, who has for twenty-one years been chief engineer of the Montgomery (Ala.) Light & Water Power Company, has been made superintendent of the municipal water and electric plant at Dothan, Ala.

Mr. R. M. Cass, formerly electrical engineer for the Indianapolis (Ind.) Light & Heat Company, has with Mr. E. Darrow, of the same city, formed the Indianapolis Engineering Company for engineering, appraisal and operating work in the utility field.

Mr. Victor T. Noonan, secretary of the general safety committee of the Rochester (N. Y.) Railway & Light Company, has been appointed director of industrial and public safety for the State of Ohio. The position is a newly created one, and is directly under the Governor. Mr. Noonan, who is a former Rochester newspaper man, was appointed editor of the *Gas and Electric News* when that publication was started by the Rochester Railway & Light Company in 1911.

Mr. George B. Tripp was recently presented with a very elaborate sterling-silver coffee service by the members of the Harrisburg (Pa.) Chamber of Commerce in appreciation of his service to the city while he was acting as vice-president and general manager of the Harrisburg (Pa.) Light & Power Company. Mr. Tripp, while still acting as vice-president of that company, was transferred recently to New York City, where he is serving as operating executive of the United Gas & Electric Company.

Mr. Travis H. Whitney was entertained at dinner on Oct. 7 by members of the staff of the Public Service Commission of the First District of New York at the Martinique in honor of his seven years' service as secretary of the commission. The chair was taken by Mr. James Blaine Walker, assistant secretary. Among others present besides Mr. Whitney and Mr. Walker were Chairman McCall, Commissioners Maltbie and Williams, ex-Commissioners McCarroll and Eustis and Judge W. L. Ransom of the City Court.

Mr. Walter Howard Johnson, who was this week elected vice-president of the Electric Vehicle Association of America, is first vice-president of the Philadelphia Electric Company. Throughout his business career he has been identified with important phases of commercial life in Philadelphia and he was at one time connected with the Philadelphia, Wilmington & Baltimore Railroad, and later with the Pennsylvania Railroad. In 1887 he accepted a position with the Edison Electric Light Company of Philadelphia, with which company and its successors he has been connected ever since.

Mr. Angus S. Hibbard, formerly vice-president and general manager of the Chicago Telephone Company, has returned to Chicago as special representative of the American Telephone & Telegraph Company, after an absence of three years in New York City, where he acted as chairman of the latter company's committee on relations with the Western Union Telegraph Company. Mr. Hibbard was formerly active in the affairs of the A. I. E. E., of which he was both a vice-president and a member of the board of managers; the Electric Club of Chicago, and the Chicago Association of Commerce.

Mr. Russell Gould, who for the last two years has been superintendent of substations of the Northern Electric Rail-

way, Chico, Cal., has been appointed superintendent of power with jurisdiction over the substations, overhead, third-rail and bonding. Mr. Gould was graduated in 1903 from a five-year course in civil and electrical engineering at the University of Georgia. He spent the next four years at the Schenectady works of the General Electric Company, being employed in the testing and drafting departments. For a year he was engaged in life-insurance work in Mexico and during the next four years was connected with the Texas Traction Company as electrical engineer on its Dallas-Sherman-Denison interurban line. This last position he resigned two years ago to become superintendent of substations with the Northern Electric Railway.

Mr. Walter H. Flandreau, who was elected president of the International Association of Municipal Electricians at its recent convention in Atlantic City, N. J., is city electrician of the city of Mount Vernon, N. Y. Mr. Flandreau was born Nov. 1, 1870, in the town of Greenburg, Westchester County, N. Y. He was educated in the public schools and learned telegraphy in the railroad office at Hartsdale, N. Y. At the age of eighteen he became a telegraph operator in the employ of the Commercial Cable Company and for seven years served as lineman and operator with the Postal Telegraph Company, opening up many new offices for that company. He was also prominently identified with the Telephone, Telegraph & Cable Company of America in its lifetime, in charge of plants at New Rochelle and Mount Vernon.

Mr. Flandreau has been superintendent of fire alarms and city electrician of Mount Vernon for the past eighteen years and has been an active member of the International Association of Municipal Electricians for eight years.

Mr. Albert E. Peirce, formerly assistant general manager of the Chippewa Valley Railway, Light & Power Company, Eau Claire, Wis., has been elected vice-president of the Wisconsin-Minnesota Light & Power Company, formed to take over the properties of the Chippewa Valley Railway, Light & Power Company, the Chippewa Valley Construction Company and the La Crosse Gas & Electric Company. Mr. Peirce began his electrical career with the Brooklyn Heights Railroad in 1898, where he worked in the shops and the line department. He later served a year and a half in the testing department of the Westinghouse Company at East Pittsburgh, Pa. After a short experience with the Christensen Engineering Company, installing air brakes in the New England States, he went with Rossiter, McGovern & Company, New York, and for about two years installed apparatus in the East. Mr. Peirce became connected with the Pennsylvania Steel Company, Steelton, Pa., as electrical engineer of the bridge and construction and the frog and switch departments. In 1905 he resigned to take charge of the Indian Territory Traction at South McAlester, I. T., remaining during the reorganization of that company into the Choctaw Railway & Light Company. Later he entered the General Electric Company power and mining department in the Chicago office. Until the fall of 1907 he was stationed in Minneapolis, Minn. He became connected with the Chippewa Valley Railway, Light & Power Company at the commencement of its development work.



WALTER H. FLANDREAU

## Obituary

Mr. J. Kenney, superintendent of the lighting department of the Little Rock Railway & Electric Company, Little Rock, Ark., is dead. Mr. Kenney was born in Elizabeth, N. J., and had resided in Little Rock for the last fourteen years, during which time he was continuously in the service of the Little Rock Railway & Electric Company. He is survived by a widow and a daughter.

## Construction

### New England

**MILWAUKEE, WIS.**—The Milwaukee Electric & Power Co. expects to extend its transmission lines to the town of Sebec, a distance of about 6 miles, through a thickly settled farming district, to supply electricity to the farmers. The company has recently installed two 150-kw three-phase, General Electric generators, two 200-hp waterwheels and a new street-lighting system, using 80-cp nitrogen lamps. C. D. Towne is manager.

**PHILLIPS, MAINE.**—Within the next two months the Phillips Electric & Power Co. expects to purchase a 50-hp to 75-hp gas engine and to erect a small power house for lighting purposes within the next two weeks. H. H. Berry is manager.

**RUMFORD, MAINE.**—The Rumford Falls Power Co., of Rumford, has recently purchased larger waterwheels to increase its output and has plans to build a new additional steel poles and towers for extension to transmission line. Charles A. Mixer is engineer.

**ATHOL, MASS.**—The Athol Gas & Electric Co. is contemplating extending its transmission lines to Petersham to supply electricity there. The town has already voted to light its streets with electricity. A. A. Laughton is manager.

**SOUTHBRIDGE, MASS.**—Preparations for being made by the Webster-Southbridge Gas & Electric Co. for the installation of a new waterwheel in its Southbridge plant, to cost about \$4,000.

**TURNERS FALLS, MASS.**—Within the next two months the Franklin Electric Co., of Turners Falls, expects to purchase line material for rebuilding the system of Montague Electric Light & Power Co., of Montague, which it expects to take over. W. H. Maynard is superintendent of the Franklin company.

**WORCESTER, MASS.**—The contract for electrical work and electrical supplies for the new St. Joseph's Parochial School has been awarded to the Byncroft Electric Co., 99 Pleasant Street, Worcester.

**NEWPORT, R. I.**—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Oct. 1, for a complete street-lighting system at the naval hospital, Newport, R. I. Plans and specifications may be obtained on application to the bureau or to the commandant of the naval station, Narragansett Bay, Newport, H. R. Stanford is chief of bureau.

**NEW HAVEN, CONN.**—The capital stock of the Connecticut Co. of New Haven, has been increased by \$500,000. The proceeds to be used for extensive improvements to the company's plant here.

### Middle Atlantic

**BERGEN, N. Y.**—The Village Board is considering the proposal submitted by the Niagara, Lockport & Ontario Power Co., of Buffalo, to furnish electricity to operate the municipal electric-lighting system. The proposition requires that the village shall furnish all equipment, consisting of an outdoor transformer station, to be situated on adjacent to the company's line near the village. The transmission line will be 100 ft. secondary transformers and meters. The proposed transmission line will be 6210 ft. private right-of-way. A special survey will be called to submit the proposal to the voters.

**BUFFALO, N. Y.**—Bids will be received from Franklin W. Ward, secretary state board of army commissioners, 174 State street, Albany, for construction, heating, plumbing and electrical work for armory and stable at Buffalo, for Troop 1, First Cavalry, National Guard, New York, until Oct. 23. Extension of date from Oct. 23. Copies of drawings and specifications may be obtained upon application to Lewis C. Fisher, state architect, Capitol, Albany.

**DUNKIRK, N. Y.**—The Board of Water & Light Commissioners is contemplating laying the carbon street lamps now in use with incandescent lamps.

**LANCASTER, N. Y.**—The Depew & Lancaster Electric & Power Co., of Lancaster, it is reported, contemplates extending its service to the towns of West Seneca, Elma, Marilla, West Hamburg, West Clare, West Newstead and East Aurora. George E. Teller is president.

**MAYVILLE, N. Y.**—Bids will be received from the Board of Village Trustees of Mayville for \$7500 in bonds, the proceeds to be used for improvement and extensions to the municipal electric-light plant. W. H. Schofield is clerk of board.

**NEWARK, N. Y.**—The Municipal Board has entered into a contract with the Central New York Gas & Electric Co. to light the streets of the village for a period of five years. Under this contract a new system has been adopted which provides for distributing the lamps in single units in place of the cluster lamps now in use also for replacing the 60-cp lamps with lamps of 40-cp.

**NEW YORK, N. Y.**—The Public Service Commission has awarded the contract for the construction of Section 1 of Route 18 to F. L. Crawford, for \$1,713,360. The line is to be a two-track subway running from the intersection of the Seventh Avenue subway in West Haverstraw and Park Place, the Federal Building and Beckman Street, to a point near William Street.

**NIAGARA FALLS, N. Y.**—The Buffalo & Niagara Falls Electric Co. is reported to be contemplating the construction of a substation and distribution plant on the line from the Buffalo Railroad, north of Perry Avenue, to cost about \$10,000.

**SYRACUSE, N. Y.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Nov. 16, for a conduit and wiring system, lighting fixtures, heating repairs and extensions at the United States post office and court house in accordance with plans and specifications, copies of which may be obtained from the architect or at the office of the custodian, Syracuse.

**WEST SAND LAKE, N. Y.**—Preparations are being made by the Wynantskill Hydro-Electric Co., of West Sand Lake, for the construction of a new building near its present station on the New York and New England Railroad at Snyder's Lake. The company proposes to extend its service in West Sand Lake, Averill Park, Crooked Lake and surrounding territory. Clifford Hastings, of West Sand Lake, is president and general manager.

**PHILADELPHIA, PA.**—Bids will be received by the Department of Supplies, Room 212, 12th Street, Philadelphia, until Nov. 2, for furnishing the electrical Bureau with incandescent lamps and dynamometers.

**PHOENIX, PA.**—Application has been filed with the Public Service Commission by the Philadelphia Electric Transit Co. for a certificate of public convenience which will give the company permission to do business in this State. The company is a Delaware corporation, capitalized at \$25,000, and proposes to build a trolley track and power line along the public highway from Phoenixville to Emaus. The company, it is understood, has secured part of the franchise from James L. Wolcott, of Dover, Del., is president.

**PITTSBURGH, PA.**—Bids will be received at the office of the United States Engineer, Pittsburgh, until Nov. 21, 1914, for furnishing and installing two air compressors and two water turbine compressors, with gear drive, at Lock No. 2, Monongahela River. For further information apply to Lt. Col. Francis R. Shunk.

**PITTSBURGH, PA.**—Bids will be received by George W. Gerhart, secretary board of public education of school district of Pittsburgh, 735 Fulton Building, Pittsburgh, until Nov. 3 for construction of the Schenley High School Building, to be erected in Grant Boulevard, Bellefield and Center Avenues (separate bids to be submitted), as follows: General contract, 1006 heating and ventilating, 1006-H; plumbing, 1006-H; electric work, 1006-E. Plans and specifications may be obtained upon application to Edward Stotz, architect, Monongahela Bank Building, Pittsburgh.

**WRIGHTSVILLE, PA.**—C. H. Gilbert, superintendent of the Wrightsville Electric Co., has asked the Council to grant the Edison Electric Co. a franchise in Wrightsville for generating power energy for the town and for lighting the railroad bridge.

**LAMBERTVILLE, N. J.**—The property of the Lambertville Electric & Power Co. has been purchased by Robert C. Shields, of Philadelphia, Pa., at \$30,500.

**MORRISTOWN, N. J.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Dec. 5, for construction, including mechanical equipment, interior lighting fixtures and approach of the United States post office at Morristown. Drawings and specifications may be obtained at the above office or from the custodian of site at Morristown. O. Wenderoth is supervising architect.

**BALTIMORE, MD.**—With a view of improving the lighting system of the Lexington Market City Comptroller Thrift has authorized surveys to be made of the building and stalls.

**EMORY, VA.**—Contract, it is reported, has been awarded by the trustees of Emory and Henry College for construction

of power house to supply electricity for lighting all college buildings on campus.

**WASHINGTON, D. C.**—A scientific company in the East Indies has advised an American consul that it is planning to be placed in communication with American manufacturers of carbon in blocks, slabs and brushes, electrical brushes, primary batteries, etc.

**WASHINGTON, D. C.**—An American consular officer in South America reports that a firm in South America in his district expects to purchase equipment for a hydroelectric plant. Further information may be secured by addressing the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., or branch office, Room 409, United States Custom House, New York, N. Y., referring to No. 13,997.

**WASHINGTON, D. C.**—A firm in the Far East reports to an American consular officer that it desires to purchase all kinds of electrical apparatus, including lamps and bulbs. Catalogs and price lists should be sent. Further information may be obtained by addressing the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., or branch office, Room 409, United States Custom House, New York, N. Y., referring to No. 13,997.

**WASHINGTON, D. C.**—An American consular officer in Central America reports that specifications have been issued for the supply of material for and the installation of an electric-lighting system for a capital city in that country. Further information may be obtained by addressing the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., or the branch office, Room 409, United States Custom House, New York, D. C.

**WASHINGTON, D. C.**—An American consular officer in Italy reports the name and address of a dealer who desires to receive offers from American manufacturers of metallic-arc lamps. Further information and response should be in French or English. Further information may be obtained by addressing No. 13,955, Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., or branch office, Room 409, United States Custom House, New York, N. Y.

**WASHINGTON, D. C.**—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Oct. 27 for furnishing galvanometers, contactor, field rheostats, current transformer and generator set at the Naval Academy, Annapolis, Md. For proposals for proposals should refer to Schedule 7400. Blank proposals will be furnished upon application to the navy pay office, Baltimore, Md. Samuel McGowan is paymaster-general of the United States Navy.

**WASHINGTON, D. C.**—An English electrical company has notified an American consular officer that it would like to receive quotations for electrodes from manufacturers on 20 tons of electrodes for export. Dimensions, etc., of electrodes desired are indicated on a diagram which may be seen at the Bureau of Foreign and Domestic Commerce. The company asks that manufacturers submit a sample pair of carbons. For further information address No. 13,942, Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C.

**WASHINGTON, D. C.**—A firm in southern Europe advises an American consular officer that it wishes to communicate with American manufacturers of metallic filaments for electric lamps. For orders are required at once. Prices must be f.o.b. by any American port having direct connection with destination. Further information may be obtained by addressing No. 14,023, Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., or branch office, Room 409, United States Custom House, New York, N. Y.

**WASHINGTON, D. C.**—Bids will be received at the Bureau of Supplies and Accounts, Washington, D. C., until Oct. 27, for furnishing at various navy yards and naval stations supplies as follows: Schedule 7423—200 electric batteries, 2700 carbons. Bids will also be received until Nov. 3 as follows: Brooklyn, N. Y., Schedule 7417—13,700 ft. of 3/4-in. (I. P. S.) conduit steel; 1000 1/2-in. cap. Edison-base key sockets; Schedule 7420—two direct-current 250-volt, 4000-amp circuit breakers, 3100 ft. lead-covered, paper insulated, single-conductor cable, miscellaneous arc-lamp carbons, ten 3/4-in. by 1 1/2-in. by 27-in. carbons, 4000-volt lamp sockets, 5000 ft. 9000-cmil. mil. twin-conductor wire, 10,000 ft. 4000-cmil. mil. twin-conductor wire, Charleston, S. C., Schedule 7421—miscellaneous seamless copper tubing, Portsmouth, N. H., Schedule 7421—1000 lb. seamless brass tubing, Boston, Mass., Schedule 7414—300 ft. flexible voice tubing (1-in. outside diameter, 3/4-in. length), Schedule 7413—Schedule 7413—hard and soft copper wire and spring





with concrete cover, 7 miles of sewer pipe from 8 in. to 16 in. in diameter, manholes, disposal plant, etc. Plans and specifications may be seen at the office of the work engineer, at the Savannah office of the day and night, where specifications may be obtained.

**FLORINCE, S. C.**—The Carolina Central El. Co. recently organized, has increased its capital stock from \$50,000 to \$100,000.

**COLUMBUS, GA.**—The Columbus Pwr. Co. expects to erect within the next 30 days a substation with an output of 500 kw to branch from the present distribution line at La Grange and to connect with the La Grange substation. Material has been purchased to erect two sectionalizing switch towers at La Grange and West John S. Bleeker is manager.

**MONTREAL, GA.**—The Water and Light Commission expects within the next three months to install one 40-hp. full engine and 312 kva, 60-cycle, 2200-volt direct current generator, also to purchase 24 or 26 incandescent lamps to be maintained by underground wires. J. M. George is superintendent.

**ROCKMART, GA.**—The Water and Light Commission expects to install within the next three months one 200-hp, four valve engine, one 125-kva generator (directly connected), with exciter, and one switchboard panel, also to purchase transformers and line material for city motor service. J. B. Cooper is superintendent of water and light department.

**SAVANNAH, GA.**—The Savannah Light & Pwr. Co. is installing a 5000-hp General Electric induced-draft apparatus, transformer, erecting line, union transmission for main station and substations, at an approximate cost of about \$150,000. A. A. Sauls is secretary and treasurer.

**OCALA, FLA.**—An election to be held Oct. 28 the proposal to construct a municipal electric light plant in connection with the voters. Plans for the proposed plant have been prepared by Twombly & Henney, 55 Liberty Street, New York.

**BIRMINGHAM, ALA.**—The Board of Commissioners expects to erect within the next six months about 500 25-ft. and 35-ft. full-tower poles, also to purchase wire, transformer, lamps, fixtures and generator units (directly connected) of a 500-kw turbo-generator set (alternating current). W. H. Abernathy is superintendent.

**CENTREVILLE, ALA.**—The Centerville Lt. & Pwr. Co. expects to erect within the next three months 5 miles of No. 3 wire, also to purchase 6 miles of bare copper wire. O. C. Oakley is president.

**OPELIKA, ALA.**—The Carmack Ry. & Pwr. Co. it is reported, is planning to erect a power house at Lake Carmack. The company will begin work on the construction of its proposed line from the town of Auburn, a distance of 7 miles, as soon as financial arrangements can be made. L. A. Bedell, of Opelika, is president.

**SCOTTSDALE, ALA.**—Plans are being considered by the City Council for lighting the streets of the city.

**JACKSON, MISS.**—The establishment of a municipal electric-light and power plant at Jackson, to cost about \$200,000, is recommended by the city council under consideration.

**WEST MONROE, LA.**—Plans are being considered by the City Council for the installation of a municipal electric-light and power plant.

**BILLINGS, OKLA.**—Bids will be received by the city of Billings until Oct. 29 for construction of an electric-light plant and water-works system according to plans and specifications prepared by E. T. Archer, city engineer, New England Building, based upon deposit of \$5 for each set of plans to the amount of \$30,000 have been received by the city.

**EL RENO, OKLA.**—Bids will be received by the office of the supervising architect, Nov. 24, for construction complete, including electrical, mechanical equipment, interior lighting fixtures and approaches, of the United States post office and of the streets and specifications may be obtained at the office or from the custodian of the city of El Reno. O. Wenderoth is supervising architect.

**YALE, OKLA.**—The Council is contemplating submitting the proposal to issue bonds for the construction of an electric-light plant and extensions to the water-works system to the voters.

## Pacific States

**CATHLAMET, WASH.**—Bids to the amount of \$4,200 have been asked for the installation of a municipal electric-light plant.

**SEACRAM, WASH.**—The City Council has authorized L. Kocher a franchise to construct and operate an electric-lighting plant in Seacram. A committee has been appointed to make arrangements for the proposed plant. Work, it is proposed, will be started at once on the proposed plant.

**TACOMA, WASH.**—The City Council has authorized B. W. Collins, superintendent of the municipal electric plant, to purchase 100 incandescent lamps to the amount of \$20,000, for which it is understood bids will be asked.

**TACOMA, WASH.**—The contract for building a 20-in. electric dredge for use in the Stuck River flood improvement project, was recently awarded to Twombly & Henney, at \$42,000, by the Joint King and Pierce County Board of Commissioners.

**MEDFORD, ORE.**—The Medford Commercial Club has recommended to the City Council the installation of a municipal electric-light and power plant. A solution of the lighting and power question which the city is now involved in.

**ANAHEIM, CAL.**—The city of Anaheim expects to erect within the next three months 50 incandescent and move street lines to alleys (about 1 mile) and to install 55 incandescent cast-iron lamp standards, carry five-lamp clusters; also to purchase five E. H. Adams is superintendent.

**AZUSA, CAL.**—An election will be called in the near future to submit to the voters the proposal to issue \$20,000 in bonds to be used for improvements and extensions to the municipal electric-light plant.

**FRESNO, CAL.**—Plans are being considered by Mayor Snow and the Board of Trustees for placing all electric wires underground and conduit in the business section of the city.

**LODI, CAL.**—Within the next 12 months the board of trustees will purchase 50 incandescent weather-proof copper wire and incandescent Mazda lamps (costing about \$1,200). John A. Henning is superintendent.

**MARE ISLAND, (P. O. VALLEJO), CAL.**—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Nov. 21, for complete, with all accessories, a marine barracks reservation, United States Marine Corps, Mare Island. Plans and specifications may be obtained on application to the above bureau or to the commandant of the navy yard named. H. R. Stanford is chief of bureau.

**STOCKTON, CAL.**—The Western States El. & El. Co. of Stockton, is planning to install a new street-lighting system in Stockton, and for a general reconstruction of its properties in Richmond and Eureka.

**MESA, ARIZ.**—The South Side Gas & El. Co. of Mesa, is erecting a substation of 250-kw rating. Westinghouse equipment will be used. H. L. Chandler is manager.

**PRESOTT, ARIZ.**—Surveys have been completed by the Arizona Hydraulic Pwr. Co. for its proposed plant on the Upper Verde River. The present plans provide for different units, to cost about \$1,000,000. The main transmission line will be about 50 miles long. Energy generated at the plant will be delivered to the city and Miami. In addition a large tract of land will be irrigated by the flood waters after they have passed through the company's plants. E. H. Meek is president of the company.

**MARYSVILLE, MONT.**—New equipment, including a crusher, three Chilean contracting tables, etc. is now being installed at the Barnes-King Dredge Co. As soon as equipment is available an electrically operated pump will be installed for permanent disposal of the property. Power will be supplied by the Montana Pwr. Co. from its Great Falls plant.

**ERIE, CAL.**—Within the next two months the town of Erie expects to erect a new transmission line, to cost about \$500,000. Frank Westwood is clerk and recorder.

**GLENWOOD SPRINGS, COL.**—The Municipal Lt. & Pwr. Co. of Glenwood Springs, expects to install a water-power turbine wheel and to purchase two low-pressure turbines, two generators, exciters, etc.

## Canada

**CHATHAM, ONT.** A by-law providing for an expenditure of \$20,000 for the installation of the Hydro-Electric system was passed on Oct. 12. Preparations will be made at once for the erection of a substation and distribution system.

**DUNDAS, ONT.** The Lake River Lt. & Pwr. Co. of Dundasville, has submitted a proposal to the town of Dundas offering to supply electric light to the amount of 200 hp. at \$10 per hp. the town to pay half of the cost of the transmission line.

**PORT ARTHUR, ONT.** A by-law will be submitted to the ratepayers on Jan. 1, providing for an appropriation of \$14,000 for the erection of a substation in Port Arthur.

**ST. THOMAS, ONT.** The City Council is contemplating making changes in the street lighting system, to cost about \$12,441. It is proposed to install on one street over 100 incandescent lamps, while on other streets the present lamps will be replaced by tungsten lamps of 100 cp. and 150 cp.

**DAWSON, YUKON TERR.** The City Council is considering the question of establishing a municipal electric-lighting plant and telephone system, at a cost of \$185,000.

## Mexico

**QUERETARO, MEXICO.**—Governor Federico Montes of the State of Queretaro, it is reported, is having plans prepared for the construction of an electric-railway system for the city of Queretaro and suburbs. A power plant will be built in connection with the project.

## Miscellaneous

**JUNEAU, ALASKA.**—With a view of establishing a large sodium carbide and nitrate manufacturing plant, a group of prominent engineers have established headquarters in Juneau, where they are working out the details for the development of Spaul River. A power plant, to develop 10,000 hp., is included in the project. The entire enterprise will involve an expenditure of about \$10,000,000. E. P. Kennedy, formerly connected with the Treadwell mine, is at the head of the engineering corps. R. A. Kinzie, formerly general manager of the Treadwell mine, is also interested.

**HOLOE, P. R.**—Within the next six months the Holloe El. Co. expects to erect about 10 miles of No. 6 B. & S. triple strand weather-proof wire and to purchase a new 300-kw. power plant, including boiler. R. R. Landon is president and general manager.

## New Incorporations

**HARTSBURG, ILL.**—The Orvil El. Lt. & Pwr. Co. has been organized by Daniel Van Gerpen, Claus Van Gerpen, J. H. Butler, D. J. Minch, E. R. Musgrove, Elmer Schmidt and A. C. Kief. The company proposes to supply electricity in Hartsburg and possibly in Emden.

**FERDINAND, IND.**—The Waterworks Co. has been incorporated with a capital stock of \$21,000 by E. E. Schreifer, W. R. Sauer, J. A. Sanderford, and others. The company proposes to supply water, power, heat and light.

**NEW YORK, N. Y.**—The Diego de Avila Wtr. Sup. & Lgt. Co. has filed articles of incorporation under the laws of the State of New York. The company's capital is \$300,000 and purposes to construct and operate water-works and electric systems and cold-storage plants in Cuba. The incorporators are: Manuel P. Cadetani, of Camaguey, Cuba; E. R. Greene and W. D. Doyle, of Brooklyn, N. Y.; Messrs. Reed & Pallister, Woolworth Building, New York, are attorneys.

**LANCASTER, PA.**—Charters have been filed for the East Earl El. Co. and the Lancaster El. Co. in the office of the recorder of deeds. Each company is capitalized at \$2,000 and their purpose is to supply electricity for lamps and motors in their respective townships. The directors are: W. W. Greist, R. B. Hull and J. S. Grubbs, Jr.

**BIG FALLS, WIS.**—The Big Falls El. Co. has been organized with O. H. Tetzlaff as president and R. Konopatzky secretary. **ORFORDVILLE, WIS.**—The Orfordville Lt. & Pwr. Co. has been chartered with a capital stock of \$7,000 by A. E. Tomlin, W. E. Tomlin, of Evansville, and Charles Taylor, of Orfordville.



# Weekly Record of Electrical Patents

## UNITED STATES PATENTS ISSUED OCT. 13, 1914.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York, N. Y.]

- 1,113,187. SIGNALING DEVICE: W. A. Bischoff, St. Louis, Mo. App. filed May 12, 1913. Water-level indicator for refrigerator drip pans, etc.
- 1,113,199. ELECTRIC REGULATOR: J. L. Creveling, New York, N. Y. App. filed Oct. 11, 1910. Charging storage batteries.
- 1,113,218. QUARTZ LAMP: F. G. Keyes, Boston, Mass. App. filed Feb. 10, 1913. Has a screen pervious to mercury vapor interposed between main body of anode and the rest of the container.
- 1,113,274. TELEPHONE TRUNKING SYSTEM: C. S. Winston, Chicago, Ill. App. filed Dec. 10, 1910. Protection of supervisory relays against discharge from the line conductors.
- 1,113,279. ALARM CLOCK: V. E. Adland, Chicago, Ill. App. filed Jan. 14, 1911. Hands of clock utilized to complete alarm circuits.
- 1,113,289. MOTOR CONTROLLER: T. E. Barnum, Milwaukee, Wis. App. filed Sept. 9, 1911. Maintains impressed voltage at a minimum until motor reaches half speed and then removes voltage-reducing means by sections.
- 1,113,312. TOY CAR: J. L. Cowen, New York, N. Y. App. filed May 31, 1913. Toy auto taking current through wheels from roadway and steered by a conductor rail.
- 1,113,319. LINE PROTECTIVE DEVICE: J. Erickson, Chicago, Ill. App. filed Feb. 14, 1912. Self-soldering heat coil.



1,113,673—Signaling Device

- 1,113,323. TREATMENT OF REFRACTORY ORES: J. Foye, H. E. Moore and R. Boyle, Johannesburg, Transvaal, South Africa. App. filed March 31, 1913. Subjects ores in solution of salts of an alkaline metal which is a non-solvent of gold to the passage of an electric current.
- 1,113,335. CIRCUIT-BREAKER: F. W. Harris, Wilkinsburg, Pa. App. filed Aug. 6, 1910. Calibration device by which circuit-breaker may be adjusted to interrupt circuit under predetermined conditions.
- 1,113,337. SAFETY-LIMIT STOP: L. C. Hart, Youngstown, Oh. App. filed Jan. 10, 1913. For electric hoists.
- 1,113,348. STORAGE BATTERY: H. C. Hubbard, Newark, N. J. App. filed Dec. 7, 1909. For miner's lamps.
- 1,113,354. AUTOMATIC TRUNKING SYSTEM: A. E. Keith, Hinsdale, Ill. App. filed March 17, 1913. For giving subscribers various classes of service from same exchange.
- 1,113,376. ELECTRIC FURNACE FOR FIXING NITROGEN FROM THE AIR: E. K. Scott, Belvedere, England. App. filed June 25, 1913. Provided with a water-cooled roof forming a steam generator.
- 1,113,388. AUTOMATIC CONTROLLING DEVICE: J. H. Vander Veer, Brooklyn, N. Y. App. filed Oct. 15, 1910. Multiple-unit train control with a single train wire.
- 1,113,395. TELEPHONE SYSTEM: C. S. Winston, Chicago, Ill. App. filed Jan. 2, 1913. Interconnecting lines having magneto and battery circuits.
- 1,113,399. INSULATOR: L. B. Abbott, Bridgeport, Conn. App. filed June 12, 1911. Insulating link readily insertible in a pull chain.

- 1,113,429. SYSTEM OF CABLE WORKING: J. Gott, Hove, England. App. filed May 2, 1912. Each following signal appears on the opposite side of the central line of the recorder tape from the preceding signal.
- 1,113,433. CIRCUIT INTERRUPTER: F. W. Harris, Wilkinsburg, Pa. App. filed Oct. 8, 1910. Interconnecting mechanism for concurrently opening circuit interrupters and allowing independent closing thereof.
- 1,113,447. WRAPPING MACHINE: C. Kuentzel, Akron, Ohio. App. filed Aug. 6, 1913. For wrapping a tire or coil of wire.
- 1,113,460. ALARM SIGNALING APPARATUS: L. A. Meyers, Sauk Center, Minn., and O. H. Tracy, Plaza, N. D. App. filed Feb. 21, 1914. For ringing the telephone bells in a number of separated rooms.
- 1,113,487. ELECTRICALLY HEATED APPARATUS: E. E. Rose, Swissvale, Pa. App. filed Feb. 7, 1913. Bake oven.
- 1,113,492. TROLLEY-WIRE HANGER: W. Schanke, Pittsburgh, Pa. App. filed Nov. 24, 1911. Special mounting of trolley-clamping ear.
- 1,113,499. SOUND-MAGNIFYING APPLIANCE FOR TELEPHONIC AND TELEGRAPHIC PURPOSES: H. Smith, Magdeburg, Germany. App. filed April 18, 1914. Applicable to ordinary or telegraphic systems.
- 1,113,511. SYSTEM OF AUTOMATIC BLOCK SIGNALING FOR ELECTRIC RAILWAYS: F. Townsend (deceased), New York, N. Y. App. filed May 31, 1906. Sectionalized trackway with special inductance bonds.
- 1,113,519. PLUMB-LIGHT: D. A. Wallace, Chicago, Ill. App. filed April 21, 1913. Electric lamp combined with a plumb.
- 1,113,520. ELECTRIC-BOX CONNECTION: F. H. Ward, Brooklyn, N. Y. App. filed Nov. 2, 1910. For clamping end of spiral armored conduit to outlet box.
- 1,113,528. FUSE BLOCK: U. S. Anderson (deceased), Dallas, Tex. App. filed Sept. 8, 1913. For primary circuits; can be expeditiously installed without the use of tools.
- 1,113,537. TELEPHONE-LIGHTING SYSTEM: J. A. Boze, Waxahachie, Tex. App. filed April 1, 1913. Lamp on telephone is lighted when ringing and live circuits are closed.
- 1,113,546. ELECTROLYTE FOR USE IN ELECTROMETALLURGY: N. H. M. Dekker, Paris, France. App. filed Aug. 17, 1912. Embodies a salt of the metal to be refined.
- 1,113,559. METAL MOLDING: G. A. Jordan, New York, N. Y. App. filed Nov. 7, 1912. Special form of molding and capping.
- 1,113,560. METAL MOLDING: G. A. Jordan, New York, N. Y. App. filed Dec. 11, 1912. Has an inclosed wooden strip to which the capping is secured.
- 1,113,565. ASYNCHRONOUS MOTOR: T. L. Lee, Westfield, N. J. App. filed Nov. 9, 1912. Has a cup-shaped armature of thin copper.
- 1,113,592. SAFETY LIMIT SWITCH: R. I. Wright and H. F. Stratton, Cleveland, Ohio. App. filed Oct. 30, 1912. For stopping the hoist motion of an electric traveling crane.
- 1,113,593. SAFETY LIMIT STOP: R. I. Wright, Wickliffe-on-the-Lake, Ohio. App. filed Sept. 6, 1913. Connects the armature of the motor in a dynamic braking circuit, including the series field of the motor.
- 1,113,598. METHOD OF FIXING NITROGEN: J. E. Bucher, Coventry, R. I. App. filed Aug. 8, 1911. Produces ammonia.
- 1,113,599. METHOD OF FIXING NITROGEN: J. E. Bucher, Coventry, R. I. App. filed Aug. 8, 1911. Electrolytic production of a metal capable of combining with free nitrogen to form a nitride from a salt of such metal.
- 1,113,649. NON-INTERRUPTING EXTENSION OF PARTY-LINE TELEPHONE SYSTEM: L. Keller, Los Angeles, Cal. App. filed June 16, 1908. Relay controls the ground connection that is common to the different telephones on the party line.
- 1,113,653. INCANDESCENT ELECTRIC LAMP:

S. Klein, Vienna, Austria-Hungary. App. filed Dec. 16, 1913. Filament supported so as to form a letter.

- 1,113,657. VAPOR-ELECTRIC APPARATUS: O. O. Kruh, Czortkow, Austria-Hungary. App. filed April 12, 1905. Mercury-vapor rectifier.
- 1,113,673. SIGNALING DEVICE: D. G. McLean, Boston, Mass. App. filed July 2, 1912. Operated by exhaust from engine and controlled by push-button.
- 1,113,680. SAFETY THIRD-RAIL FOR ELECTRIC RAILWAYS: W. H. Parnell, Jr., Brooklyn, N. Y. App. filed May 6, 1907. Rail sections energized only when vehicle is adjacent thereto.
- 1,113,692. ARC LAMP: H. E. Ringe, Wyncoke, Pa. App. filed March 6, 1911. For moving-picture machines.
- 1,113,718. MACHINE FOR WINDING INSULATED COILS AND THE LIKE: C. H. Thordarson, Chicago, Ill. App. filed Jan. 4, 1913. Winds alternate layers of wire and paper strip.
- 1,113,745. ELECTRIC GLOW-LAMP: F. Blau, Berlin, Germany. App. filed April 17, 1906. Suspenders for the filament are made exceedingly elastic.
- 1,113,760. STOVE: H. Dulz, Detroit, Mich. App. filed June 21, 1913. Gas automatically ignited and turned off by placing receptacle on or taking off stove.
- 1,113,762. MOUNT FOR ELECTRIC FITTINGS: G. A. Eckman, Chicago, Ill. App. filed Jan. 30, 1914. Provides adjustment for bringing switch fan flush with wall surface.
- 1,113,778. ELECTRIC FURNACE: J. H. Gray, New York, N. Y. App. filed Aug. 21, 1913. Arc type; for melting and refining metals.
- 1,113,817. CONTROLLER FOR AUTOMOBILE GAS LAMPS: A. M. O'Brien and W. D. Ferris, Sharon, Pa. App. filed Aug. 28, 1912. By which flow of gas lighting an extinguishment of lamps is controlled.



1,113,923—Electric Locomotive or the Lk

- 1,113,819. ELECTRICAL COUPLING OF SIGNAL ARMS FOR RAILWAYS: A. Centenrich (deceased), Vienna, Austria-Hungary. App. filed Sept. 12, 1912. Connection between signal arm and the mechanic operating gear.
- 1,113,850. IGNITER MECHANISM: E. C. Wilcox and B. L. Lawton, Meriden, Conn. App. filed Jan. 16, 1914. Compact for of combined timer and distributor.
- 1,113,875. RAIL BOND: G. H. Burge, Huntville, Mo. App. filed Oct. 9, 1912. Clamping bonding wire against sharp edge of rail base.
- 1,113,901. MOTOR CONTROLLER: C. J. Jewe, Baltimore, Md. App. filed Aug. 24, 1911. Starter and reverser for alternating-current elevator motors.
- 1,113,909. PORTABLE ELECTRIC LAMP: A. Recker, Oakville, Conn. App. filed Aug. 15, 1914. In simulation of a candlestick.
- 1,113,917. SHUNT REGULATOR FOR VARIABLE SPEED MOTORS: G. C. Stirk, Halifax, Ex. App. filed Jan. 26, 1911. Uses two contact arms to the shunt resistance.
- 1,113,923. ELECTRIC LOCOMOTIVE OR T. LIKE: J. H. Ames, Chicago, Ill. App. filed July 18, 1913. Prime movers mounted the space between the trucks and generators mounted in the chambers lesser headroom over the trucks.
- 1,113,937. TELEPHONE TESTING SYSTEM: A. Mellinger, Chicago, Ill. App. filed Jan. 10, 1909. For automatic or semi-automatic systems.
- 1,386 (reissue). ELECTRIC ELEVATOR SYSTEM: E. M. Fraser, Yonkers, N. Y. App. filed April 28, 1914. (Original patent 1,098,183, April 14, 1914.) Traction by two electric machines having co-opering rotors.

# Electrical World

THE CONSOLIDATION OF ELECTRICAL WORLD AND ENGINEER AND AMERICAN ELECTRICIAN

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**The Low-Priced Electric Automobile** The problems relating to the production of cheaper electric vehicles for passenger transportation were subjected to a highly critical analysis by those well qualified to differentiate among the many conflicting considerations at the recent Philadelphia convention of the Electric Vehicle Association of America. Many paradoxes came to the surface, particularly the fact that what is being loudly clamored for has been practically at hand for a decade but has not been wanted, at least by the purchasing public. Again, the manufacturer and sales agent, who are supposed to be the greatest beneficiaries from the cheaper article, are the strongest opponents of any crusade in this direction. Furthermore, those manufacturers who are now the most practical exponents of the high-priced luxurious car express the greatest readiness to turn their energies in the new direction whenever the conditions warrant this course. The entire project seems to be pivoted upon the old principle of supply and demand. The users continue to require more convenience, greater interior accommodation, higher speed, longer radius of action, with all the comfort and finery that can be incorporated in the carriage de luxe; and, last but not least, they are willing to pay the price. Many attempts have been made to turn the trend in the opposite direction, but in each instance the result has been to develop a sadder and wiser type of conservative builder who now expresses the hope that some day the more frugally inclined will seek an electric vehicle having an equipment limited to utility and not including the luxuries demanded at present.

**Improvement in Financial Conditions** The third month has passed since the war cloud arose in Europe. The constructive forces of this country, hampered as never before in our history, have advanced most encouragingly. The leading spectacular signs of financial improvement are the reduction in money rates and the freer buying of commercial paper. This is an effect, not a cause, and it means that the banking conditions, from which alone this improvement could come, have undergone radical change. Banking psychology leads the lender to seek an outlet for his funds just as soon as the acute stage of a crisis is past and he is no longer liable to sudden, unexpected or unreasonable demands for the money of his depositors. Another sign which bears with equal directness and importance upon our industry is that the bond market is, by all testimony, substantially better. In one large Eastern city it is reported that there is an actual shortage of good municipal bonds to meet an increasing demand. In

time this will open the way to the ready purchase of municipal securities by bankers and, in turn, will restore workable conditions for public utility borrowers. The definite arrangements for alleviation of the needs arising from the artificial condition of the cotton-laden South will do a great deal to restore an important section of the country to its normal state. Matters which necessarily are slower of relief are the reopening of trading in corporate securities having an international or active national market and the associated problem of collateral loans held by banks. It will be desirable if the New York Stock Exchange authorities will permit restricted trading soon in a way that will invite investment funds from the unaffected interior agricultural sections and will at the same time absolutely safeguard the banking position. Probably some means of doing this under organized control will be developed, but it is better to delay this move until some step can be taken with so much assurance that, no matter what develops later, it need not be retracted. As for central stations, they still average their traditional good showing in continued strength of gross revenue.

## Conference of the Mayors

The conference to be held by mayors of cities in Philadelphia on Nov. 10 to 12 is not wholly an outgrowth of the movement for "home rule" of public utilities. When the conference was first suggested it appeared to be merely an expression of the discontent among municipal officials over their involuntary surrender of regulative powers to public service commissions. As the program published elsewhere in this issue shows, the scope of the conference has fortunately been so broadened as to include representatives of state commissions. This is wise because it means that effective regulation, not municipal displeasure, is the real subject for consideration. Regulation is now very generally in the hands of state commissions, and it is to them that both cities and public utilities look for fair decisions. The state commission has as its sole purpose of existence the performance of regulative duties which, under the old practice, the city exercised as only an incidental part of its vast functions. The city is too vitally interested as advocate or prosecutor to act as judge too, and it is perfectly logical that the semi-judicial, authoritative higher state commission should have been evolved by public desire to put the work of regulation on a more reasonable plane. The part of the cities in the present country-wide policy of regulation is to make the state commissions thoroughly effective agencies. That is also the part of the corporations. Keeping in mind the public will that



state commissions shall have the control, both cities and corporations have a plain duty to perform in safeguarding the integrity of regulation. State commissions cannot do so well or so fairly without the co-operation of cities and companies as they can with it. They need it in their studies, investigations and hearings. With present regulative policies the relations between city and company are not a matter of barter. They involve scientific rate-making, political economy, labor problems, banking and commercial methods, and analysis and careful judgment of the relative weight of each of these considerations. In this large public work the commissions will profit by all of the help that they can get. Whatever the gathering of mayors can do to help in this direction will be put to immediate good use.

### Effect of Wave-Form on Moving-Vane Ammeters

One of the most elementary forms of current indicator, long known to electrical workers, was a solenoid coil with an iron core which was attracted into the coil when the latter became excited. For use with alternating currents the core had to be laminated. This device went through a number of modifications in form and dimensions, the principle of operation remaining the same. A very practical form, which has seen much service, consists essentially of a coil of insulated wire supported near to a pivotally mounted sheet-iron vane carrying a pointer over a graduated scale. When the coil is excited the vane moves into the coil and deflects the pointer against a torque either of gravitation or of spring elasticity. The instrument is more particularly adapted to indicate on alternating-current circuits.

The theory of action in such a case is very simply enunciated, although numerical applications of the theory may be very difficult. The iron vane when magnetized acquires magnetic energy. If by any small displacement about its pivots it can acquire more magnetic energy, it will become displaced, provided the increase of energy will pay for the work done in overcoming the opposing torque and friction. The greater the current in the exciting coil the greater the flux-density that can be set up in the iron vane and the greater the magnetic energy and total displacement produced. The indications of the instrument are likely to be affected both by the frequency and the wave-form of the alternating current. The only question is as to the amount of disturbance due to change of frequency or form. As a general rule, it may be assumed that the thinner and lighter the vane the less the eddy-current disturbance, and the lower the range in magnetic intensity the less the hysteretic disturbance.

A series of tests on the effect of changes in wave-form, at constant frequency, on the indications of such an alternating-current vane ammeter have been recently reported by Mr. R. B. Burrows in the London *Electrician* for a particular instrument not specifically identified. The current strength through the coil of the instrument was varied between 4 amp and 7.5 amp, at a steady frequency of fifty-four cycles per second. The

wave-form of the current was varied at each stage by selecting different generators. The crest-factors of the different currents varied from 1.4 to over 2.0, yet the readings of the vane ammeter under test were substantially unaffected by these differences in wave-form. The observations reported may, therefore, be interpreted to mean that in the case of the particular magnetic vane ammeter tested the effect of wave-form was too small to be distinctly observed. Of course, some other magnetic-vane instrument might behave in a different way.

### Noteworthy Hydraulic Features of Bishop Creek Plant

In the current section of our account of the work done on the Bishop Creek hydroelectric system there is recorded an interesting example of the difficulties which have to be overcome in installing and maintaining the hydraulic equipment of a high-head plant in a wild country. In constructing plant No. 2 of this system the water had to be conveyed from near the tailrace of plant No. 1 over a distance of some two and a half miles, winding over moderate grades for a distance of about two miles and then taking a downward plunge to the power house. The pipe line, as our readers will note from the detailed description, is a very interesting combination of wood and steel. For the first two miles use was made of wooden-stave pipe, which has made a good record for itself on the Pacific Coast for many years past. Water is taken out of the dam through a 48-in. steel pipe, which is then connected with a 48-in. stave pipe running along the hillside on a nearly uniform grade of 4 ft. per 1000 ft. Numerous horizontal curves were required to accommodate the pipe to grade. Moderate curves up to about forty diameters of the pipe could be made with staves alone, but where there are shorter radii the line consists of wood-stave tangents united by steel-pipe angles. These steel angles are fitted inside the wood pipe for a distance of about 2 ft., the staves being actually built around the steel and firmly banded to make a tight joint. Such joints which have proved successful for heads as high as 100 ft., enable the cheap stave line to be carried conveniently in very difficult places.

A striking feature of the construction was the care taken with the grading to enable the pipe to be made up in the shop with the necessary horizontal and vertical angles to adapt it to the contour of the trench. Exact data were given to the manufacturer for all the angles from a careful transit survey of grade stake flush with the bottom of the trench, so that when the 24-ft. sections were delivered they could be placed together without regrading.

At the bottom, where the pipe line ends in a steel manifold with 24-in. branch pipes for the Pelton wheel a reducing "Y" of cast steel was installed. When break occurred from a crack in the casting, after the "Y" had done good service for five years, the static was flooded, but, through the activity of the static staff, very little damage was done to the machine

Then was undertaken one of the most interesting emergency repair jobs that have come to our notice. The crack which developed was about  $\frac{1}{8}$  in. wide and 5 ft. or 6 ft. long, and the repair was executed by electric welding. The crack was chipped out into a wide "V," and by means of an arc electric-welding equipment molten steel wire was caused to flow into it until a solid weld was made, after which additional metal was applied for a reinforcement and the damaged casting was further strengthened by shrinking and clamping up steel bands. The repaired casting was put into service in about three weeks from the date of the break, the time specified including not only the actual welding, which consumed only five days, but the slow and difficult process of cutting out the casting and all the delays incident to getting the necessary material into place. This was an admirable piece of emergency work, quite in keeping with the resourcefulness displayed in the original construction of the pipe line.

### Kinetic Energy of an Electric Vehicle

The ideal region for an automobile is a flat country like Holland or Florida, with no hills and small grades. To rise in level means expenditure in energy. Hilly countries exhaust the storage batteries of electric vehicles. Theoretically, of course, this is not an incontrovertible proposition. In the long run the ups and downs must cancel, and if all the watt-hours of work done against gravitation in climbing a hill were restored when gravitation was allowed to drive the vehicle down hill the drain on the storage battery need not be more than when running over the same length of level road. In some mountain electric railroads of Switzerland and using three-phase induction motors these machines are utilized as generators when the car is descending so as to help drive some other car on the ascent. In the great majority of cases, however, electric vehicles make no attempt to regenerate on the downward path. When they go up they work, but when they go down hill their energy goes to swell the entropy of the universe, and they abandon themselves to their gravitational fate.

Mr. T. H. Schoepf, in a paper read before the recent convention of the Electric Vehicle Association of America, proposes to utilize some of the wasted energy of descent in hilly districts, and on electric storage-battery cars, by recharging the battery when going down hill. His plan has, of course, been tried before, in its broad features, but has generally been considered not worth the extra complexity. The author proposes, however, to accomplish the result with only a few extra contacts on the controller and with the addition of an exciter battery of three storage cells. The advantages claimed are an increase in vehicle range, in average running speed and in schedule speed.

It is evident that, granting all that the author claims, there is a certain degree of hilliness within which it is not worth while to introduce the regenerator elements. The only question on which serious difference of opinion

is likely to manifest itself is just how much hilliness there must be before the device becomes worth while. It seems very reasonable that it should be worth while on the up-and-down roads, but those who live on hilly country should not blame the flatlanders for being unregenerative in their vehicles.

### Radio Telegraphing to Germany

Since the appearance of an article on the transatlantic radio station at Sayville, N. Y., in our issue of Sept. 26, in which the technical possibility of direct radio communication from Germany to the United States was pointed out, authoritative statements have been made to the effect that much of the German war news alleged by a part of the daily press to be spurious was actually received by wireless not only at Sayville, but at Tuckerton, N. J., and in part at Washington, D. C. It appears that until mid-September the greater part of the questioned transmission was from the Goldschmidt sustained-wave station at Eilvese, near Hanover, and that during the night-time the high-frequency spark transmitter at Nauen has since been sending quite reliably to the United States stations. It is stated, further, that telephone-circuit amplifiers of the vacuum-tube type have been in regular use in the Sayville receiving outfit. All this gives interesting confirmation of the contentions advanced in our article, and it is noteworthy that the newspapers loudest in denunciation of the "faked reports" are again printing dispatches received by way of Sayville.

That the Long Island station's sender is not sufficiently powerful to afford regular transmission to Germany, even at night, has been indicated since the day when breakdown of the Tuckerton plant left Sayville as the only means of reaching the European Continent directly by radio. Uncertainty of transmission in the easterly direction has, of course, caused difficulty in acknowledging or requesting partial repetitions of messages to the United States. It is for this reason that the reopening of the Tuckerton station has been impatiently awaited, since its high towers and powerful radio-frequency alternator have given evidence of ability to communicate across the 4000 miles separating them from Eilvese.

On page 853 of this issue Mr. John L. Hogan, Jr., describes the equipment of the Tuckerton installation, which is practically a duplicate of that at Eilvese. The arc which was temporarily installed at Tuckerton in place of the reflection alternator having proved suitable for continuous working, commercial telegraph service has again been instituted even before the arrival of the new generator. In this way transatlantic radio transmission from the United States was re-established during the present week. When the Tuckerton station shall have been reopened with its original installation duplicated there will be ample opportunity to determine just how well the Goldschmidt stations can meet the commercial requirements of continuous day and night service.



# The News of the Week

## Activities and Events in the Electrical Field— Reports of Meetings—Commission Findings, Etc.

### Ban on Small Motor-Starting Devices in New York

On and after Jan. 1, 1915, small motor-starting devices, more particularly those used in connection with commercial sewing machines, will be prohibited in New York City, unless of types which have been approved by the Department of Water Supply, Gas and Electricity since July 1, 1914. A number of fires have resulted from the use of the old-style starting boxes, and it is expected that their elimination will be beneficial.

### Inductive-Interference Committee Meeting

The committee of engineers appointed by the Railroad Commission of the State of California to investigate the disturbances on telephone lines caused by adjacent energy transmission circuits, and whose recommendations were published in the *Electrical World* of Sept. 5, held its first regular meeting since the presentation of the preliminary report on Oct. 22. In marked contrast to the usual highly technical discussions the business transacted was chiefly general in character. A plan was adopted for carrying on the future work of the committee, which will require the manufacture of additional testing apparatus of special design to supplement the equipment now in service at the field laboratory in Santa Cruz. The next regular meeting of the committee will be held in November.

### Arizona Bill Regulating Electrical Construction

Among the bills to be voted on at the coming state election in Arizona is one regulating the placing, erection, use and maintenance of electric wires, cables, supports and appliances and providing punishment for violation thereof. The bill is patterned after the California statute that was found to be impracticable by the California Railroad Commission, which later replaced it with the National Electric Light Association specifications. The standard at present used in Arizona also follows the National Electric Light Association rulings. Advocates of the measure are supporting it on the ground that more effective specifications must be adopted inasmuch as 42 per cent of the electrical workers killed in a short period were electrocuted. It is contended by those opposing the bill, however, that the figures quoted do not take into account the number of deaths which were preventable.

### Contracts for Railway Energy

The Texas Power & Light Company has closed a contract to furnish electrical energy for all of the requirements of the Texas Traction Company for thirty years. The minimum requirements under the contract are to be approximately 2000 kw. This arrangement follows a similar contract made some time ago by the Texas Power & Light Company with the Southern Traction Company. The latter contract is for fifty years and provides for all of the requirements of the company with a minimum provision of approximately 2500 kw. An-

other subsidiary of the American Power & Light Company, the Kansas Gas & Electric Company, has a contract of the same kind to provide the electrical energy for all of the requirements of the Arkansas Valley Interurban Railway for twenty years.

### Lamps and Chemistry

On Nov. 10, at 8 p. m., there will be held at the Chemists' Club, 50 East Forty-first Street, New York, a meeting of chemists and engineers to discuss the general subject of the bearing of chemistry on lamp development and the use of lamps in chemical processes. Among the papers to be read and discussed will be the following: "Chemistry in the Development and Operation of Flaming-Arc Lamps," by Dr. William C. Moore, National Carbon Company, Cleveland; "Improvements in the Incandescent Mantle," by Prof. M. C. Whitaker, Columbia University, New York; "The New Tungsten Lamps," by Dr. R. E. Meyers, Westinghouse Lamp Company, Bloomfield, N. J.; "The Quartz-Tube Mercury-Vapor Lamp," by Mr. R. D. Bailey, Cooper Hewitt Electric Company, Hoboken, N. J.; "The New Moore Tube Lamp and the Neon Tube Lamp," by Mr. D. McFarlan Moore, General Electric Company, Harrison, N. J.; "The Light of the Future," by Dr. Herbert E. Ives, United Gas Improvement Company, Philadelphia.

The meeting will be held under the auspices of the New York Section of the American Electrochemical Society with the co-operation of the New York Section of the Illuminating Engineering Society and the American Gas Institute. Dr. C. G. Fink, General Electric Company, Harrison, N. J., chairman of the New York Section of the American Electrochemical Society, is in charge of the arrangements.

### Convention of Rhode Island Contractors

The Rhode Island Electrical Contractors' Association held a successful convention at Providence on Oct. 20, the total attendance being nearly 200. The program included a business session in the afternoon and a "get together" meeting and banquet in the evening at the Narragansett Hotel. In opening the convention President Walter Thurber condemned the individualism which had been so prominent in the industry in the past and pleaded for a larger degree of co-operation among the working units composing the membership. The speakers and topics discussed were: "The National Association," by Mr. George W. Hill, Utica, N. Y.; "Public Service," by Mr. Robert L. Brunet, public service engineer, Providence; "Relation of the Central Station to the Contractor," by Mr. E. R. Davenport, Narragansett Electric Lighting Company, Providence; "The Electrical Contractor and Lighting Service," by Mr. P. Baker, Pawtucket, R. I.; "The Relation of the Jobber to the Contractor," by Mr. Arthur K. Moody, Westmore-Savage Company, Boston, Mass.; "Legislation at the Contractor," by Mr. A. J. Hixon, Boston, Mass.; the banquet Lieut.-Gov. Roswell B. Burchard of Rhode

Island paid a tribute to electrical invention and Mayor Joseph H. Gainer of Providence spoke of the possibilities of co-operation among cities in employing experts. Secretary Henry D. Temple, Worcester, Mass., of the Massachusetts Electrical Contractors' Association, also spoke briefly.

### Activities of Commercial Section, N. E. L. A.

The executive committee of the Commercial Section, National Electric Light Association, met at the Hotel Sherman, Chicago, Oct. 23, when reports were read by heads of committees and plans outlined for the commercial sessions of the 1915 convention.

The publications committee, through Mr. E. A. Edkins, Chicago, chairman, announced that 26,000 sets of the house-wiring campaign have been sold during the last three months. Each set consists of a series of seventeen pieces adapted to be mailed to prospective central-station customers at intervals during the year. The committee now plans a much larger edition, from which separate cards or pieces will be sold, depending upon the requirements of the company purchasing them. A special issue of 200,000 copies of the Christmas pieces of the series is now being prepared in anticipation of the holiday demand. The publications committee also contemplates issuing booklets on store service and factory lighting for the use of N. E. L. A. member companies. The next meeting of the executive committee will be held on call of Chairman E. L. Callahan, probably at New York during the second week of December.

### Celebration of Anniversary of the Incandescent Lamp

The thirty-fifth anniversary of the invention of the electric incandescent lamp was observed very generally by lighting companies throughout the country. Joining in a common tribute to the genius of Edison, the Electric Vehicle Association of America at its final session in Philadelphia last week sent a telegram of congratulation on Oct. 21 to Mr. Edison, who was then at Buffalo. "The Electric Vehicle Association," read the message, "desires

hope that your efforts will not be relaxed until the electric vehicle reigns supreme."

The Baltimore Section of the National Electric Light Association was addressed on the occasion by Mr. H. H. Wagner, vice-president of the Consolidated Gas, Electric Light & Power Company, who spoke on the stability of the public service company now as compared with the time when Edison invented the first lamp. Mr. Douglass Burnett, commercial manager of the electric division of the company, also made an interesting address on the life of Edison. The Jovian League of Southern California held a special celebration on Oct. 21 in honor of the event. Lighting companies throughout the country took advantage of the occasion to offer bargains in lamps and to advertise in various ways the incandescent lamp by means of portraits, posters, window displays, etc. The Brooklyn Edison Company's display was typical of many others.

At the Edison laboratories in West Orange, N. J., are more than 100 congratulatory telegrams sent to Mr. Edison by electrical engineers, central-station managers, manufacturers, etc., in various parts of the country. These all await Mr. Edison's return from Detroit, for which city he started about two weeks ago on a visit to Mr. Henry Ford, of automobile fame.

### Awards in Prize-Story Competition of Society for Electrical Development, Inc.

The Society for Electrical Development, Inc., announces the following as the successful contestants in its recent prize-story competition:

First prize (\$250), Mr. Roscoe E. Scott, National Lamp Works of General Electric Company, Nela Park, Cleveland, Ohio.; second prize (\$150), Mr. Don Cameron Shafer, General Electric Company, Schenectady, N. Y.; third prize (\$50), Mr. George S. Burdick, Scranton Electric Company, Scranton, Pa.; fourth prize (\$10), Mr. Russell B. Cressman, manager Opalux Company, New York, N. Y.; fifth prize (\$10), Mr. R. E. Plimpton, General Vehicle Company, Brooklyn, N. Y.; sixth prize (\$10), Mr. E. C. Myers, General Electric Company, Berkeley, Cal.; seventh prize (\$10), Mr. W. H. Garnett, Western Transformer Company, Oakland, Cal.; eighth prize (\$10), Mr. W. A. Wolff, Western Electric Company, New York City.

In reaching a decision on the last prizes, there were found to be some stories which, in the opinion of the judges, were so nearly equal in merit that five supplementary "honorable mention" prizes of \$5 each were awarded to the following:

Miss Dorothy V. Alison, Denver Gas & Electric Light Company, Denver, Col.; Mr. William H. Easton, Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.; Mr. Henry A. Germain, General Electric Company, Pittsfield, Mass.; Mr. Joseph W. Price, General Electric Company, Llanerch, Pa.; Mr. A. Morley Underhill, Fort Wayne Electric Works, Fort Wayne, Ind.

### Preparing Exposition Illumination Features

The electrical department of the Panama-Pacific International Exposition is now at the height of the construction period. Already 200 of the 400 search-lanterns, which are between 18 in. and 48 in. in diameter, have been set up in their permanent locations. Of these, twenty-three are on the Liberal Arts Palace, seventeen on the Palace of Education, twelve each on the domes of the Palace of Horticulture and Festival Hall, four on the Press Building, twenty on the Palace of



ADVERTISING EDISON DAY IN BROOKLYN

to congratulate you upon the fact that your services to mankind have been recognized in the selection of Oct. 21 as Edison Day. Your contributions to the arts and sciences are too innumerable to be cataloged. This association desires on behalf of the industry which it represents to thank you for all that you have done to make the electric vehicle possible and economical, with the



Agriculture, ten on the floral wall, a fan of five on the Southern Pacific Building, and a fan of eight on the California Building.

The Tower of Jewels is being hung with its 125,000 pendent novagems, and fifty fixed projectors are being placed at high vantage points several hundred feet from all sides of the tower to flood its façades with light. On the balcony which encircles the tower 320 ft. above the ground twelve revolving projectors are arranged for displaying a fan of varied colors.

Early in October the finishing touches were put on 450 minor reflectors for nitrogen-filled tungsten lamps. Two hundred of these are 20 in. in diameter, each made up of forty-eight small mirrors arranged around a central parabolic reflector. The lamps are rated at 110 volts and will be used to throw a brilliant light against the banners.

## ELECTRIC-VEHICLE DISCUSSION AT CHICAGO

### Closer Co-operation Between Various Branches of the Industry—Cheap Electric Vehicle Discussed

The Philadelphia convention, co-operation between central stations and manufacturers and among the manufacturers themselves, the "low-priced" electric car, better facilities for charging and a broader publicity policy were among the topics discussed at a lively session of the Chicago Section of the Electric Vehicle Association of America held at the Hotel Sherman on Oct. 27. President-elect John F. Gilchrist was the guest of honor. In a brief address Mr. Gilchrist predicted that, with closer co-operation between the branches of the industry, proper charging facilities and good roads, the electric vehicle will come to the front and ultimately serve the general public in an overwhelmingly large proportion of cases. The speaker decried the bandying of charges between vehicle manufacturers and central stations that, on the one hand, electrical energy should be sold at lower prices and that, on the other, the prices of cars should be reduced. The central stations as a whole, said Mr. Gilchrist, are not carrying their share of the load in introducing the "electric," although some of the big companies are doing well in this respect and the men down the line are exerting themselves to their utmost. But the value of the electric vehicle as a charging load needs to be brought more forcibly to the attention of many executives. The Lincoln Highway, remarked President Gilchrist, is now provided with adequate charging facilities for electric vehicles practically all the way from New York to the Mississippi River with the exception of a short stretch of mountain road in Pennsylvania, and this section will shortly be equipped by neighboring central stations. In closing, Mr. Gilchrist touched upon the field of possibilities lying open before the electric vehicle and referred to the rapid progress made by the E. V. A. during the administration of his predecessor, Mr. Frank W. Smith, of New York.

Mr. E. L. Chalfant, secretary of the Electric Automobile Manufacturers' Association, an organization of six leading electric-vehicle makers, which has headquarters in Chicago, told of his aim to get the manufacturers closer together in the electrical-car field as has already been done in the gasoline-car industry. He discounted discussion of the so-called "cheap" electric automobile and said that the public has received erroneous impressions of the statements made by Dr. Steinmetz, Mr. Edison and Mr. Ford concerning low-priced electric vehicles. Instead of looking toward such popular use of the electric vehicle, Mr. Chalfant urged its further adoption as a central-station vehicle in the field for

which it is best fitted, and suggested that a car designed by central-station engineers to meet central-station needs would find ready manufacture and ready sale. Mr. Walter Wardrop contrasted the excellent organization and complete data available in the electric-vehicle field with the lack of understanding of their products and industry which obtains among representatives of many of the 600 manufacturers of gasoline cars. Mr. W. G. Pancoast, of the Rauch & Lang Company, Cleveland, Ohio, said that the tendency of electric pleasure-car buyers has been distinctly toward more expensive types and designs, citing the fact that the makers of the various "low-priced" cars already brought out have all except one met with financial disaster. The single exception, he added, is now in the hands of a receiver. Mr. D. C. Arlington made a renewed plea for an inexpensive electric car which could be classed with other "domestic utilities" of central-station service. Mr. Harry Salvat cited a case where a central-station manager was unable to help an electric-truck purchaser to charge his car. This apathy on the part of the manager almost lost the sale of the truck after it had been delivered from a city 20 miles distant under its own power, and did result in the installation of a private gas-engine-driven charging plant. Chairman W. J. McDowell, Messrs. C. B. Frayer, G. A. Freeman and others reported on the Philadelphia convention, and by unanimous vote Chairman McDowell and the members of his administration were continued in office for the rest of the electoral year.

## CONFERENCE ON PUBLIC UTILITIES

### Program of Important Meeting of American Mayors to Discuss Public Policies Concerning Municipal Utilities

The program has been issued for the conference of American mayors on public policies concerning municipal utilities to be held in Philadelphia on Nov. 12 to 14. The conference was called by Mayors Blankenburg of Philadelphia, Mitchel of New York, Harrison of Chicago, Baker of Cleveland and Shroyer of Dayton. A reception to visiting mayors and delegates will be held on the evening of Nov. 12 at the Bellevue-Stratford Hotel. Governor Tener of Pennsylvania is to make an address of welcome.

### Sessions on the Problems and Regulation of Utilities

The first business session will be held at the Bellevue Stratford Hotel at 10:30 a. m. on Friday, Nov. 13. The general subject is "Practical Utility Problems." Mayor Blankenburg will preside. The following addresses are on the program: "Fundamental Planks in a Public Utility Program," by Mr. Delos F. Wilcox, franchise expert, New York; "The Regulation of Municipal Utilities," by Mr. Nathaniel T. Guernsey, general counsel American Telephone & Telegraph Company, New York; "Philadelphia's Transit Problems," by Mr. A. Merritt Taylor, director of city transit, Philadelphia; "Municipal Lighting Rates," by Mr. Ray Palmer, commissioner of gas and electricity, Chicago, Ill.; "Laborers' Interests in Public Utilities," open discussion.

The program for the afternoon session, on the general subject of "Regulation of Utilities," is as follows: "Some Present-Day Issues in Regulation," by Prof. Edward W. Bemis, board of supervising engineers Chicago Traction; "What Certain Cities Have Accomplished Without State Regulation," by Mr. Stiles I. Jones, secretary Voters' League, Minneapolis, Minn.; "A Constructive Policy for Public Service Corporations," by Mr. Charles Day, of Day & Zimmermann Philadelphia; "What Regulation Must Accomplish

It is to Be Permanent," by Mr. John M. Eshleman, president Railroad Commission of California. The third session, under the auspices of the American Academy of Political and Social Science, is to be held at the Central High School at 8:15 p. m. on Nov. 13 and is to be devoted to local and state regulation of municipal utilities. Mayor Mitchel of New York is to preside, and addresses are to be heard from Messrs. Halford Erickson, Railroad Commission of Wisconsin; Milo R. Maltbie, New York Public Service Commission, First District; Charles E. Merriam, professor of political science, University of Chicago, and Ira W. Stratton, Mayor of Reading, Pa.

#### Municipal-Ownership and Holding-Company Sessions

The fourth session is to be at the Bellevue-Stratford at 10:30 a. m. on Nov. 14 and is to be on municipal ownership and operation. Mayor Baker of Cleveland will preside. An address on "Municipal Ownership—The Testimony of Foreign Experience," will be made by Mr. Frederick C. Howe, commissioner of immigration, New York. Fifteen-minute reports will be heard from managers of typical municipal plants. There will be an open discussion led by Mr. Clarke M. Rosecrantz, of general counsel Milwaukee Electric Railway & Light Company, and Congressman Robert Crosser of Ohio. The fifth session, in the afternoon, will be executive and open only to mayors and delegates. There will be a round-table discussion on "elements in a constructive utility program."

The sixth session will be held at Witherspoon Hall under the auspices of the American Academy of Political and Social Science on the evening of Nov. 14 and will be devoted to holding companies and the public welfare. Secretary of the Interior Franklin K. Lane will preside. Addresses will be made by Messrs. Francis T. Homer, of Bertron, Griscom & Company, New York; Charles F. Mathewson, counsel Consolidated Gas Company, New York; James P. Goodrich, director National City Bank, Indianapolis, Ind., and Louis D. Brandeis, Boston.

So far mayors of 124 cities have indicated their intention of attending the conference in person or by delegate. Delegations have also been appointed by civic organizations and public service commissions.

#### The Utilities Bureau

The program contains a reference to the Utilities Bureau, organized by the mayors who called the conference. The purposes of the bureau are given as follows:

- 1) To serve as a national agency through which American cities may co-operate in exchanging data as to rates, service standards and cost factors in municipal utilities;
- (2) to advise cities as to the best plans and methods for their utility campaigns;
- (3) to publish and disseminate information pertaining to service standards, rates, franchises, public contracts, and any and all other matters of interest and value to the public regarding the operation, construction, maintenance and regulation of public utilities;
- (4) to assist, upon request, in the proper and adequate presentation of the interests of the city and the public in hearings on utility matters before public service commissions or other regulative or judicial bodies.

The trustees are Messrs. Louis D. Brandeis, lawyer, Boston; Frederick A. Cleveland, political economist, New York; S. S. Fels, manufacturer, Philadelphia; Felix Frankfurter, professor of law, Harvard University; Charles F. Jenkins, proprietor *Farm Journal*, Philadelphia; Leo S. Rowe, professor of political science, University of Pennsylvania; Frederick W. Taylor, consulting engineer, Philadelphia, and Charles R. Van Hise, president University of Wisconsin.

## ELECTRIC-VEHICLE CONVENTION

### Abstracts of Additional Papers Read Before the Philadelphia Gathering and of the Discussions That Followed Their Presentation

In the *Electrical World* of Oct. 24 the transactions of the Electric Vehicle Association of America at its Philadelphia convention were briefly outlined and abstracts and discussions of some of the more important papers were given. Abstracts of the remaining papers, together with discussions which they brought out, are given herewith.

#### Electric Vehicles in Europe

According to Mr. P. D. Wagoner, the development of the electric vehicle in Europe began in 1881, and he gave a brief historical outline of its evolution up to the present day. There are now approximately 3200 electric vehicles in the whole of Europe. The number of electric trucks, however, is very small and the development of those in use has been along highly specialized lines. Few of the electric passenger cars compare with the luxurious cars of America. In England the electric car is receiving considerable publicity, and up to the time of the war splendid progress had been made in providing electric taxicabs, fire and street-cleaning apparatus in Germany. Electric vehicles were used rather extensively in mail service in Germany also, as well as in Vienna, Austria. Mr. Wagoner discounted any unfavorable effect of the war on the future of the electric vehicle and declared that the outlook in Europe is reasonably bright.

#### Electric Fire Apparatus in Philadelphia

In his paper entitled "Electric Fire Apparatus," Mr. George S. Walker, chief mechanic of the Philadelphia Fire Department, gave some details of the operation of electric fire vehicles used by the city, comparing them with gasoline and horse-drawn apparatus. The comparison revealed the decided advantage of the electric apparatus. Mr. Walker told how with snow on the ground the electric vehicle was far more reliable than the other conveyances. The battery tractor, he declared, surpassed the gasoline apparatus in answering alarms because of the simpler control and its ability to start more quickly.

#### Committee on Insurance

The committee on insurance was able to secure only one concession on insurance of electric vehicles, and it was suggested that members place insurance with those companies making special rates on electric vehicles and centralize on as few companies as possible.

Mr. Dana Pierce, of the National Board of Fire Underwriters, in discussing the report, pleaded for an electric vehicle which would be safe and reliable. Co-operation, he declared, was necessary in the development of good practice.

#### Cheap Electric Car Not Wanted

In reply to the claim of Dr. Steinmetz at the recent Philadelphia convention of the National Electric Light Association that a low-priced car was a possibility, Mr. J. Crawford Bartlett read a paper entitled "An Answer to Dr. Steinmetz," in which he declared that the low-priced car has been developed but long ago proved impracticable. No one wants it, he claimed. The desire for luxurious fittings and large mileage radius has conspired against the cheap electric vehicle. There was a flood of cheap cars during the development stage of the electric vehicle and they did the industry untold harm. A weak, puny electric car is not wanted; the sturdy long-distance car is in demand.

Mr. R. L. Lloyd directed attention to the fact that Dr. Steinmetz had compared the electric-vehicle development with that of the bicycle. So long as the bicycle was a



luxury the price was high, but as soon as it became an aid in business and therefore more or less of a necessity the price was lowered.

#### Electric Truck and Its Applications

"Special Applications of the Electric Truck" was the subject of an illustrated paper by Mr. F. Nelson Carle, who stated that as long ago as 1906 the electric truck reached a point where it could be standardized as to basic design and that there have been no radical departures since then. He divided the past fifteen years of development into three periods, that from 1900 to 1905 being one of experimentation, the next five years one of standardization, and the period from 1911 to the present day one of specialization. Following these periods, the author declared, should come that of quantity production. Mr. Carle urged the necessity of co-operation between the buyer and seller and the need of adopting various types of standardized trucks to new kinds of work.

#### Electric Vehicles in Central-Station Service

In a paper entitled "Power Wagon Operation in Central-Station Service," Mr. W. A. Manwaring recited the diversified uses to which trucks for central-station service are put. It is the aim of all central-station companies, he declared, to provide quick transportation at the lowest possible cost, and it is with this end in view that the electric truck has been adopted. It is difficult for a transportation department of a central-station company to show a book profit when comparing electric vehicles to horse-drawn trucks. The advantage in any electric truck lies in its ability to cover the required distance between jobs with all possible speed and a minimum delay. The greatest drawback to the universal adoption of the electric vehicle by the central stations is the high first cost.

#### Discussion

Mr. W. P. Kennedy claimed that the cost of the commercial electric vehicle is not too high. One should consider the great amount of work performed and the increased efficiency of the workmen.

Mr. J. F. Gilchrist stated that of the trucks used by the Commonwealth Edison Company 20 per cent were usually kept out of service for painting or repairs. The trucks, he said, were painted twice a year. His company had experimented with a drying oven for the painting operation, but not much time could be saved.

#### Educating the Public

Mr. F. C. Henderschott, chairman of the N. E. L. A. committee on education of salesmen, read a paper entitled "Educating the Public in the Field and Use of the Electric Vehicle," in which he emphasized the importance, in a selling campaign, of carefully compiling a list of prospective buyers who promise the largest measure of returns. Admitting that there can be no better advertisement than a satisfied customer, the first effort should be to get the electric car favorably introduced into the community. This can be better accomplished by carefully selected lists of prospective customers than by general publicity campaigns. Educational effort should be conducted jointly by the manufacturer and the local central station. The author also suggested that the influence of owners of electric vehicles in the community be utilized.

#### Operating Costs of Commercial Electric Vehicles

Mr. W. P. Kennedy in a paper the subject of which was "A Practical Project to Secure Authentic Cost of Operating Commercial Electric Vehicles" directed attention to the growing demand for reliable information on operating costs. There have been many efforts to obtain information of this character, Mr. Kennedy

stated, but in most cases these efforts have lacked comprehensiveness and when investigated by the manufacturers they have not always been impartially regarded. Mr. Kennedy stated that an investigation should be inaugurated by an independent authority, and, apropos of such a need, he gave details of a movement which the *Electrical World* has begun to determine the results which the actual users of electric vehicles have experienced in the cost of operating their equipment. This information the *Electrical World* is purposing to publish.

Mr. H. F. Thompson suggested that everybody lend his co-operation to such a project as Mr. Kennedy outlined in his paper. Work of this character, he declared, can never be completed.

#### Co-operation of the Society for Electrical Development

Mr. J. M. Wakeman, manager of the Society for Electrical Development, Inc., spoke of the efforts of his society to distribute information on all electrical topics and asked for closer co-operation between the Electric Vehicle Association and the Society for Electrical Development. He told of the society's desire to be of service to the Electric Vehicle Association and what it had already done to spread the knowledge of electricity. In the motion-picture films of the society whenever an automobile is used it is an electric one.

#### Constant-Potential Charging System

In a paper entitled "Constant-Potential System of Charging from Motor Generators," Mr. H. P. Dodge described the charging equipment used in a St. Louis garage. The installation consists of two 35-kw shunt-wound generators operated by three-phase, sixty-cycle motors. A Tirrill regulator is employed for each generator. In most cases for the first five minutes of charging a current of 150 amp is necessary. Each motor-generator set is independent of the other, but the switchboard provides means for throwing any charging plug on either generator set.

#### Low-Priced Car Impracticable

"The Trend of Electric-Vehicle Manufacture" was the title of a paper read by Mr. H. H. Doering, in which he averred that the day of cheap electric automobiles has come and gone. Almost without exception the manufacturers have discarded the low-priced car. Instead of a cheap, light, short-mileage automobile the trend is in the opposite direction and manufacturers are making bigger and better cars. The demand for luxuries has also tended to make the electric car more expensive.

#### Discussion

Mr. J. Crawford Bartlett stated in the discussion following Mr. Doering's paper that the public has no means of judging an electric car and the more reputable a manufacturer becomes the more readily can his product be sold. Mr. Bartlett lamented the practice of some manufacturers who boost the prices of their product simply because some people will buy an article which is high-priced.

#### Characteristics of Vehicle Motors

In a paper by Mr. H. S. Baldwin entitled "The Electric Automobile Motor" were outlined the development of electric-vehicle motors and batteries and the characteristics of present-day apparatus. As a rule, the earliest motors were comparatively light in weight, operated at high speeds and good efficiencies, but had rather highly saturated magnetic circuits. In commenting on modern vehicle motors it was suggested that voltages in the vicinity of 110 volts should be employed as the batteries can be charged more efficiently from electric-service circuits. Series motors having relatively low flux density in the magnetic paths were recommended

for commercial vehicles which are required to start and stop frequently and ascend steep grades. On the other hand, a passenger-car motor should have a more highly saturated field to give high speeds on grades.

#### Discussion

Mr. Day Baker and Mr. J. P. Mallet took part in the discussion following the reading of Mr. Baldwin's paper. Mr. Baker declared that the information contained in this paper is valuable for the men selling electric vehicles. The motor, he asserted, is often abused, and if the salesman imparts to the prospective purchaser the proper kind of information regarding its operation it will receive greater care than otherwise. Mr. Mallet mentioned the possibilities of the shunt-wound motor for conserving the energy in the battery.

#### Motor Calculations

Mr. A. A. Nimms in his paper on the "Calculation of Electric Motor Characteristics and Prediction of Vehicle Performance" assumed the proportions of a series motor suitable for use with electric vehicles and computed its characteristics in order to determine the performance of the car. The computation of such motor

truck by adding one or two contacts to the controller and increasing the number of cells in the battery.

#### Operating Data on Central-Station Electric Vehicles

"Electric Vehicle Performance in Central-Station Service" was the title of a paper read by Mr. Robert B. Grove in which he summarized the performance of the electric vehicles used by the United Electric Light & Power Company of New York City. The equipment of that company, Mr. Grove stated, consists of twenty-seven vehicles of varying types, according to the nature of the service performed. Two garages are maintained. The vehicles are inspected at the finish of each day's operation, and necessary repairs are made whenever it is possible to do so during the night. The author described a number of small forms which are used in collecting and tabulating performance data.

#### Charging in Private Garages

Mr. J. F. Lincoln emphasized the importance of properly charging the batteries of pleasure vehicles in his paper entitled "Charging Apparatus for the Private Garage," and stated that the charging apparatus must have a great many automatic features in order to give



GROUP OF DELEGATES AT PHILADELPHIA CONVENTION OF THE ELECTRIC VEHICLE ASSOCIATION OF AMERICA

characteristics and vehicle performance, Mr. Nimms stated, tends to emphasize the relation between the voltage, speed, watts and torque of the motor. Vehicle movement, Mr. Nimms stated, depends upon the inertia, train resistance and gravity, all of which must at times be overcome by the torque of the motor. The values of these factors were analyzed and their effects on vehicle movement computed.

#### Utilizing Kinetic Energy

In cities having many grades greater mileage and higher speeds can be secured, it was stated in a paper entitled "Effects from the Utilization of the Kinetic Energy of an Electric Vehicle," which was prepared by Mr. T. H. Schoepf and read by Mr. A. Carrel, by increasing the rating of the battery and the number of cells or by substituting an equivalent in order that the electric vehicle may become an economical means of transportation. The simplest equivalent is frequent boosting, which, however, is limited owing to the lack of properly equipped stations. Boosting the charge of the storage battery while the truck is standing at the loading stations is sound in principle, and if this is augmented by charging from the motor acting as a generator when the truck is under way the ideal is approached. The author gave the results of tests performed with a standard

the battery the proper tapering charge and always keep it below the excessive gassing rate without attention. Mr. Lincoln outlined some of the advantages and disadvantages of the mercury-arc rectifier and described the "Lincoln" electric charger.

#### Electric Industrial Truck

"The Electric Industrial Truck" was the title of a paper containing information on electric trucks contributed by the following manufacturers: The Automatic Transportation Company, the Elwell-Parker Electric Company, the General Vehicle Company and the C. W. Hunt Company. A prologue to these contributions was read by Mr. S. G. Thompson.

#### Water-Power Construction in California

The California State Water Commission has issued a report covering its activities from March 23, 1912, to April 1, 1914. Construction is progressing actively on seven permits for the use of water for power purposes, and the total expenditure involved in this work is \$5,941,300. Of the seven permits pending, the largest affects the Clear Lake and Cache Creek project of the Yolo Water & Power Company. This involves 50,000 theoretical hp, and the development is to cost \$5,185,000.



# Business Conditions in the Industry

Mr. Alex Dow Discusses Large Increases in Detroit and Manufacturers Tell the Effects of the European War on Their Domestic and Foreign Trade

## MR. ALEX DOW ON LARGE DETROIT GAINS

Gross Increases of 13 per Cent in August and 16 per Cent in September Hold Encouragement

Mr. Alex Dow, president and general manager of the Edison Illuminating Company of Detroit, who has been in New York for a few days, told a representative of the *Electrical World* that the normal increase in business of the company is affected only very slightly by conditions arising from the European war. This is shown by the fact that earnings in August this year were 13 per cent greater than in August, 1913, while in September they were 16 per cent greater. The estimate of Mr. Dow is that the full calendar year will show probably a gain of 14 or 15 per cent over 1913. Last year showed 25 per cent gain over 1912.

"Because of financial conditions we have postponed a good deal of construction work that would be desirable," said Mr. Dow. "The Conners Creek plant, which is now under construction, will help us materially. We, of course, shall finish the generating plant there. We had planned to build three substations, but we can get along without two of those for the present and probably will do so. In order that we may have the benefit of our increased generating capacity the work on the distribution system will necessarily continue. A certain amount of construction can be continued economically with our own organization. With other construction, however, we will await improvement in financial conditions.

"As showing the gain in business we added 2120 customers in September. Of these 1500 to 1600 are new-residence customers, mainly people who have built new houses. On the average we connect 100 or so a month of old residences not previously wired, and we secure practically all the new houses built. Our September record in new customers was almost the high record month of our history. In large part it represents the result of building operations which have been under way for some months, but we do not regard it as by any means a phenomenal showing. It is characteristic of the generally favorable business conditions which exist in Detroit.

"The great diversity of industries in Detroit is just as important to that city as diversity of load to a central station. It has done a great deal to build up Detroit and make it the active, prosperous city that it is to-day. Dull times in one section or industry in the city are offset by good times in another. The reduction of active business in some lines because of the operations in the theater of war is offset by increased momentum in other directions due to the same cause. In some plants which make motor trucks, for instance, orders are on hand for all that can be built in a given time, and three shifts of men are kept at work so as to have the plant in operation night and day.

"The August gain of 13 per cent over the corresponding month of last year is unusually low for us and is due to the fact that some of the industries which are large consumers of energy closed for repairs or overhauling in the summer months. The tremendous diversity of industries in Detroit has greatly strengthened the banking position there, and business men of the city are positively assured that their legitimate requirements will be met. We are assured of what we will require

for our present needs, but at this time the financial conditions do not warrant commitments in advance to any material amount of capital expansion during 1915. We see no occasion to cut either dividends or wages—only to be cautious about expansion."

Mr. Dow was asked about the work of the new-business department and he replied: "Our force is having time to do a good deal of visiting at the offices of customers. We are working especially on those manufacturers whose activity has been lessened by financial conditions. We are urging concerns of this character to introduce the economy of electric drive. With us dullness, temporary or periodic, in any industry has always meant that we get new business from that industry. We are always running tests and making engineering studies of existing plants. When we find a manufacturer ready to take our energy we give him the name of local agents of electrical manufacturers and he buys the equipment directly from them. As a result of our studies it has occurred frequently that manufacturers have been able to make actual manufacturing economies in their plants. We do not hesitate to make suggestions to a manufacturer that enable him to introduce manufacturing economies. We do that irrespective of whether or not he becomes a customer immediately. We are willing to do that much good and take a chance that some time in the future we shall find the manufacturer ready to buy energy. When we get a manufacturer to take our advice to his advantage on a mechanical problem it creates a friendly feeling for the future. Our salesmen are often on exceedingly friendly terms with customers. Our whole aim is to get in personal touch with customers. Our business policy has been absolutely continuous in this respect since I went to Detroit in 1896."

In reply to a question, Mr. Dow said that the normal annual capital expenditure of the company is about \$3,000,000. On account of the construction of the new generating plant this year more has been expended, but next year the average will apparently be below the normal amount. On account of the exceptional earnings shown and the position of the company in a city that is doing well in its varied industries, Mr. Dow is encouraged over the general business outlook. He believes that conditions are improving radically.

## HOW MANUFACTURERS SEE THE OUTLOOK

### Trade Conditions and Export Possibilities in Different Branches of the Industry

Statements from manufacturers, given to the *Electrical World*, are as follows:

#### August Business Greatest Known

Leeds & Northrup Company, Philadelphia: "The export business of this company has not been very large and has not come to us because of any great effort on our part to secure it. We have advertised in circular form quite considerably among the colleges in some countries, but we have made no other effort to secure their business. Since our export business has been such a small proportion of our total business, we do not look for any bad effect upon our volume of business this year due to the falling off in exports. It so happens that

from the nature of our business there is very little opportunity for export to the countries directly involved in the war. Germany, England and France all have instrument factories of quite high grade, and it would be difficult for us, under the best conditions, to secure much of a foothold in these countries. The larger part of our business in the export line has gone to Japan and China, and quite a considerable amount to Australia. We very frankly state that we cannot see much light in regard to the question of South American business in our particular line. We are certainly going to make efforts to secure what business there may be for electrical instruments in the countries of South America, but, as stated above, we are not in a position to state definitely, one way or the other, the probable amount of business which is available. We do not look for any great decrease in the volume of our business for this year because of the war conditions. In the first part of August, during the first days of the war, our business fell off materially, but during the latter part of the month it picked up to such an extent that the total volume for August was greater than for any August in the history of this business, and further the total business for the quarter ended June 1 was greater than that for any other quarter with one exception, this exception being due to a special order involving a large amount of money. We have not decreased our organization in any way; in fact, we have, during the last month, strengthened our selling force, not so much for the sake of export trade as for home business. We have been somewhat dependent upon European countries for raw materials, but fortunately we are quite well stocked with the more important materials, and when these stocks are exhausted we fully believe that the same materials can be secured in this country, so that we do not anticipate any difficulty due to inability to secure raw material."

#### Expect Stimulation After War

Mr. V. L. Yessen, H. B. Camp Company, Pittsburgh, Pa.: "It is our opinion that the war will have a stimulating effect on exports of our conduits to Europe; that is, after peace has been declared. There are, of course, countless miles of electric communication and light transmission wires now being destroyed which eventually will have to be replaced and possibly with underground service. We do not anticipate any increased business emanating from South American countries in our line as, to the best of our knowledge, practically all clay conduits used in these countries have been furnished by American manufacturers, and the war would therefore not have any direct influence on conditions there. We have always enjoyed a very good business with our neighbors to the South in the conduit line and confidently look for a continuance of this. None of our raw materials are imported, and we are therefore not affected by curtailment of production in the European countries."

#### Expects Trade of Countries Not at War

Mr. B. G. Stauffer, treasurer and general manager Fidelity Electric Company, Inc., Lancaster, Pa.: "The effect of the war upon our individual business to date has been slightly detrimental. We have been exporters for the past fifteen years to a limited extent, but customers to whom we furnish our apparatus are also exporters, which indirectly affects us. We all expect that the countries not in the war will turn to the United States for their imports. However, we have not been benefited so far by a change of this kind. We are not dependent upon European countries for any of our raw materials. Our factory is operating with its normal force for this time of the year."

#### Appliance Business Good

Mr. Harry G. Seaber, vice-president and sales manager of the Brokaw-Eden Manufacturing Company, of Chicago, in talking with a representative of the *Electrical World*, said that at the time the European war was begun the officials of that company were puzzled as to what course to take. The prevailing opinion in business circles at that time was one of doubt and uncertainty. The Brokaw-Eden company manufactures electric washing machines and appeals to housewives on the ground of economy. Nevertheless, it may be difficult to induce buyers to make an immediate outlay in dull times to secure an ultimate economy. The cash receipts of the company were reduced greatly in the first days of August. To be on the safe side, the directors of the company decided to reduce expenses and curtail activity in the manufacturing department. The sales force was not cut down, however, and was instructed to be more active than ever. The result was not at all discouraging but distinctly encouraging. By Aug. 15 remittances began to come in, and by the end of that month business and collections were nearly in normal volume. September proved to be the biggest month in the history of the company, with a greater volume of business than June or July, which were record-breaking months. Mr. Seaber is confident that business will be good all the rest of the year. He thinks that, with appliance manufacturers particularly, now is the time to press for new business. Business is particularly good in the West, and notably so in and near Kansas City.

#### FACTS ABOUT EXPORT CONDITIONS

##### Information Bearing on Development of Opportunities in Foreign Fields for American Manufacturers

Mr. Verne L. Havens, who has been appointed commercial attaché of the Department of Commerce at Santiago, Chile, has been in New York interviewing manufacturers in regard to his future work. Mr. Havens has returned to Washington but will be in New York again before his departure for Chile. Mr. Havens is an engineer and has been connected with the electric railways in the cities of Mexico and Havana and with the Mexican Light & Power Company. He also was connected with the Presidio & Ferries Railroad of San Francisco. He speaks Spanish and will devote his efforts to the collection of information that will be of value to manufacturers of this country. The following other new commercial attachés have also been in New York conferring with business men for a few days before their departure for their posts: Messrs. Albert Hale, Buenos Aires, Argentina; A. L. Harrington, Lima, Peru, and C. W. A. Veditz, Paris.

At the fifth annual convention of the American Manufacturers' Export Association, held in New York on Oct. 21, the following officers were elected: President, Mr. Alba B. Johnson, president Baldwin Locomotive Works; first vice-president, Mr. Charles A. Schieren, president Charles A. Schieren Company; second vice-president, Mr. A. N. Hargrove, J. G. Brill Company; third vice-president, Mr. W. F. Adam, Clarence Whitman & Company; treasurer, Mr. E. H. Huxley, manager foreign department United States Rubber Company; directors (three-year terms), Messrs. James A. Farrell, president United States Steel Corporation, and M. A. Oudin, foreign manager General Electric Company. The directors held over are Messrs. W. N. Dickinson, General Elevator Company; W. S. Gavan, E. I. du Pont de Nemours Powder Company; W. E. Leigh, Western Electric Company, and A. W. Ransome, Ransome Concrete Machinery Company.



## PUBLIC SERVICE COMMISSION NEWS

## Illinois Commission

As the city of Jerseyville, Ill., and the Central Illinois Public Service Company failed to reach an agreement on electric rates, the commission on Oct. 22 ordered the company to prepare and present an appraisal and inventory of its property in order that just rates might be determined.

The commission denied the petition of the city of Rock Falls, Ill., for a rehearing in the case in which the commission approved the sale of the property and franchise in Rock Falls of the Northwestern Barb Wire Company to the Illinois Northern Utilities Company. The city said that it has a municipal plant that is being improved and that there is not room for two electric plants in the city. The commission holds that the electric franchise held by the selling company was good and that it was transferable.

## Massachusetts Commission

The Gas and Electric Light Commission has issued an order approving the electric power and cooking rates of the Reading municipal lighting plant, but dismissing that portion of the petition of the municipal light board which asked for authority to sell energy at 2 cents per kw-hr. to the town water department for pumping purposes. The petition asked the commission to consent to the maintenance of certain prices alleged to be less than cost as defined in Acts of 1914, Sec. 115, Chap. 742. The motor-service prices range from 8 cents for 200 kw-hr. or less per month to 2.5 cents for more than 10,000 kw-hr., and the cooking and heating rate alleged to be less than cost is 3.6 cents net. A special 2-cent rate has been in force for the local water department.

## Missouri Commission

Official announcement has been made that an injunction will be asked by the Springfield (Mo.) Gas & Electric Company to restrain the Missouri commission from enforcing its decision lowering electrical rates.

## New Jersey Commission

The Board of Public Utility Commissioners has dismissed the petition filed against the Public Service Railway Company to compel it to extend its system from Plainfield to South Plainfield. The board holds that present conditions would not justify the construction of this line, estimated to cost between \$75,000 and \$100,000, and that the probable return in revenue would not warrant the expense involved.

## New York Commissions

At the continued hearing before the New York Public Service Commission, Second District, on Oct. 21, in relation to the valuation of the New York Telephone Company, Mr. John L. Swayze, attorney for the company, filed a valuation of property assets as follows:

Telephone plant, \$67,131,689; less proportion of total replacement reserves, \$11,438,380; balance, \$55,693,309; construction in progress, \$1,076,073; total, \$56,769,382.

Tangibles: Reproduction of physical plant, 20 per cent of \$55,693,309; appreciation of real estate, cost of reproduction of Brooklyn subways, 15 per cent right-of-way, etc., \$11,138,662.

Intangibles: Special franchise, 1913, New York City, \$38,878,949; going-concern value, at least \$13,400,000; investment in securities of Empire City Subway Company, \$11,794,000; working capital, supplies, \$5,250,000; accounts receivable, cash, \$137,352,044.

Earnings: Telephone business, eight months, 1914, actual, \$6,396,400; earnings, four months, estimated, \$3,198,200; total, \$9,594,600; estimated earnings Empire City Subway securities, \$690,320; total, \$10,284,920; net earnings on investment, 7.5 per cent.

## Current News Notes

EXHIBIT OF ELECTRIC CARS IN BOSTON.—The second electric automobile salon under the auspices of the Electric Motor Car Club of Boston will be held in the grand ballroom of the Copley Plaza Hotel in Boston from Monday to Friday, Nov. 2 to 6, inclusive. The grand ballroom will be beautifully decorated for this exhibit of pleasure cars. Six manufacturers of electric cars will have exhibits and four manufacturers of batteries and charging apparatus.

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## SOCIETY MEETINGS

SUPPLY JOBBERS' CONVENTION.—The Electrical Supply Jobbers' Association will hold its next convention at Birmingham, Ala., Dec. 8, 9 and 10. The headquarters will be at the Tutwiler Hotel. The general secretary of the society is Mr. Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

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NEW OFFICERS OF ELECTRICAL LEAGUE OF CLEVELAND.—At the sixth annual meeting of the Electrical League of Cleveland, held at the Hollenden House on Oct. 22, the following officers were elected: President, Mr. George S. Milner, Erner Electric Company; first vice-president, Mr. M. H. Moffett, National Carbon Company; second vice-president, Mr. H. S. Greene, Nungesser Carbon & Battery Company; third vice-president, Mr. N. H. Boynton, National Lamp Works; fourth vice-president, Mr. Aitken, George Worthington Company; secretary, Mr. R. G. Paite, Cleveland Telephone Company; treasurer, Mr. H. C. Mohr, Cleveland Electric Illuminating Company.

\* \* \*

PITTSBURGH MEETING OF A. I. E. E.—At the regular monthly meeting of the Pittsburgh Section of the American Institute of Electrical Engineers held Wednesday evening, Oct. 21, in the rooms of the Engineers' Society of Western Pennsylvania, Mr. C. B. Auel, director of standards, processes and materials of the Westinghouse Electric & Manufacturing Company, gave an illustrated talk on electric welding. The meeting was largely attended, especially by railroad men, a number of whom participated in the discussion, bringing out many points in the practical operation of electric welding.

\* \* \*

MEETING OF PHILADELPHIA COMPANY SECTION, N. E. L. A.—The Philadelphia Company Section of the National Electric Light Association held its first fall meeting on Oct. 23, 1914. About 375 members were in attendance. Mr. Frank A. Birch, the section's newly elected chairman, presided. Following a vaudeville program in which the section's new band, the "Edison Concert Band of Philadelphia," took part, Mr. Joseph B. McCall, president of the Philadelphia Electric Company, made a brief informal address. Mr. William C. L. Eglin, second vice-president of the company, in a very neat and appropriate speech, presented the Doherty gold medal to Mr. Harold Goodwin, the winner. A telegram was sent to Mr. Thomas Edison congratulating him upon the thirty-fifth anniversary of the invention of the electric lamp. Four brief papers were presented by Messrs. A. F. Mayers, of the meter department; R. A. Huebner, of the accounting department; John Meyer, of the commercial department, and D. F. Schick, of the engineering department. Each touched briefly upon the work of his respective department and showed the manner in which the work in each dovetailed with that in the others.

## The Goldschmidt Transatlantic Radio Station

Description of the plant at Tuckerton, N. J., which receives sustained waves from Eilvese, Germany, 4000 miles away. By John L. Hogan, Jr.

THE sustained-wave wireless station at Tuckerton, just north of Atlantic City, is again becoming a center of interest by reason of the recent reopening of radio service from there direct to Eilvese, near Hanover, Germany. It will be remembered that this plant had been in experimental operation for some months prior to the beginning of the European war, and that communication between the United States and Germany had been secured both by day and by night. Further trials, to determine the possibility of continuous exchange of messages through periods of severe atmospheric interference and to determine the reliability of operation, were anticipated, and it was proposed later to compete with cable transmission to Germany. When the Emden cable was cut direct signaling to Germany could be effected only by the radio stations at Tuckerton and Sayville, and of these the higher-powered Tuckerton plant proved the more useful. A number of messages were sent through, when a complication in the matter of federal license for the station (which is foreign-owned) arose. To expedite the useful end of what promised to become a snarl of legal technicalities, the United States Navy Department took over the operation of the Goldschmidt outfit and, beginning Sept. 9, accepted from the public "neutral" messages for transmission to Eilvese and other shore stations in Europe.

Under naval supervision a station rate of 17 cents per word (with ten-word-per-message minimum) was fixed,

and a set of elaborate regulations concerning the censorship of coded messages was formulated. On Sept. 15 it was announced that communication with Eilvese could be had through the prevailing heavy static for only about three hours each night, and that therefore the station word rate would be increased to 25 cents and a maximum length of 25 words set for any one message. The requirement of ten words minimum was withdrawn. Operation upon this basis was begun, but during the night-sending schedule of Sept. 15-16 the radio-frequency alternator became damaged and the station was forced to close. A duplicate machine was immediately ordered from Germany, to be shipped by way of Rotterdam, and it is hoped that the new alternator will pass quickly through neutral territory. In the meanwhile apparatus from California has been installed to re-establish communication.

The Goldschmidt installations here and in Germany are essentially duplicates and form the first pair of radio stations erected to intercommunicate over such great distances by means of machine-generated sustained waves. The "reflection alternator," within which alternating currents having a fundamental frequency of the order of 10,000 are efficiently quadrupled in frequency, is the basis of each installation. The Tuckerton machine is shown in Fig. 1, in which can be seen the heavy main radio-frequency conductors and the banks of mica-dielectric condensers used for tuning to the sub-frequencies of approximately 10,000, 20,000 and

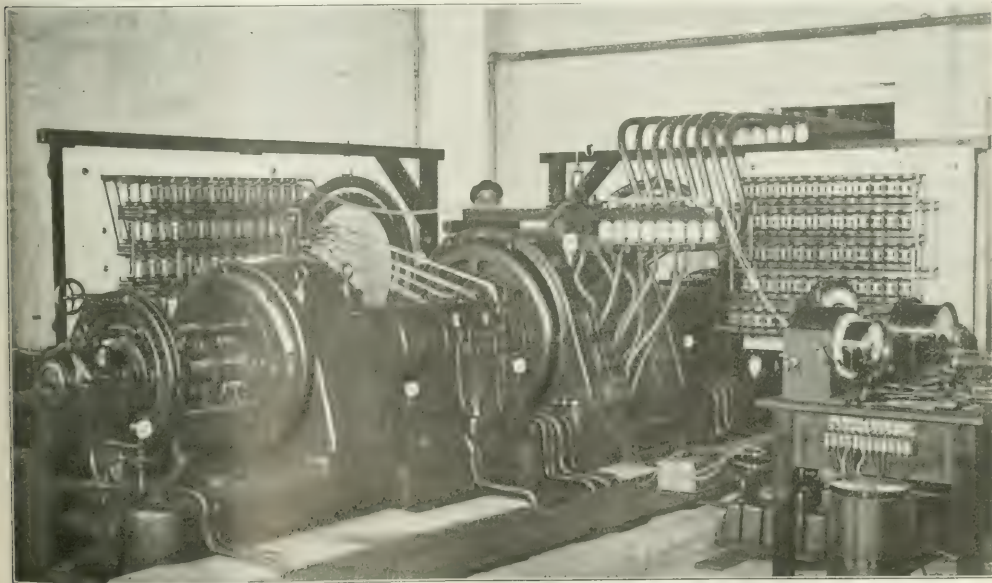


FIG. 1—GOLDSCHMIDT 100-KW RADIO-FREQUENCY ALTERNATOR



30,000 cycles per second. The Tuckerton plant has a complete steam-power equipment comprising a Westinghouse double compound vertical engine belted to two Triumph 120-hp, 220-volt direct-current generators, which, through line-voltage control, operate the main driving motor. This machine is of 250-hp rating, and,

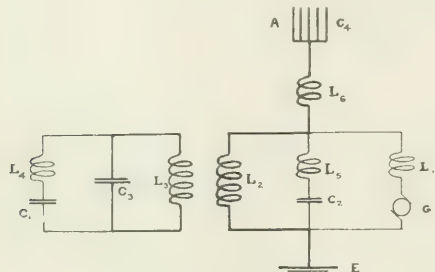


FIG. 2—ARRANGEMENT OF FOUR-STEP MACHINE

as shown, is coupled directly to the radio-frequency alternator.

The alternator and its motor are of German construction and are considered remarkable electrically and mechanically. The generator is of especially rigid design, since in it there are some 300 poles surrounding a rotor about 3 ft. in diameter, both rotor and stator being constructed of steel laminations 2 mils in thickness separated by 1.2-mil paper. The rotor weighs approximately 5 tons. The machine runs at 4000 r.p.m. with an air-gap of less than 1 mm. These unusual conditions, among others equally difficult to meet, are forced upon the builder by the requirements of high fundamental frequency and minimum leakage in the magnetic paths. The details of the method of frequency transformation effective in the machine have been given in other papers,<sup>1</sup> and it will be sufficient herein to indicate and explain the circuits used in the four-step machine, as in Fig. 2. Direct current from the exciting generator *G* is led through the choke coil *L*<sub>1</sub> and the stator windings *L*<sub>2</sub>, and in the usual way sets up a current having a frequency of 10,000 cycles per second in the rotor *L*<sub>3</sub> and associated condenser *C*<sub>1</sub> and inductance *L*<sub>4</sub>, which series of elements is tuned to this frequency. By reaction the 10,000-cycle current reinduces 20,000 cycles per second in the stator, this double-frequency current flowing through the tuned circuit *L*<sub>5</sub>, *L*<sub>6</sub>, *C*<sub>2</sub>, and in turn creating a triple frequency of 30,000 in the rotor. The circuit *L*<sub>6</sub>, *C*<sub>2</sub> is tuned to this rate of alternation, and its current sets up in the stator the resultant desired 40,000-cycle current, which is applied to the resonant antenna-to-earth circuit *C*<sub>4</sub>, *L*<sub>6</sub>, *L*<sub>7</sub>, *E*. At Tuckerton the aerial radio-frequency current is some 135 amp, which, since the antenna resistance is about 6 ohms at 7400 m wave-length, represents about 110 kw in the aerial. This is produced with a power expenditure in the driving motor of approximately 180 kw, indicating an efficiency of 60 per cent. It is stated that the machine is capable of generating as much as 200 kw of radio-frequency power.

Fig. 3 is a general view of the Tuckerton plant. The single triangular-section steel tower is 825 ft. high and supported by twelve guys in sets of three. Fig. 4 shows the glass-insulated base of the tower, which includes a universal joint to permit slight tilting of the structure under heavy wind stresses. A second insulated joint is

placed half-way up the tower, to give additional flexibility and to prevent the formation of large currents by induction. The steel-cable guys are also subdivided by insulators. The "double-cone" aerial system consists of a group of thirty-six wires insulated from the tower and extending umbrella-wise from its top for about 600 ft. and then dropping to the tower base, where they enter the station building. The natural frequency of the aerial is about 107,000 cycles per second, corresponding to a wave-length of 2800 m, or approximately two and seven-tenths times the operating frequency of the generator.

In sending Morse signals with the Goldschmidt transmitter the radio-frequency power is shut off or materially reduced from full value during the "space" interval between dots and dashes by connecting the key in the exciting direct-current supply. Thus the motor load is rapidly thrown on and off, and since the relative times for which the key is down and up change according to the succession of dots and dashes, the resultant load on the motor varies from second to second. Such changes if not compensated would, of course, cause the motor-generator speed to fluctuate, and the antenna current would become less as the machine drifted away from the resonant frequency. To secure constancy of tuning and wave-length, therefore, it has been found necessary to place in the key or Morse relay circuit a part of the motor-field resistance, so connecting it that as the key is depressed and the load thrown on the motor field is weakened just enough to overcome the tendency to slow down. It should be noted that in sending by opening and closing the exciting circuit the entire output of 100 kw or so may be controlled by relays carrying only some 5 kw or 6 kw, and that, because of the highly laminated magnetic circuits of the machine, the antenna current changes are abrupt enough to permit rapid telegraphing.

The Tuckerton station receives sustained waves sent from Elvase, 4000 miles away, by use of the usual tuning circuits and a detecting or converting device called the tone wheel.<sup>2</sup> This instrument, which is shown in

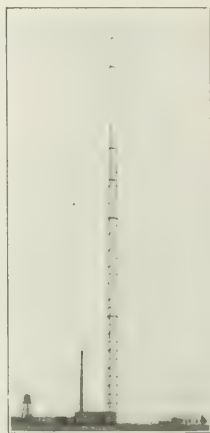


FIG. 3—GENERAL VIEW OF PLANT AT TUCKERTON

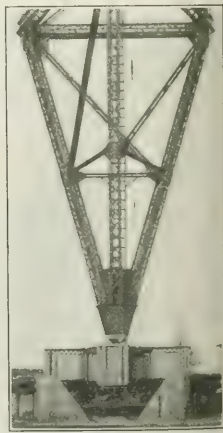


FIG. 4—INSULATED BASE OF TOWER

Fig. 6, consists of a toothed wheel mounted on the shaft of a special high-speed motor and having a contact brush running on its edge, the whole forming an inter-

<sup>1</sup>The theory and further details as to the construction of the Goldschmidt machine may be found in: *Proceedings, Institute of Radio Engineers*, Vol. II, No. 1, March, 1914, page 69, Mayer; *London Electrician*, Feb. 17, 1911, page 744; July 19, 1912, page 615, and May 16, 1913, page 219, and *Jahrbuch der Drahtlosen Telegraphie*, Zenneck, 1913, pages 255-259.

<sup>2</sup>For further details of the tone wheel, see *Proceedings, Institute of Radio Engineers*, March, 1914, and *Jahrbuch der Drahtlosen Telegraphie und Telephonie*, June, 1914, pages 516-524.

rupter of high and controllable frequency. As may be seen from the photograph, the instrument is equipped with a tachometer, an eddy-current brake and a centrifugal-electrical speed-controlling device. When connected in a suitable circuit—for example, at *TW* in the usual tikker or rectifier arrangement of Fig. 5—and rotated

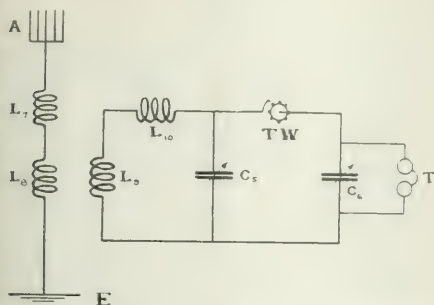


FIG. 5—DIAGRAM OF TONE-WHEEL CONNECTIONS

so that the contacts occur slightly faster or slower than do successive current maxima produced by the received electromagnetic wave, a musical signal tone is given off by the receiving telephones *T*. The pitch of this tone is equal to the difference in the received oscillation frequency and the contact frequency, and may be varied to suit static or other conditions by altering the speed of the tone wheel. The mode of operation may be understood by further consideration of Fig. 5, wherein *L*<sub>1</sub> and *L*<sub>2</sub> are used to tune the antenna *C*<sub>1</sub> to the frequency *n*<sub>1</sub> of the incoming waves, and *L*<sub>3</sub>, *L*<sub>4</sub>, *L*<sub>5</sub> and *C*<sub>2</sub> are the secondary tuning elements arranged for the usual adjustments. When in resonance sustained alternating potentials of maximum value and radio frequency *n*<sub>1</sub> are set up across condenser *C*<sub>2</sub>. If the tone wheel revolves at the speed giving interruption frequency *n*<sub>2</sub> (corresponding to one contact per complete cycle of oscillation in the receiving circuit), the condenser *C*<sub>2</sub> will be charged with a unidirectional voltage of amplitude and polarity determined by the phase relation between the instant of contact and the oscillation cycle. If the tone wheel is driven at a contact frequency *n*<sub>2</sub>, slightly different from *n*<sub>1</sub>, there will be a uniform progression of phase difference between these polarity and amplitude determining factors, and the result will be an alternating charge upon *C*<sub>2</sub>, the cyclic frequency in polarity of which will be measured by the beats between frequencies *n*<sub>1</sub> and *n*<sub>2</sub>, or, in other words, their numerical difference. Thus, if the wave-length received is 7500 m, having a frequency of 40,000 cycles per second, and the tone wheel is run at 39,500 or at 40,500 contacts per second, the signal note produced will have a pitch corresponding to *n*<sub>1</sub> - *n*<sub>2</sub>, or 500 cycles per second. Since energy is drawn from the secondary circuit at each oscillation, the telephone condenser *C*<sub>2</sub> must have smaller capacity than is customary with the intermittent-contact tikker, if the selectiveness of the tuning arrangement is not to be destroyed by high equivalent resistance effects. In addition to operation at the fundamental wave frequency, it is possible to secure the production of audible beat tones on speeds of the tone wheel giving contact at rates slightly different from various multiples or sub-multiples of the received wave frequency, though it is stated that a diminution of signal intensity attends such operation.

Obviously, the tone-wheel method of reception has many of the same properties as the Fessenden heterodyne receiver. For instance, the tone frequency is equal to the numerical difference in frequencies of the

received wave and the contactor or local generator, the tone effects may be produced at harmonic frequencies of either, interference may be eliminated by adjusting the local frequency to produce inaudible current frequencies from the interfering waves, sustained wave signals result in clear musical tones while persistent damped wave signals give hissy sounds in the telephones, etc. The receiving circuits actually used at Tuckerton have not been disclosed, but the simple arrangement of Fig. 5 includes no local source of energy and depends upon the mechanical periodic alternate rectification of the incoming wave energy to affect the telephones. Opinion appears to differ as to whether or not this may be considered an equivalent of the heterodyne apparatus which produces the same effects, since the amplification secured with the heterodyne by addition of local energy may not be had with the arrangement illustrated.

The Goldschmidt stations are excellent examples of modern radio engineering as applied to long-distance telegraphing. Signals from Tuckerton have been printed photographically at Eilvese, in daylight transmission, by use of the string galvanometer shadow recorder, and are officially stated to give intensity readings of from 100 to 200 times audibility under normal working conditions. Transmission seems about the same in either direction, though atmospheric difficulties may be somewhat greater at the American end. No data are available as to the degree to which "static" interferes with uniform signaling. It is believed that these plants have approached more nearly than any others the condition permitting commercial radio service directly between the United States and Europe, and the fact that the Tuckerton alternator was mechanically damaged just as a demonstration was begun is a cause of much regret among radio engineers generally. Until the California alternator was installed the station was operated with an arc-type sustained-wave generator which for short periods can be used on some 80 kw to 100 kw input of power and gives an antenna current of about 90 amp, corresponding to nearly 50 kw of radio-frequency power. This permits night-time signaling to Eilvese under favorable conditions. Arrangements were made to install larger apparatus in order to permit continuous sending by the arc method at this or somewhat higher power. In consideration of the 825-ft. antenna height, Tuckerton may give better service than can be

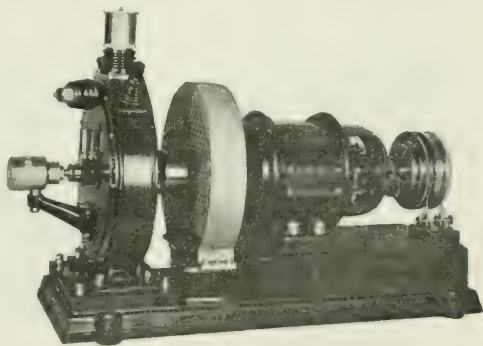


FIG. 6—TONE WHEEL

secured from Sayville's 50-kw spark transmitter even before the new alternator is received.

The final re-establishment of communication in both directions between the Goldschmidt plants will confer a great boon upon all who have been hampered by the difficulties of indirect and censored cable communication with Germany.



# The Design of High-Voltage Rectifiers

Description of three completed machines embodying distinct principles and of a proposed fourth apparatus to combine the best features of the others. By H. C. Wolf and H. Mathews

THE study of the phenomena and the applications of high potentials has recently led to a demand for high unidirectional, but not necessarily constant, voltages. Direct-current generators cannot be well enough insulated to produce very good results along this line, and hence rotating rectifiers, which reverse a portion of the alternating wave, have been

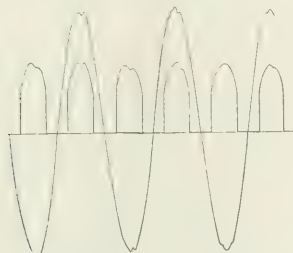


FIG. 1—OSCILLOGRAM OF RECTIFIED VOLTAGE

employed. The most important demands for these high unidirectional voltages have come from physicists for use in a study of Roentgen rays and from experimenters with electrical precipitation processes.

A rectifier can be made to take off only a portion of the wave. It is driven by a motor running in synchronism with the exciting circuit current, thus causing all the loops to be identical. For most effective results the maximum portion of the wave should be included in the part rectified, not only to give the greatest amount of power for the same voltage, but also to prevent an alternating voltage being obtained on the rectified side by rectifying the portion which crosses the axis. The cost of construction and maintenance and the insulation of rectifiers are the two deciding factors in their design. Three different rectifiers, each embodying distinct principles and each governed in a greater or less degree by the above factors, were built and tested by the writers, while a fourth, containing the best features of these three, has been proposed.

For obtaining high alternating voltage use was made of a 100-kw, sixty-cycle, 500, 1000 or 2000 to 200,000-volt transformer excited from a 440-volt source. From an auxiliary low-voltage winding effective secondary voltages were read and oscillograms were taken directly. The maximum value of the voltage was either computed from an analysis of the wave or ascertained by the use of a sphere gap. Oscillograms were taken also on the rectified side, and the maximum point of voltage was obtained as before. A 10-hp, 440-volt, four-pole synchronous motor was used to drive the rectifiers, but a 5-hp motor would have been large enough.

The first rectifier constructed was of the disk, contact type, its design being entirely original with the writers. Two 12.5-in. wooden disks were mounted parallel on a wooden shaft 11 in. apart. On the periphery of each disk were two electrically connected brass segments at right angles to those on the opposite disk, 180 mechani-

cal degrees apart, and each spanning 45 mechanical degrees so as to rectify 90 deg. of the wave. Alternating voltage was received from two slip-rings, one attached to the segments on each disk, while the rectified voltage was taken off by two sets of two wire brushes each bearing on the periphery of the disks. These two sets were 90 mechanical degrees apart, and brushes in the same plane on opposite disks were of the same polarity, hence electrically connected. The brushes were set to take off 90 deg. from the maximum portion of the wave, which effect is shown by the oscillogram of Fig. 1, and by actual measurements. This oscillogram was taken at a maximum voltage of 368 volts, measured on the alternating side, and by analysis it shows the effective value of the rectified wave to be 0.63 of the maximum and the average value to be 0.45 of the same value. An induction-type voltmeter registered 240 volts at the same time that a permanent field meter read 170 volts, both values checking closely with the wave analysis. The similarity between the alternating and rectified voltages is noticeable, the one being simply the reproduction of the other. The advantage of this type of rectifier lies chiefly in the fact that its action can be studied and all adjustments made at low voltages. It was possible to rectify only 65,000 volts, maximum value, for at this value flash-over occurred around the periphery of the disks.

The second rectifier is shown in Fig. 2. It is somewhat similar to one used by the Research Corporation

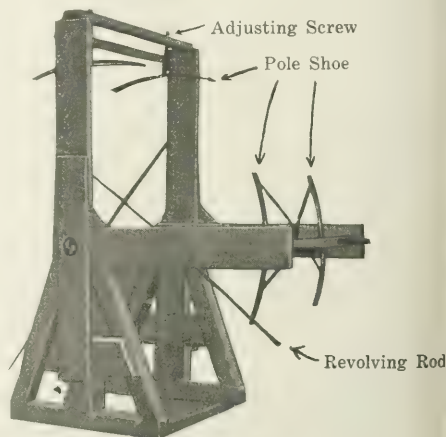


FIG. 2—RECTIFIER OF REVOLVING RODS

of New York in work on the electrical precipitation of suspended particles. Since it is difficult to construct well-insulated and at the same time well-balance wooden disks, the idea was conceived of substituting for these brass rods set at right angles, and of governing the length of the rectified wave by stationary instead of revolving brass segments. These rods were 30 in. long and each pair was spaced 12 in. along

wooden shaft. Alternating voltage was received through slip-rings as before, while the rectified voltage was taken from the stationary pole shoes. The clearance between the revolving rods and the shoes could be adjusted by means of a set screw shown at the top of the frame. Looking at Fig. 2 and assuming that the rod is positive when in a vertical position, it

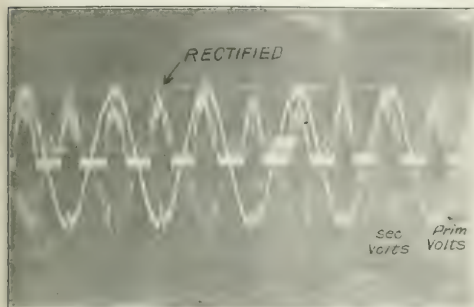


FIG. 3—OSCILLOGRAM OF RECTIFIED VOLTAGE

is seen that it will be negative one-fourth of a revolution later when in a horizontal position. Thus one pair of the pole shoes is positive while the other is negative, as the other rods are going through the same process as the one referred to. The air-gaps in the circuit and the capacity and inductance of the system produce high-frequency currents, thereby rendering a wave analysis extremely difficult. Fig. 3 is an oscillogram taken at a maximum emf of 55,000 volts, showing the primary and secondary voltages of the transformer and the rectified voltage. Several other waves are noticeable, but they are not pertinent to this discussion. The high-frequency oscillations are seen to be carried back into the primary, thus indicating the strain thrown on the entire system in high-potential testing. For taking this oscillogram the rectified voltage was impressed on a resistor of high resistance which was grounded at its mid-point, and the oscillograph element was placed in the ground connection. The auxiliary winding on the transformer was used for obtaining the alternating wave. With this type of rectifier any emf from 15,000 volts to 110,000 volts maximum value could be rectified; it possesses advantages of lightness and compactness.

In the third rectifier use was also made of wooden disks. These were of seasoned poplar, 18 in. in diameter and 1.5 in. thick, spaced 14 in. along a 4-in. wooden shaft. Equally distributed about the periphery of each disk were four brass segments of such length as to rectify about 64 deg. of the wave. Two opposite segments on each disk were electrically connected, while the alternate segments were connected to the segments on the opposite sides of the other disks. Alternating voltage was conveyed to these segments from brass discharge points mounted on the tops of wooden posts, one set of points in each line, and so constructed that the clearance between the points and the revolving segments could be varied. Two similar sets of points on opposite sides of the disks collected the rectified voltage. Fig. 4 gives a view of this rectifier showing the disks and a portion of the segments and connectors, the discharge and collecting points, the shaft and bearing, and a portion of the driving motor. The advantage of this type of rectifier lies in the fact that its connections are so made that electrical break-down must occur either around one-half the periphery of the disks or between discharge points of opposite polarity, and thus a machine of the same dimensions as the previous types

could be worked at much higher voltages. A maximum emf of 180,000 was attained in practice before break-down occurred. The great weight of the revolving parts and their liability to become unbalanced are, however, objections which may outweigh the increased insulating value.

A combination of the last two types with a possible provision for obtaining actual brush contact would seem to be the best solution of the problem. A machine fulfilling these provisions would have stationary pole shoes in place of the discharge and collecting points used in the last type, while the brass rods of the second type would be replaced by insulating rods with brass tips. One of these rods on either end should be hollow to allow of the connection between the tips, while the other tips should be interconnected similarly to the segments in the third type, by rubber-incased wires. Balancing weights would probably be required to offset the effect of these latter connections. Suitable bearings and supports must be provided and the whole machine well insulated from the ground. A rectifier of this type, using 30-in. rods spaced 18 in. along the shaft and with pole shoes long enough to rectify 90 deg. of the wave, should withstand 300,000 volts, maximum value.

The simplest method of making adjustments for securing the best portion of the wave seems to be to change the relative position of the revolving parts of the motor and of the rectifier by means of an adjustable coupling between the two. Several methods of finding the best position of the parts are possible, the most accurate being by means of an oscillogram of the rectified and alternating waves. The rectified voltage may also be impressed on a resistor of high resistance and the current read either on the rectified or on the alternating side. The best position is attained with the maximum current. Another method applicable to those rectifiers which do not have actual contact between their brushes and revolving parts is to observe the condition of the sparks as the points pass under the pole shoes, when the rectified brushes are short-circuited. A definite spark, plainly noticeable in a dark room, occurs at the peak of each oscillation, being brighter the higher the peak. Thus the brightest point will occur at the maximum value of voltage, and by making adjustments until this point comes at the center of the pole shoe the best portion of the wave will be secured. A brighter spot on the end where the brush leaves the pole shoe indicates that the brushes should be set back, while a

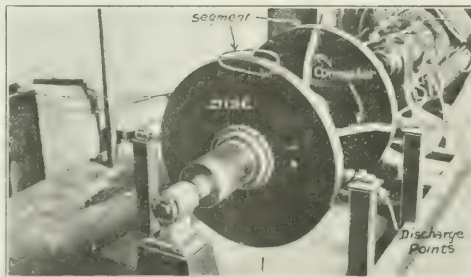


FIG. 4—REVOLVING-DISK RECTIFIER

bright spot on the approaching side indicates a lag in the brushes.

There are many considerations which enter into the design and use of high-voltage rectifiers, and it will probably be a great while before manufacturers are making a satisfactory standard rectifier, but there is no reason to believe that a good machine cannot be built in any modern experimenter's shop.



## Hydroelectric Development on Bishop Creek, Cal.—III

**Intake reservoir of station No. 2—Detailed description of the wood-stave flow line and the steel pressure line—  
How a broken casting was repaired. By C. O. Poole**

**T**HE flood-water line of Plant No. 2 intake reservoir will be on a level with the tailrace of Plant No. 1. This intake reservoir has a capacity of 600 acre-ft. and serves as an equalizing reservoir for the whole system of plants. The dam is earth-fill, with concrete core wall and rubble-concrete spillway, 40 ft. in width. There are two 36-in. sluice ports through the spill section that serve to sluice out any accumulation of sediment carried into the reservoir. Fig. 17 is a view of the dam and reservoir, with the Sierras in the background. Fig. 18 is a plan and section of the dam. The elevation of this intake is 8028 ft. The intake chamber for the flow line is situated within the reservoir and is of reinforced concrete, having openings on two sides, covered with inclined screens consisting of  $\frac{1}{4}$ -in. by 3-in. steel bars on edge, spaced on 1-in. centers. The control of the water to this box is by means of four wooden gates 36 in. wide by 96 in. high.

The reservoir is on the Middle Fork of the stream, and the water from the South Fork is brought to it by means of a steel pipe laid in the form of an inverted siphon. This pipe is 8140 ft. in length, the upstream half being 38 in. in diameter and the lower half being 34 in. in diameter. The South Fork is diverted by means of a small crib dam, rock-filled. The entrance to the pipe is screened and controlled by wooden gates. The elevation of this intake is 112 ft. above the intake to station No. 2. The lowest point of the siphon is 158 ft. below the South Fork intake, and at that point a 16-in. gate valve is installed for the purpose of drawing out sediment. The line passes over the point of a hill about midway in the line, from which point the pipe has a uniform drop of 14 ft. per 1000 ft. On the high point of the pipe there is provided a float air vent having a 2-in. valve to relieve the siphon of air accumulations. There is also a 6-in. drop air valve at that point to admit air to prevent the pipe collapsing.

### Flow Line, Station No. 2

A 48-in. steel pipe leads through the intake dam and connects with a 48-in. wood-stave flow line laid on a uniform grade of 4 ft. per 1000 ft. This grade, together with the head in the intake reservoir, gives a carrying

capacity of 135 second-ft. The wood pipe is 10,035 ft. in length and the grade is on a hillside the whole distance. Curves as short as 40 diameters are made with the staves, while curves of less radius are made with steel angle pieces, as shown in Fig. 19. These steel angle pieces are made smooth on the outside for a distance of 2 ft. on either end by using a butt strap on the inside and countersinking the rivets on the outside. The outside diameter of these angles is the same as the inside diameter of the wood pipe. The wood pipe is then built around the steel pieces, and the wood stave bands are used to make the joint tight. This has proved very satisfactory, joints thus made having been used under a head of 100 ft. for several years.

The staves are of selected redwood, and  $\frac{1}{2}$ -in. steel bands are spaced to give a factor of safety of four, based on an ultimate strength in the steel of 60,000 lb. per square inch. Steel dowels,  $\frac{1}{8}$  in. by  $1\frac{1}{2}$  in., are used to join ends of staves. The flow line terminates in a steel standpipe fitting, the standpipe being 48 in. in diameter and 80 ft. in height. It is composed of  $\frac{1}{4}$ -in. steel in the lower half and 3/16-in. steel in the upper half and is firmly guyed with eight steel cables, four at the top and four at the middle joint. The standpipe is installed on a narrow ridge, from which point a steep descent is made to the station.

### Pressure Line

The steel pressure line commences at the standpipe, where it connects with a 48-in. cast-iron gate having a 6-in. pass. Directly below this gate in the steel pipe is a manhole providing means of access. This has been found very convenient on one occasion at least, as shown later. The pipe has a total length of 2646 ft. and a uniform inside diameter of 48 in. The metal varies in thickness from  $\frac{1}{4}$  in. to  $\frac{3}{8}$  in., the upper half being riveted lap joint and the lower half butt straps, triple riveted. Fig. 20 shows the system of riveting. The pipe has a factor of safety of four, based on ultimate strength in the steel of 55,000 lb. per square inch using joint efficiency of 7 per cent in the lap-rivets and 85 per cent in the butt strap sections. The sections were all riveted and calked in the shop at

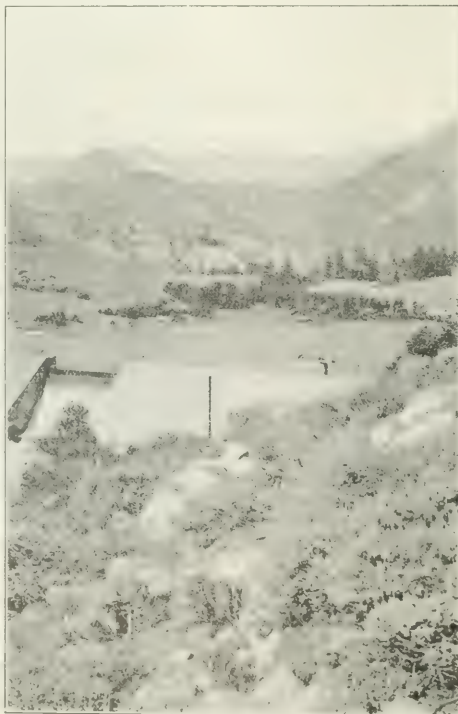


FIG. 17—DAM AND RESERVOIR FOR STATION NO. 2

shipped in 24-ft. lengths. The holes in the joining ends were punched  $\frac{1}{8}$  in. small in the shop and reamed out to size after joining in the trench, air tools being used in all field work.

The cost of the steel pipe, including all handling, trench and field work, was 8 cents per lb. The pipe was laid in a trench from 4 ft. to 5 ft. in depth and anchored in place by heavy concrete piers placed about 300 ft. apart. There were a number of angles in the pipe, and it was designed in the shop to fit the grade of the trench. The method of obtaining the measurements for the pipe was to grade the trench carefully to stakes set in the bottom of the trench, the tops being flush with the grade and care being exercised to have a station at each angle, either horizontal or vertical. A transit line was then run over the tack centers of the stakes in the center of the trench. At each angle the horizontal angle was read, then the vertical angle, and the exact distance along the bottom of trench was measured

reinforcing. It may be of interest to state here that the largest Y, reducing from 48-in. diameter to 40-in. diameter, with 24-in. branch, after being constantly used for five years, without any unusual conditions of operation, failed by opening up a crack  $\frac{1}{8}$  in. wide extending throughout the 40-in. and 24-in. flanges and through the crotch of the branch. The station was flooded, but the operator succeeded in disconnecting the generators from the system and cutting out the fields before the water filled the pits, so no particular damage was done to the apparatus inside the station. A description of the break and repairs is given below.

The broken casting was supposed to be of the best quality cast steel that could be obtained at the time it was made, but the use of cast steel in such forms in 1908 was apparently not far enough advanced to secure absolutely uniform texture of metal throughout the forms of the casting.

The size of the casting was 7 ft. in length over the

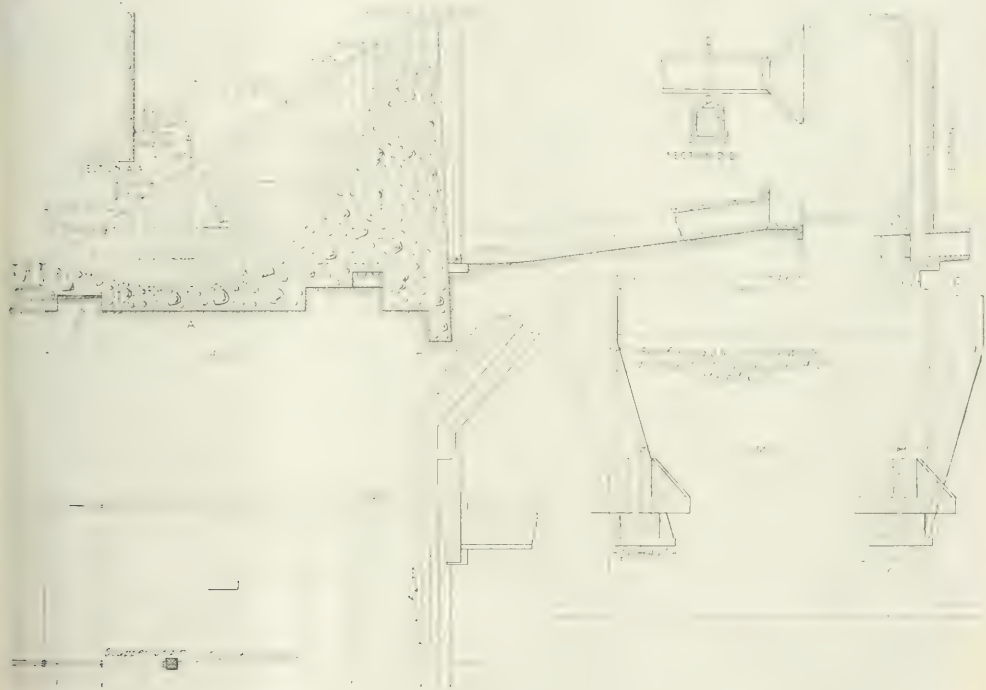


FIG. 18—PLAN AND SECTION OF DAM FOR STATION NO. 2

between angle points. Where a vertical and horizontal angle occurred at the same point, a resultant angle was worked out for the pipe manufacturer. For this purpose a formula was developed as follows:

$A$  = vertical angle of one pipe.

$B$  = vertical angle of the other pipe.

$C$  = horizontal angle between pipes.

$X$  = pipe angle.

Then  $\cos X = (\sin A \times \sin B) - (\cos A \times \cos B \times \cos C)$ .

The pressure pipe terminates in a steel manifold at the generating station, where three 24-in. branch pipes are taken off and a 12-in. relief pipe extends in line with the main pipe. This arrangement is shown in Fig. 20. The reducing Y's are of cast steel, the thickness of the metal being  $1\frac{1}{2}$  in. with heavy ribs on the outside for

flanges in the main section, one end having a diameter of 48 in. inside and the other having a diameter of 40 in. inside, the upper end being provided with a flange 3 in. thick, with a total outside diameter of  $62\frac{1}{2}$  in., the 40-in. section having a flange of  $2\frac{1}{2}$  in. thickness and outside diameter of 53 in. There was a 24-in. branch taken off at a 30-deg. angle, flange  $1\frac{1}{4}$  in. thick, outside diameter 35 in.

The metal in the body of the casting in both branches was about  $1\frac{1}{2}$  in. thick. The forks were heavily ribbed with  $1\frac{1}{2}$ -in. ribs, the whole piece being cast integral, flanges and all.

The failure in this steel Y-piece was undoubtedly primarily caused by a shrinkage strain or poor metal in the casting, as there was nothing unusual in the operation of the system at the time the accident happened.



Some of the operators at station No. 2 had on two or three different instances heard a kind of cracking noise outside the generating station but could not find any reason for the noise until the pipe finally gave way. It is possible that this crack has been forming for some

time and finally gave way on Nov. 7, 1913. The station was flooded and all of the grounds around the building washed out, in addition to part of the road for a distance of about 300 ft. below the plant. There was about 6 in. of water on the floor of the station, and naturally the lower half of the generators were soaked

give it clearance, so that it could be removed for repairs. This was a very tedious and hard job and had to be done by hand. The men worked night and day cutting rivets and drilling them out, etc., by hand, at the same time straining every effort to install the compressor plant, which had to be moved from station No. 3, so that air tools could be used to expedite the work. The compressor went into service on Nov. 14 and the rivets were all cut that night. The Y was then hoisted out of the trench and blocked up ready for putting it in the power house.

After the accident the writer went immediately from Riverside to Los Angeles and considered with the Baker Iron Works the best way to repair the casting. In order to be prepared for any emergency and to save time, shrink rings, special clamps, etc., were ordered shipped in by express, and the Schaw-Batcher Company, at San Francisco, was ordered to send two good pipe men, while arrangements were made with the Pelton Water Wheel Company, of San Francisco, to send an electric welder.

time and finally gave way on Nov. 7, 1913. The station was flooded and all of the grounds around the building washed out, in addition to part of the road for a distance of about 300 ft. below the plant. There was about 6 in. of water on the floor of the station, and naturally the lower half of the generators were soaked

Fig. 21 (a) is a view of the casting hoisted up from the trench ready to be put into the power house. Inside the station the casting was placed under the crane, where it could be handled to good advantage, and work was started immediately in chipping out the casting

FIG. 19—STEEL BAND FOR WOOD-STAVE PIPE

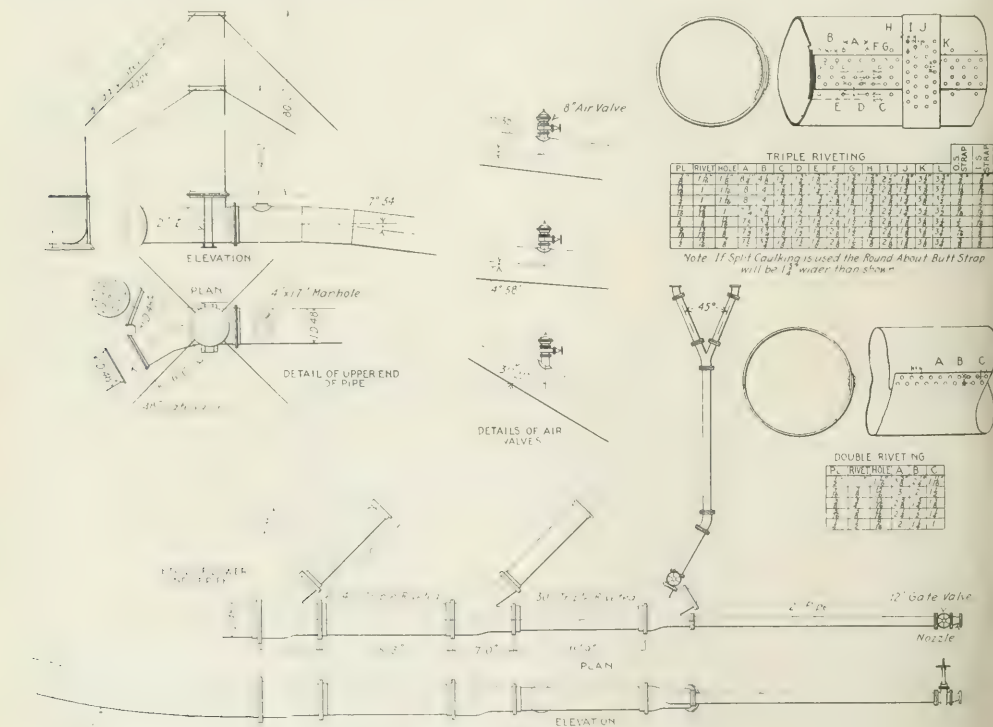
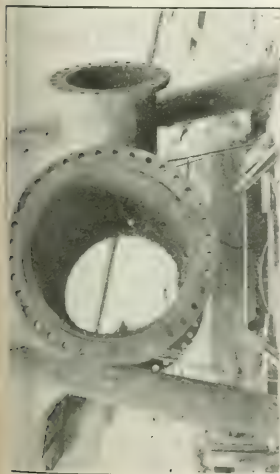


FIG. 20—DETAILS OF STEEL PRESSURE PIPE

with water. By energetic work the generators were put into service again a few days later.

Owing to the massive construction of the Y-piece and the peculiarly wedged position of the casting it was impossible to take it out without first cutting the  $\frac{3}{4}$ -in. butt strap through and cutting off eighty 1-in. rivets and wedging the half-steel flange on the section of pipe below the Y far enough away from the steel casting to

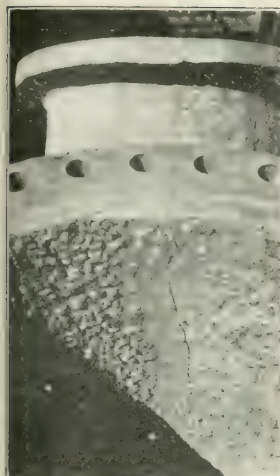
along the cracks of the two branches of the Y. By referring to Fig. 21 (b and c) a good idea of the nature of the fracture can be obtained. The pictures were taken looking into the 40-in. end of the Y and show the 24-in. branch to the right. As will be seen, the crack extended through the 40-in. flange and into the crotch of the Y, a distance of about 30 in. to the point of the crotch; thence through the 24-in. branch, including the flange of



A—CASTING RAISED FROM TRENCH



B—VIEW OF FRACTURE



C—ANOTHER VIEW OF FRACTURE



D—THE CHIPPING BEFORE WELDING



E—THE WELD FINISHED



F—VIEW OF THE CLAMPS USED



G—VIEW OF STEEL CLAMPS



H—VIEW OF STEEL CLAMPS



I—VIEW OF STEEL CLAMPS

FIG. 21—VIEWS OF FRACTURED CASTING AND ITS REPAIR



same, a distance from the crotch to the end of the 24-in. flange of about 37 in. The opening in the crack through the metal was about  $\frac{1}{8}$  in.

With the tools at hand the cracks were chipped in the two different branches of the Y in a V-shape from the inside of the casting, the width of the channel thus cut being about  $1\frac{1}{2}$  in. across at the top and shaping down to the edges with the width of the crack in the bottom, leaving not more than  $\frac{1}{8}$  in. thickness of metal in the bottom of the crack toward the outside of the casting. The metal was then chipped clean for a distance of 3 in. on each side of the crack for the purpose of reinforcing the weld to this extent. Chipping into the metal of the Y along the crack at the crotch it was found that through the thick part of the crotch, which should have been solid metal for 6 in. through between the two branches, there was only about 1 in. of solid metal in each of the branch plates, there being a pocket

means of the arc between the casting and the ends of the wire, and by skilful manipulation the metal melted from the wire was deposited in the recess chipped out along the crack. After sufficient metal had been deposited in this way to fill up a  $1\frac{1}{2}$ -in. recess, additional metal was deposited over the crack for a distance of approximately 3 in. on each side of the center line of the crack and built up to a height of at least an inch above the interior surface of the casting. In this way the welded crack was reinforced to an extent that made it far stronger than any other section of the casting. This same process was applied on each branch of the Y, making a complete weld of the metal throughout. The finished weld is shown in Fig. 21 (e). The process of welding took five days, and as soon as it was completed, a heavy steel band was shrunk on the 24-in. branch flange for additional strength and a heavy 3-in. by 4-in. two-part steel clamp was placed around the

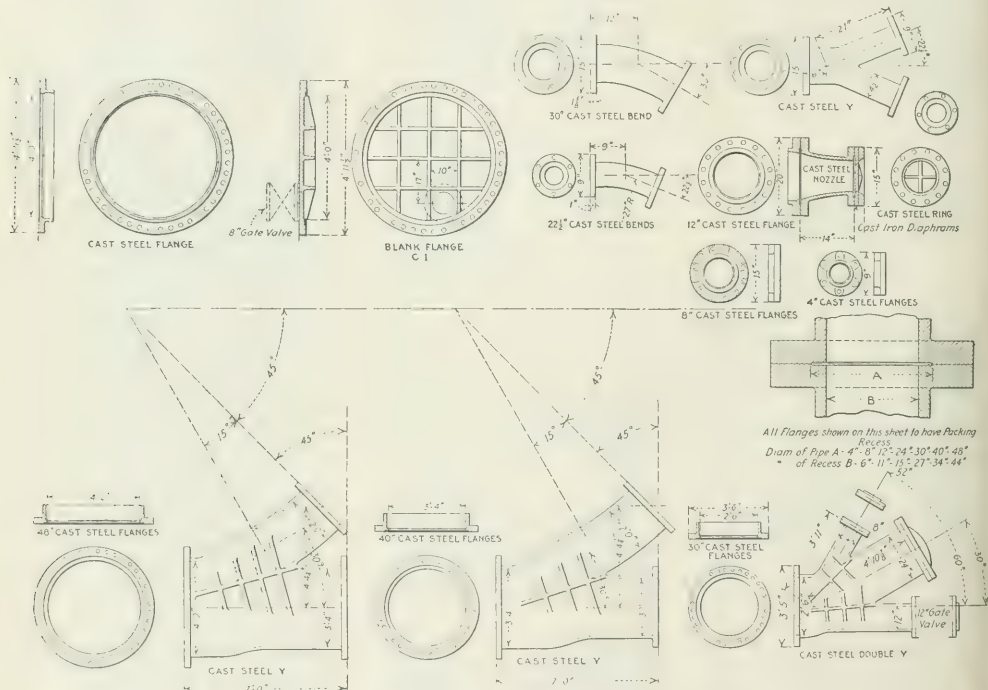


FIG. 22—DETAILS OF CASTING FOR PRESSURE PIPE

of cinders in this heavy part between the two branches and a hole large enough for a hand, showing that the Y was weakened at the point where it should have been strongest and this fact was doubtless responsible for the failure of the Y. Fig. 21 (d) gives a good idea of the nature of the chipping preparatory to welding, the left-hand section being in the 24-in. branch, while the right-hand (not finished) shows the 40-in. branch. The process of welding the break was then begun, a motor-driven exciter being used to supply 150 amp, the voltage across the arc varying from 30 volts to 50 volts. The process of welding was carried out by grounding the negative side of the circuit to the steel casting and connecting the positive lead by means of flexible cable and clamps attached to  $\frac{1}{4}$ -in. fluxed steel wire that was used for making the weld. The electric current passing through this steel wire melted the ends by

40-in. flange. The Y was then placed in the trench and the flanges pulled together, the 40-in. loose flange on the lower section of the pipe being drawn up to the flange on the Y. After getting it in this position the steel flange on the 40-in. pipe was re-riveted and calked so as to make it absolutely tight. After this two additional steel clamps were placed around the 24-in. branch of the pipe and also a heavy beam clamp around the 40-in. section of the Y, as shown in Fig. 21 (f). This beam clamp was only put on for temporary purposes. Two heavy castings were shaped out to fit the circumference of the Y, one on the top and one on the bottom. Eye-bolts were carried across the castings in contact with the 40-in. section of the Y and fastened together with four  $2\frac{1}{4}$ -in. steel bolts, thus offering additional strength to resist external pressure as a factor of safety for the welded section of the Y. Fig. 21 (g, h and i)

gives other general views of these steel clamps. Since this repair two additional heavy steel clamps were ordered, one to take the place of the beam clamp. The new cast-steel clamps offer better surface for contact than the cast-iron pieces now used on the beam clamp, will be safer and more permanent and make a better-looking job. An additional clamp will also be placed around the 48-in. section of the Y for an additional factor of safety at that point, owing to the fact that a small crack has developed. This leak, however, is generally diminishing, and with the clamp in place no danger from this source is anticipated. The repair was completed Nov. 22, 1913, when the water was turned into the pipe and the plant put into operation again.

The manifold is securely anchored in place by embedding the Y-piece in heavy blocks of concrete. Fig. 22 gives the details of the fittings, and attention is directed to the detail of the steel flanges, showing the form of gasket recesses. Round eclipse manhole gaskets are used, varying from  $\frac{3}{8}$ -in. diameter to  $\frac{5}{8}$ -in. diameter, depending upon the size of joint to be made. The recesses are made wide enough to allow for the flattening of the gaskets, and the turned faces of the flanges are bolted up solid, face to face. This joint has been used for years and has given entire satisfaction.

The 12-in. extension of the manifold is used for a relief outlet in case of dangerous over-pressure occurring in the pressure line. This extension is provided with a 12-in. steel gate, and the end of the pipe is fitted with a heavy steel flange, to which is bolted an 8-in. diameter cast-steel nozzle. Between the flange and the nozzle is placed a tested cast-iron blank disk with a circle turned in the face of it, leaving a thickness of metal in the turned groove of  $\frac{1}{4}$  in. This cast disk is designed to blow out with a rise of pressure of 40 per cent above normal and relieve the pipe line. The disk has never blown out in practice, but several of the sample disks were broken experimentally. Preparations are being made at present to replace this disk with an automatic relay relief valve that can be adjusted to any required pressure.

### A Comparison of Rate Theories

A paper on "Rates: A Résumé and Comparison of Rate Theories," read before the Spokane convention of the Northwest Electric Light and Power Association by Mr. Stacy Hamilton, of the Portland (Ore.) Railway, Light & Power Company, contained a discussion of some of the good and bad features of various rate theories and gave many valuable references to court and commission decisions relating to this subject. He said that simplicity of expression is one of the chief requisites of a system of rates. In addition, they should be equitable and should encourage the greatest profitable development of the particular class of business to which they refer. Rates which make the charge for service practically proportional to the value of the service will naturally tend toward the greatest development of the business as consumers are more easily convinced of their fairness. While the cost of service is the most equitable basis on which to establish rates, from the central-station point of view such a basis, while still accepted as the primary basis for rate schedules, must often be considerably modified for the sake of simplicity of expression and from commercial and economic considerations of the value of service and the development of business. Among the forms of rates discussed were the flat rate, straight meter rate, straight demand rate, two-charge demand (Hopkinson) rate, Wright demand rate, consumers' output rate and off-peak rate. Differentials, determination of demand and minimum charges were also discussed.

### FOUR VIEWS ON CO-OPERATION

Representatives of the Contractor, Manufacturer, Jobber and Central Station Show How Various Interests May Reach Co-operative Plane

In the account of the convention of the Jovian Order printed last week notice was taken of the four interesting papers on co-operation written from the respective standpoints of the contractor, the manufacturer, the central station and the jobber. Brief abstracts of these papers follow here.

Mr. J. R. Galloway, Washington, president National Electrical Contractors' Association, analyzed the position of the contractor. The contractor's close relation to the ultimate consumer, said the speaker, and his intimacy with the installation and use of electrical equipment and appliances particularly fit him to suggest new and necessary things to the manufacturer. Too much emphasis cannot be placed upon the importance of the contractor as a factor in the development of the industry. In closing Mr. Galloway exhorted each Jovian to exert his utmost efforts to bettering trade conditions and declared that much individual effort would be required to effect the result desired collectively.

Representing the manufacturing interests, Mr. P. M. Lincoln, Pittsburgh, president of the American Institute of Electrical Engineers, delivered a short address entitled "Co-operation Between Allied Electrical Associations," in which he urged "parallel operation" of societies whose aims are alike. Mr. Lincoln's most significant remark came in the summary of his talk, when he called attention to the similarity of the Jovian slogan, "Altogether all the time for everything electrical," and the slogan of the Society for Electrical Development, Inc., "Do it electrically."

In a talk on practical co-operation, which he said might well be entitled "Current Development," Mr. A. C. Einstein, St. Louis, president of the Union Electric Light & Power Company, declared that only the central station can create a demand for electric service. Hence it should have the hearty support of all other electrical interests. While these sentiments, said he, are selfish in a measure, they point to a way by which the various interests may reach a co-operative plane. Of the local situation Mr. Einstein said: "We do sell lamps and appliances, it is true, not, however, in competition with other electrical interests but to create a demand for things electrical and to help the other branches of the industry." As an instance of the co-operative spirit of the Union Electric Light & Power Company, Mr. Einstein cited the fact that a 27 per cent reduction in electric service rates had been made during the last two years. These reductions augment business, and although the company's revenue suffers temporarily, the reductions have taken electric service out of the luxury class and made it a necessity.

The title of the address of Past-Jupiter W. E. Robertson, Buffalo, was "Elements of Successful Selling," but in the beginning he digressed to agree with the sentiments of Mr. Einstein on the relative importance of the central station. He also commented upon the speech of Mr. Lincoln, saying that while there are now three great parallel movements afoot in the electrical industry, it is his belief that those things which can best be done by the Jovian Order will be done. In like manner other good works will be accomplished by the Commercial Section of the National Electric Light Association and by the Society for Electrical Development. In time, there will come elimination of whatever waste may occur from duplication of effort.

Of the elements of successful selling, the speaker said that sincerity, industry and intelligent use of information gained in business come first.



## Stimulating Electric-Vehicle Progress\*

**Industrial revolution in city transportation methods awaits guidance of central-station executives—Enormous loads available in freight movement. By James H. McGraw**

**W**HAT can be done to invigorate the electric-vehicle business? This is a prevailing question in the minds of all who are concerned, and as a detached and keenly interested observer I have been trying to resolve the question into its elements to discover those that retard and those that accelerate the use of electric vehicles.

Two features of the problem which stand out boldly are the wealth of possibilities for large development and the abundant resources among those engaged in the business. Yet in spite of great possibilities there is evidence of sterility in the comparatively little progress made. I say comparative progress advisedly, because I am not unmindful of the great number of vehicles already in service; but in view of what can be done and will be done this is only a very limited beginning.

### Causes of Slow Growth

If, therefore, we may be permitted to regard the present situation as unsatisfactory, what are the causes? Aside from the generally depressed condition of business throughout the country, my investigations indicate that there are three reasons for the slow growth: First, the novel character of the business, which, while it has brought large installations in the commercial field and successfully launched the passenger car, has been depended upon to carry the business to a point where exhaustion has set in. Second, those responsible for the administrative conduct of the business have done little in a constructive or creative way to open up new lines of endeavor in exploiting their product, and have depended too much upon the routine performance of subordinates. Third, effective collaboration from central-station companies furnishing energy supply (which has been depended upon as an interlocking necessity) has not been received to the extent to which it must be exerted.

All these elements can be corrected and improved without superhuman effort or extraordinary revolutionary undertakings by simply applying to them such reasoning as will develop adequate comparison with progress made in other lines of business, and by adopting principles which have been known to bring results.

### Electric Vehicle Not Yet Commercialized

Taking up the first cause, we have a condition analogous to that which previously existed in nearly every other field of commercial endeavor where the introduction of new methods or of improved equipment became a problem. The same conditions obtained. Whether it was agricultural implements, railway equipment, sewing machines, telephones, safety razors, pianolas, newspapers, electric lighting or any of the myriad other refinements which have combined to improve our economic and social life, the same ebb and flow has been experienced, and in no case has substantial progress been accomplished until the impediments of novelty have been ruthlessly brushed aside by the stern and irresistible necessities of commercial enterprise.

This is the case with the electric vehicle. It has

hardly reached a transitory stage. It is not yet commercialized. We are still fondling it as a luxury, hesitating to put behind it that dynamic energy necessary to force it upon the public, which does not know its value and which is waiting to be convinced that it must have it and use it in great numbers as an economic necessity.

With all the merit which the electric vehicle possesses to warrant its employment in every well-to-do family as a domestic convenience, and in mercantile houses as the cheapest and most expeditious conveyance yet devised, there is no reason to wait for a Ford or an Edison, a Pope or a McCormick to thrust it into universal use by sheer force of genius. This could be accomplished almost immediately if the latent power of those conducting the business were brought into service and united with all the collaborating influence which can be marshaled to their assistance. Unfortunately, the glamour of the gasoline pleasure car still infects the business. The "joy rider" and the speed maniac are still with us. It is essential, therefore, to secure for the electric vehicle of either type a utilitarian consideration. Mercenary incentives must be implanted and the toy-shop tendencies uprooted before the art of buying and selling machines can reach the level and security of normal every-day trade and commerce.

### Executive Guidance Necessary

Considering the second cause, it must be evident to every keen observer that the solution of most of the many difficult problems now left to the salesmen must be made by those justly responsible for administrative functions. The inclination to drift with the tide of things and be satisfied with business that can be readily secured, without any effort to sift out and win by sheer merit the more difficult but more profitable undertakings, must be checked. The excuse that the business is new and that time is necessary to overcome obstacles is no more valid in this line than in others. On the contrary, the reward which awaits industry in this field is infinitely greater than that which falls to the lot of business projectors in other fields. However, these anticipated results will never be secured automatically. They can only be won when the strongest kind of administrative energy is directed against the obstacles involved.

The present semblance of weakness must be entirely changed, and upon the administration must be laid the task of discovering, testing and establishing those methods of organization and management by which all business productive energies may be united, stimulated, guided and rewarded. Then all the possibilities covered by the enormous scope of this industry may be forced to yield that increase in the application of electrical machines which will transport the entire vehicular tonnage of freight now moved within the city limits, as well as supply the latent demand for that immense passenger traffic of a domestic, professional or commercial character which awaits only an enforced recognition of the cheap, convenient facilities of the electric carriage.

\*Read at convention of Electric Vehicle Association of America, Philadelphia, Oct. 19, 1914.

### Central-Station Opportunity

It is as much within the province of companies selling electrical energy to supply it for moving freight and merchandise as for other power applications for illumination or for passenger transportation. Yet the project has never been taken up seriously enough by them to realize the significance of its value as compared with that of the load now sought in their routine channels. Perhaps this is because their efforts are so intensive in their beaten paths of business that they are too much engrossed to see the possibilities in new directions. The fact remains, however, that a great opportunity is passing by, practically unseen except for a limited attention which is insignificant in comparison with what the prospect demands. If anything like the same amount of energy as is now directed to secure and maintain the lighting load or the industrial load were made effective to secure transportation load, this latter might become the dominant direction in which electrical energy would be supplied.

### Enormous Load Available

Some conception of this city vehicle load may be gained by reference to the volume of our transported materials in other directions. The annual tonnage originating on railroads for the past eight years has averaged 800,000,000. An equal amount was transferred to connecting railroads, thereby making the total annual rail tonnage more than 1,500,000,000. It would be fair to assume that at least one-third of this finally reached our principal cities and was carted there at least twice over a distance of only one mile. We have a minimum of 1,000,000,000 ton-miles per annum. If the public service electric companies secured this business as completely as they have secured city rail passenger transportation and illumination—and it is practically within their reach—their profit would be enormous, because there would be no such permanent investment or expense as is required in the present fields of their activity.

It is generally conceded that the freight tonnage reaching cities is handled many times over, but, assuming as above that it is simply handled once from the railway to business premises and afterward to the consumer, 1,000,000,000 ton-miles at an average energy consumption of 5 kw-hr. per ton-mile would at the 4-cent rate reach a total figure of \$200,000,000 per annum. This equals very nearly the total gross income of all central stations now engaged in business in the United States, and if this tonnage were handled for one additional mile the revenue would practically equal the total gross income of all electric-railway organizations in the country. Here is a field for leadership to awaken the dormant energy within the ranks of the workers in this industry and to marshal the many powerful potential agencies which are willing to serve and which await only executive command and guidance to engage in a fresh and brilliant campaign of energetic business.

### Heartier Central-Station Support Necessary

Now to consider the third cause. It may well be acknowledged that the attitude of the majority of central-station organizations is favorable toward the advancement of electric-vehicle projects, and that at least a half dozen of the larger ones are conducting organized departments for the advancement of vehicle use. Furthermore, all of them have liberally contributed to the funds of the general advertising campaign which has done such effective educational work in the past few years. However, it is equally plain that the central-station effort is not at all in keeping with the enormous vehicle load which stands practically at its doors.

With constructive motives in mind, let us look a lit-

tle deeper into the situation. It has taken a long time and much persuasion to develop the friendly disposition that exists, because central-station men in the past have looked at the proposition from the wrong end of the telescope, believing that the matter was not of particular interest to them and that they were being invited to pull chestnuts out of the fire for the manufacturer. Most of them did not look with favor upon the electric vehicle anyway. Some thought the designs were defective, and that their intimate knowledge of electrical engineering qualified them to do the job better than the fellow who had his money at stake on his product. A few central stations at first consented to patronize the art by buying and using one or more machines, usually specifying such off-standard equipment as to distort the design and eliminate the profit, all with a strangely adverse disposition very hard to account for.

Fortunately most of this feeling has disappeared. Great numbers of machines have been purchased for all kinds of service. They are now advertised and advocated, at least in the principal cities, because it has become the policy of the management in each case to foster their employment. Down the line, however, among the departments, they are not yet so favorably accepted. Gas cars are preferred for their dash and speed and the great advantage, if ever required, of ability to go 80 miles or 100 miles away from the base. Few of the operatives are willing to make compromises for the general good of the cause.

### Business Features Overlooked

What the situation really needs is a much more serious recognition of the business features of the entire project. It should be taken in hand with purely selfish motives, and not because of a desire to render charitable assistance to the manufacturers, or because of good fellowship in yielding to the persuasion of associations pleading the cause. "There's millions in it" should be not only a working slogan but the underlying conviction of those who own or control central stations.

The lack of administrative attention in the central-station field is practically similar to that described in the vehicle-manufacturing field. Not many have an adequate conception of the magnitude of the project or the feasible means of its accomplishment.

It seems astounding that with the administrative talent which has been concentrated upon all the large communities in this country to sell electricity for illumination, for industrial purposes and for city rail passenger transportation, the plain and practical project of transporting the immense freight tonnage in cities by means of vehicles using central-station energy should be neglected and almost ignored.

It may be difficult to answer the question as to what can be done to quicken that administrative genius so as to secure the immediate concentration and guidance of those scientific methods of business which have been brought to bear so successfully upon the commercialization of other kindred electrical utilities, but the answer will be forthcoming.

I have indicated in what direction the salvation of the industry lies. We need to show the central stations of the country the great market offered by electric vehicles when they come into their own, and to induce them to preach their use in season and out of season as they do the use of lamps, motors and heating devices. Freight loads are larger than passenger loads and possess greater diversity. If, therefore, it is profitable to transport human beings electrically, how much more so would it be to transport freight; and if central stations are eager for railway loads, they should be even more keen to secure electric-vehicle loads. I think they need only to be shown.



# Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods and Current Practice Among Successful Utilities

## Water Heaters in Canada Supply an All-Night Load

The Hydro-Electric Power Commission, Toronto, Canada, reports that one of the most useful electrical appliances in operation among its rural customers is an off-peak hot-water heater. In most cases a 600-watt heating unit is used with a 200-gal. tank, the farmer placing the heater in operation at night when he retires and turning it off when he arises in the morning. In this way a liberal supply of hot water is available early in the morning for mixing hot feed or for cleansing milking-machine parts and other dairy equipment.

is made to advertise any particular make of apparatus, and the engravings accentuate convenience, saving of time and labor as well as decorative and ornamental features of the appliances shown. The last page lists thirty-nine electrical-gift suggestions. Mr. N. H. Boynton, Box 387, Cleveland, Ohio, is the sales manager of the publications committee of the Commercial Section of the National Electric Light Association, under whose auspices the publication is issued.

## Suggestions for Electrical Gifts

One of the most attractive booklets which the Commercial Section of the National Electric Light Association has ever offered to central stations is entitled "Gifts That Please." The booklet, which has just made its appearance and contains sixteen pages, deals in an attractive manner with the various electrical appliances

## Appliances for Increasing Central-Station Revenue

At the recent Northwest Electric Light and Power Association convention held in Spokane, Wash., Mr. H. B. Peirce pointed out in a paper on "Electrical Appliances" that the reduction in central-station revenue brought about by the introduction of high-efficiency lamps and a reduction in rates may be offset by connecting a large appliance load to the system. Consumers should not only be sold devices which will be required the largest number of hours per day, but these appliances should be maintained in operating condition to keep the customer satisfied and to insure the maximum load on the system at all times. The advantages of various heating and motive appliances were discussed and their relative values as revenue producers brought out. As flexible cords are the most vulnerable part of most appliances, their owners should be supplied with duplicate cords, or else should be instructed to bring defective cords to the office, where they will be exchanged for good conductors.

Electric irons, in the author's estimation, are at present the best revenue-producing appliances which can be attached to lamp sockets. Among other heating devices used extensively are the electric toaster, percolator, heating pad, table grill and hot-plates. Ranges which will operate economically are now on the market with the heating units inclosed in thin armor which will not retain much heat but will prevent rapid oxidation of the resistance wire. The domestic water supply of a small family can be heated in a 30-gal. tank containing a 600-watt heater connected permanently to the house circuit. In this paper was also a description of the construction and operation of a special water heater developed by the Washington Water Power Company. For heating houses by electricity the author recommended a hot-water system with a continuous heater installed around the baseboards of each room. Although the revenue from motor appliances is not great, they are a desirable load when installed in the same house with heating appliances, as a customer questioning a bill mentally appears to credit a motor-driven device with more work than a heating appliance. The author advised that electric fans should never be rented or sold on trial but sold outright, recommending that electric-service companies keep the stock and allow contractors to draw on it at jobbing prices. Other appliances whose advantages and uses were discussed were suction and vacuum cleaners, sewing machines, vibrators, utility motors and clothes-washing and dish-washing machines.



DESIGN OF COVER AND ENVELOPE

suitable for Christmas presents. It is prepared in two colors with engravings that should appeal particularly to the housewife, and it brings out the modern idea of giving gifts which have a utilitarian as well as an artistic value. The Commercial Section purposes to issue many thousands of these booklets, which will be offered at prices within the reach of every central station. Envelopes of special design are also obtainable. The size of the booklets is such as to make it possible to inclose them with the monthly statements of central stations or to distribute them over the counter to those who come into the office to pay bills, or from the various electrical stores throughout the town. The accompanying illustration shows the cover design of the booklet as well as of the envelope to inclose it. No attempt

## Flat-Rate Easy-Payment Plan for Wiring Houses

The Edison Electric Illuminating Company of Brooklyn, N. Y., has offered residents of that city an opportunity of having their houses wired for electric service at a flat rate per room and of paying for the work in monthly instalments. The plan has been made flexible

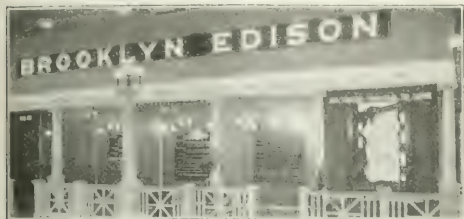


FIG. 1—SOME OF THE ROOM-WIRING PROPOSITIONS

to meet the requirements of rich, poor, large and small consumers who may be on the distribution circuits of the electric-service company. One advantage of the proposition is that a contractor's estimate does not have

### FLAT-RATE WIRING PRICES AND DEDUCTIONS

KITCHEN	
No. 1—Outlet consisting of a baseboard or wall flush receptacle, installed in kitchen on first floor, and one ceiling outlet with one-lamp fixture and pull-chain socket.	\$19.45
CELLAR	
No. 2—Ceiling receptacle in cellar at heating apparatus with flush switch at head of cellar stairs.	7.75
HALL	
No. 3—Ceiling outlet in hall with one-lamp chain fixture and pull-chain socket (if wall bracket fixture is desired instead deduct 85 cents)	8.10
DINING-ROOM	
No. 4—Dining-room outlet with three-lamp shower fixture, pull-chain sockets (if amber glass dome is desired instead add \$1.50)	11.75
PIAZZA	
No. 5—Outlet on piazza with ceiling fixture and globe with switch in hall.	10.00
BEDROOM	
No. 6—Bedroom outlet with two-lamp shower fixture, pull-chain sockets	8.00
PARLOR	
No. 7—Parlor outlet with four-lamp shower fixture, pull-chain sockets	10.50
CHINA CLOSET	
No. 8—China-closet outlet and bracket fixture with pull-chain socket	6.20
BACK PORCH	
No. 9—Back-porch outlet and bracket fixture with switch.	10.35
PANTRY	
No. 10—Pantry outlet and one-lamp bracket fixture with pull-chain socket	6.20
BATHROOM	
No. 11—Bathroom outlet and one-lamp nickel-plated fixture, pull-chain socket	6.20
ALL OTHER OUTLETS	
No. 12—All other lighting outlets with one-lamp bracket fixture, pull-chain socket.	6.20
No. 13—Two three-way switches for controlling hall lamp from upper or lower floor.	9.90
No. 14—Floor, baseboard, wall, or ceiling receptacles.	4.95
No. 15—Bell-ringing transformers for alternating current only	4.95
No. 16—Flush wall switches.	3.85
INSTALLING RISERS	
No. 17—For each additional floor above first floor add.	5.50
DEDUCTIONS FOR FIXTURES IF PERSONAL SELECTION IS DESIRED	
No. 1.	\$1.30
No. 2.	2.10
No. 3.	2.10
No. 4.	4.65
No. 5.	.70
No. 6.	\$3.05
No. 7.	5.50
Nos. 8, 9, 10, 11, 12, each.	1.25

to be made on each installation; therefore the central-station new-business solicitors can quote prices directly to prospective consumers. The prices range from \$19.45 for wiring a kitchen alone to \$64 for a kitchen, dining-

room, living-room, hall, bedroom and bathroom. To have a house wired on this plan the kitchen must always be included. This room was selected as the basis on which to set the prices, as it was assumed that electricity would be used more there than in any other part of the house. After one room is wired the rest can be connected considerably cheaper, so that a small charge for each additional room serves as an inducement for the prospective consumer to equip the entire house.

Very attractive spun-brass chain-pendent fixtures are furnished in the rooms where this type is suitable. If anyone desires fixtures more or less elaborate than those furnished, deductions are allowed for the latter and the consumer may select and purchase any kind he wishes. If the rooms which are wired are not all on one floor, an additional charge of \$5.50 is made for each riser which has to be installed. Armored cable is employed exclusively for these installations, and the conductors are entirely concealed. Walls, ceilings and floors do not have to be ripped open, as the wires are fished between outlets; therefore the occupants of a house are not inconvenienced by dirt and a torn-up house.

In the accompanying tables are the prices quoted with this proposition. From the data any person is able to figure out what it will cost to equip his home for electric service. For wiring any combination of rooms the company requires a payment down of not less than 8 per cent of the total cost. The minimum monthly instalment allowed is \$2 and the maximum time permitted to complete payments is twenty months. If the balance after the first payment is made falls between \$24 and \$36, the instalments must be made in twelve monthly payments; if between \$36 and \$60, fifteen months is allowed; between \$60 and \$90, eighteen months, and for \$90 and over, twenty months.

In selecting the flat rates which are being offered the company consulted several reliable contractors to find



FIG. 2—SIMPLIFIED METHOD OF WIRING

out what they would charge per room for wiring. An average was taken of the bids submitted and each was asked if he was willing to do the work at that price. Before the proposition was made public about twenty had agreed on the standard prices shown herewith. Practically all of the contractors in Brooklyn have now accepted the terms and are co-operating with the electric-service company to secure new business. The lat-



ter has published a booklet containing the names and addresses of contractors and fixture dealers in Brooklyn. The lists are furnished to anyone contemplating the installation of electric wiring and equipment. When a contract is closed for wiring a house on the easy-payment plan the contractor is selected by the manager of the district in which the order was taken. In this way the company tries to apportion the business fairly.

Contractors in working up their own business have frequently come across persons who are unable to pay cash down. In such cases they refer the person to the easy-payment plan. Under this proposition the contractor furnishes the material for wiring and installs the equipment, while the electric-service company supplies the fixtures. The interest taken by contractors in the flat-rate plan of wiring houses was shown by their promoting the proposition at the electrical exposition held recently in New York City.

### Collections from Small Customers at Muncie, Ind.

At Muncie, Ind., there are many customers on the lines of the central station who, using electricity on a controlled flat rate, pay the electric company \$1 each month. Speaking before the recent convention of the Indiana Electric Light Association, Mr. Thomas F. English, manager of the Muncie Electric Light Company, said that collections from this class of customers were considered very good, less than 2 per cent of them ever becoming delinquent.

To insure prompt payment of the electric-light bills a 25-cent penalty is imposed for failure to pay within the specified time. The company's customers call at the office to pay the bills at present, but Mr. English says that he believes the European coupon billing and collection system, or a variation of it, could be used.

### Traveling Meter Reader's Report Form

The Washington Water Power Company, Spokane, Wash., which supplies electricity to a number of rural communities, employs traveling agents to read meters, make collections and secure new business. Notations of

FIG. 81

No. 9054

Water No.		To THE WASHINGTON WATER POWER COMPANY, INC.	
Contract		SPOKANE, WASH.	
Change Meter			
Transfer Acct. to			
Date	Present Reading	Previous Reading	E. W. No.
	4 6 8 2 0 5 4	6 0 8 5 4	
Title			
Rate			
Balance as per bill rendered		Current Bill	
		TOTAL	

TRAVELING SALESMAN'S TRIPPLICATE FORM OF BILLING

instrument readings and any transactions made with a consumer are filled in on a form similar to the one reproduced herewith. The report is then sent to the district superintendent's office, where all accounting and billing is done. This office in turn informs the commercial agent of the parent company concerning monthly sales, earnings, collections, etc.

### Advertising Exclusive Electric-Vehicle Garaging in Chicago

In Chicago there are many garages where electric-vehicle charging equipment is installed and in which both electric and gasoline automobiles are cared for. There are some garages in which the business of electric-vehicles alone is solicited. One of these, the Fashion Garage, in the vicinity of exclusive residential districts



EXTERIOR OF ELECTRIC-VEHICLE GARAGE

on the South Side of the city, recently placed a large painted banner over its door advertising the fact that "the entire building is now being used exclusively for electric-vehicle garaging." Exploiting this exclusive electric feature proved a good stroke of business, as nearly everyone in this age is wont to believe in the remarkable good to be gained by specialization.

### Development of Electric Service Business in Rural Districts

The method of canvassing rural territories for business preparatory to extending a transmission line and the subsequent manner of developing this business so that the installation expense may be justified were described in a paper entitled "Extensions of Electric Service Into Small Country Communities and Rural Districts," by Mr. M. C. Osborn, of the Washington Water Power Company, at the Spokane meeting of the Northwest Electric Light and Power Association. Preliminary canvasses of the towns are made to ascertain whether business is available, then fifty-year franchises and ten-year contracts for lighting the streets are secured. The next step taken is to close contracts for electric service and to wire the buildings where electricity is desired. As the construction work nears completion salesmen are sent out to sell fixtures and appliances and leave some devices on trial. When the lines are energized the new service is advertised and many new consumers are obtained in this way. In twelve towns served in this way which have a combined population of 4158 people 877 were connected at a capital cost of \$256.30 apiece. The revenue for the first year amounted to \$54 per consumer, or \$11.40 per capita. The total profit derived in the same period from appliance sales and wiring contracts amounted to \$2,464, or about \$2.80 per consumer.

The method of supervising and operating this portion of the company's system was also described in the paper. Tables were included showing the profit on wiring in different localities and the relation between gross monthly and yearly revenues and between estimated yearly income and the actual revenue obtained.

## Illumination and Wiring

### Safeguards on Decorative Lighting, Indianapolis

The parapet protecting the edge of the roof garden on the Hotel Severin at Indianapolis, Ind., supports ornamental lighting units which outline the top of the structure at night and help to illuminate the tables



PROTECTOR FOR DIFFUSING GLOBE

used by the garden's visitors. Standing at the extreme edge of this thirteen-story building, the large diffusing globes which surmount these standards would present a hazard to the pedestrians beneath if the glass were not properly safeguarded. The needed protection is afforded, as is shown in the picture herewith, by inclosing the globes in a strong wire network which is attached to the iron standards.

### Features of Detroit's Proposed Electrical Ordinance

There is now before the City Council of Detroit, Mich., an ordinance to regulate electric wiring construction and the use of electricity. Among its provisions is the stipulation that armored cable shall not be used where conductors are subject to moisture or under floors where they are liable to mechanical injury. In commenting on the ordinance Mr. Frank R. Mistersky, city electrician and superintendent of public lighting, says:

"While it is true that the National Electrical Code requires that a lead sheath be placed between the outer braid and the steel armor of cables to be used in damp places, these rules make the ultimate result depend upon the good judgment of the contractor, who is not always a competent engineer. When in an inspector's judgment it is necessary to replace such work there is a direct loss. It is to prevent such loss and the accompanying delay and annoyance that limitations have been placed on armored cable.

"Some cities require wiring in metal conduit only within the so-called fire limit or in buildings of certain class or size. The Public Lighting Commission of Detroit, however, believes that there should be no distinction unless the cost is prohibitive for the smaller installations. It is believed that the greater safety secured is well worth the additional cost."

Perhaps the most unusual provision in the ordinance is that allowing only a single service connection to a building. Detroit is especially fortunate in having alleys in the rear of practically all property within the city limits. This scheme of thoroughfares enables underground cables in the streets to be connected to overhead distribution lines in the alleys, making an

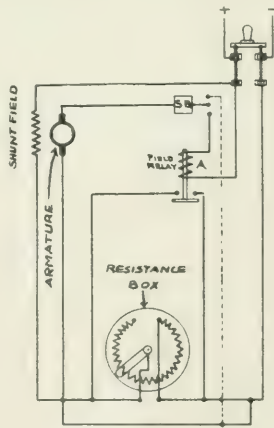
ideal system without excessive investment. The ordinance, in allowing but one service connection to a building, will, it is hoped, avoid the unsightly wire tangles which have existed in many back yards.

The ordinance also provides for basing the schedule of fees for inspection on the number of circuits in a building instead of basing it on the number of lamps. Separate permits for fixture and wiring work are issued by the city's electrical department, and in the past some contractors have escaped a part of the inspection fee by understating the number of lamps to be installed. The fixture man paid the full fee, for the inspector could, with the job completed, see how many lamps were to be used. Basing the fees on the number of circuits will relieve this difficulty.

### Short-Circuiting a Field Resistance When Starting Shunt Motor

To prevent a shunt motor drawing excessive current during acceleration it has generally been necessary to cut out the field resistance by hand before starting and after the motor has accelerated gradually to insert resistance until the desired speed is obtained. This procedure is unnecessary if a relay coil is connected in series with the armature, as shown in the diagram, so that an excessive current flow will cause the contactor to short-circuit the field resistance. Thus, at starting, if the field resistance is set for high speed, the armature will momentarily draw an excessive current, closing the contactor and cutting out the resistance. As the motor speed picks up, the relay will drop, allowing the current to build up because of the weakened field. The contactor will close again, going through the same cycle of operations and vibrating until the desired speed is reached.

A relay so connected will also cut down the effect of overloads by allowing the speed to drop, thereby preventing the opening of the main circuit-breaker. Moreover, it will compensate for a sudden change in the field resistance made by an inexperienced operator. If dy-



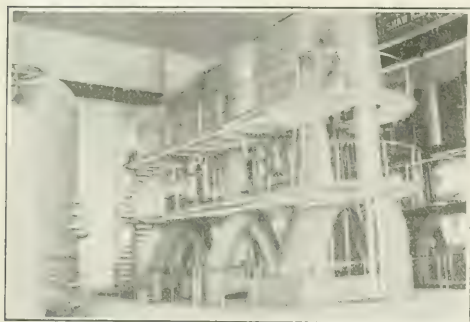
CONNECTIONS OF RELAY

namic braking is employed on motors equipped with a relay connected as described, it will close when the braking current is flowing, raising the field excitation and thus causing the motor to come to rest more quickly. This use of a relay was suggested by Mr. Stewart C. Coey at the Iron and Steel Electrical Engineers' convention held recently at Cleveland, Ohio.



## Lighting a 12,000,000-Gal. Pumping Engine

A gigantic steam pump supplying water to the mains of the municipal water system at Grand Rapids, Mich., is lighted by means of three circuits of lamps, each of which completely encircles the platform decks. Suspended from a single line of conduit attached to the



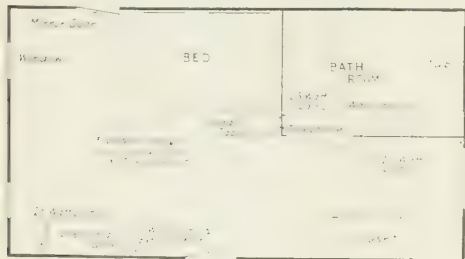
PUMPING ENGINE AT GRAND RAPIDS

white under-surface of the platforms, the forty-five 5-cp lamps light all parts of the machinery so that workmen may enjoy increased safety.

Each of the three circuits is controlled separately from a steel-wall cabinet near the engine. At present Mr. Charles W. Merritt, engineer of the plant, is in doubt as to whether or not he dares operate this lighting, for the city's electrical inspector has declared that forty-five outlets per circuit is too many, according to the Grand Rapids ordinance, even though each socket carries but a 5-cp lamp. This consideration, Mr. Merritt says, will be taken into account in placing lighting circuits on a new duplicate pump just installed. Each pump is capable of delivering 12,000,000 gal. of water in twenty-four hours.

## Electrical Conveniences in a Hotel Room

Attention or inattention to detail makes or leaves unmade that attribute of a hotel which the traveler designates as good service. This attention to detail may be carried out in the physical equipment of the rooms by the installation of electrical conveniences to make



BEDROOM WIRING LAYOUT, SEVERIN HOTEL

them pleasant, comfortable and commodious. As an example of what can be accomplished along this line a sketch of a typical room at the Severin Hotel, Indianapolis, is presented herewith, the position of lamps and electric outlets being included in the drawing.

The general lighting for the room is supplied from a central ceiling outlet controlled from a push-button

switch near the entrance to the room so that a guest does not need to grope in the dark or search his pockets for a match to find the lighting fixture. There are three 25-watt lamps in this central chandelier. Other fixtures, of which there are five in all, are controlled by pull-chain sockets at the bases of the individual lamps. The lamps are so placed that although the installation is economical, yet there is ample illumination at both sides of the mirrors in the bathroom and on the dressing table. One of the fixtures beside the dressing table is provided with a double socket so that a heating appliance may be used without removing any of the lamps from its place. Beside the bed there is a wall receptacle to which is attached a portable reading lamp, and the telephone is kept on the same table with this handy unit. The connected lighting load of a typical room is 180 watts.

## Letter to the Editors

### Payment and Responsibility of Directors

*To the Editors of the Electrical World:*

SIRS:—A letter printed in your issue of Aug. 29, "Payment and Responsibility of Directors," closed with the following sentence: "Their duties as trustees are of a peculiarly responsible and complicated nature, and their compensation should certainly be much more than 12 cents for each \$10,000 of income before they can reasonably be expected to give more time and thought," reference being made specifically to directors of electrical properties.

The opinion expressed in this quotation will not be welcomed by the average stockholder, who finds his dividends threatened on every hand; nor is the necessity apparent for a salaried directorate. There is a better solution for the situation, which is becoming acute.

In theory directors are such by reason of a large personal interest as stockholders. They occupy the position as of right for the protection and conservation of that interest, and as of duty for the protection and conservation of the interests of smaller stockholders. Neither consideration entitles them to pay.

Morally stockholders are responsible for the affairs of the company in proportion to their interest, to their information and to their ability to do things.

Of late years the above qualification for directors has oftentimes been neglected; some interest commands votes enough to elect directors subservient to its dictation, which may or may not be for the highest interest of other security holders. A further extension of this policy is the "dummy" director.

The corrective is not for the stockholders to put directors on salary, but to put them on honor. First aid for the situation is a return to first principles. Elect as directors men of large holdings who have a due sense of trusteeship and will exercise independent judgment.

To adjust the situation fully directors should provide themselves with more definite and conclusive information as to the affairs of the company, with positive concise data as to condition and tendencies. This would conserve their time and afford a proper basis for correct decisions on questions relating either to policy or equipment.

In an editorial in the issue of July 18 you state regarding the responsibility of directors to safeguard properties: "To do it they will have to give time and thought far beyond their past ideas." With informative data in their hands, as here suggested, this would hardly seem necessary for directors who have a just sense of trusteeship.

Brookline, Mass.

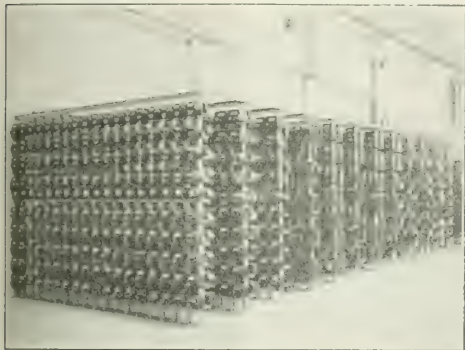
WALTER STUART KELLEY.

# Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

## Storage Racks for Electric Meters

The accompanying illustration shows the storage racks for electric meters which have recently been installed in the Monument Street meter-testing laboratory of the Consolidated Gas, Electric Light & Power Company of Baltimore, Md. The racks are made of



ELECTRIC METERS IN STORAGE RACKS

angle iron and are skeleton in form, permitting the meters to be hung in the same position as they are when installed. In addition, the company number and data are in plain sight, making it possible to locate a meter without moving the others to get at it. The arrangement offers a great improvement over that which formerly obtained. Heretofore the meters were stored in bins and piled on top of each other two and three layers deep. As many as thirty-two small meters were often stored in one bin, and a hunt for a particular meter often necessitated removing and replacing almost all the others. The convenience of the new arrangement was clearly shown recently when the semi-annual inventory of meters was taken.

## Characteristics of Mechanical Stokers

Mechanical stokers are practically limited to the firing of bituminous coal, as anthracite fuel can be handled successfully only with mechanical shovelers which require almost as much attention as hand firing. As pointed out in a paper presented recently before the American Electric Railway Engineering Association, the principal requirements of a stoker are to coke the green coal, mix air with the volatile matter where it can be ignited, burn the fixed carbon, dispose of the ash and clinker, and prevent sifting and clinker adherence to the brickwork and stoker parts.

### Overfeed Stokers

In all overfeed stokers the coal is fed in at the top and allowed to coke as it is gradually forced downward by gravity and rocking of the bars. As the green coal packs

closely, air must be supplied through the lower part of the grate or through openings in the arch. The length of flame for a semi-bituminous coal containing 17 to 25 per cent volatile matter is over 30 ft. with these stokers. The distance from the grates to the tubes varies from 5 ft. to 9 ft. Accumulation of clinker must be prevented by slicing and periodic dumping. Too frequent dumping will prevent the complete combustion of carbon in the clinker, while the other extreme will cause the clinker to become large and hard to dislodge. Five to 8 per cent of the fuel will sift through overfeed grates,

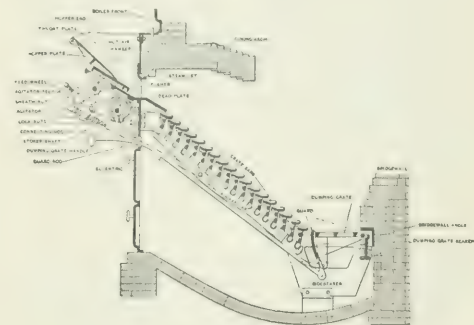


FIG. 1—FRONT-FEED STEP-GRATE STOKER

depending on the amount of air space and the condition of the grates. At the present time it is considered good practice to provide a stoker which is capable of operating the boiler at 200 per cent of its rating continuously.

### Chain-Grate Stokers

On chain grates coking occurs at the entrance to the stokers, but as the coking arch is much longer than for slope grates, the air and volatile matter are mixed more

### AVERAGE DATA FOR STOKERS

Type of Stoker	Stoker Slope Overfeed	% Over- feed	Chain Overfeed	Gravity Under- feed	Horizontal Retort Underfeed
Average price per rated loadship	\$3.60	\$3.60	\$3.50 to \$6.35	\$5.65	\$4.44
Normal furnace ability in percent of rating	190	175	260	300-350	300
Price per maximum hp. developable	\$1.90	\$2.06	\$2.52	\$1.88 to \$1.62	\$1.48
Maintenance per ton coal fired, in cents	10 to 12	11 to 14	6 to 10	2.5 to 4	4 to 6
Attendance in manhours per active hour	0.45	0.45 to 0.50	0.20 to 0.30	0.08 to 0.10	0.30 to 0.40
Lbs. coal per sq. ft. grate surface maximum	55 to 58	35 to 42	45 to 48	60 to 75	50 to 65

effectively and less loss due to incomplete combustion results. Clinker troubles are reduced as the grates are entirely cleared of ash and clinker and cooled by re-



turning on the under side once every revolution. Chain grates weigh more per boiler-horse-power than other types, sometimes over twice as much as slope or underfeed grates. Having larger grates than other overfeed grates, however, chain grates can be forced much higher.

#### Underfeed Stokers

Underfeed stokers have the following principal advantages: The tuyeres are covered with green or only partly coked coal so the grates are not liable to be burned; practically the entire furnace area is utilized to distil volatile matter; all of the air supplied to the furnace is immediately and intimately mixed with the vola-

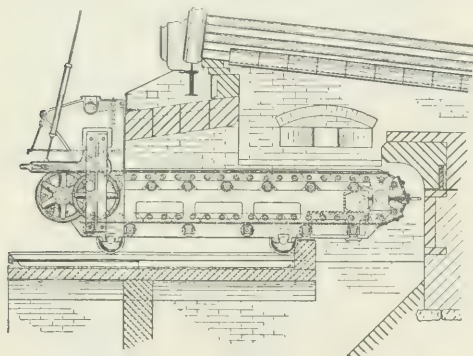


FIG. 2—CHAIN-GRATE STOKER

tile matter while it is still in the coal bed; the combustible gases pass through the hottest zone of the fire before reaching the furnace, and no arches are required. These stokers necessarily operate with forced draft as the air openings are restricted and the fuel bed is deep. As no arches are required, considerable expense is eliminated in repairing brickwork.

#### Stokers Compared

From the accompanying table showing the relative characteristics of mechanical stokers it can be seen that of the overfeed types the chain-grate stoker can be forced the most, costs the least to maintain and requires the least attention. This grate is also superior for burning highly volatile fuel containing considerable ash. For other kinds of coal the gravity-underfeed type is best, and it will probably be used eventually for all classes of fuel. It can be forced to operate at 300 to 350 per cent of its rating, costs only \$1.62 to \$1.88 per

boiler efficiency alone and do not allow for steam consumed by auxiliaries such as blowers, stokers, and boiler-feed pumps. In general the best efficiency is shown when the boiler is operated at less than 100 per cent rating. Curves A and B indicate an ex-

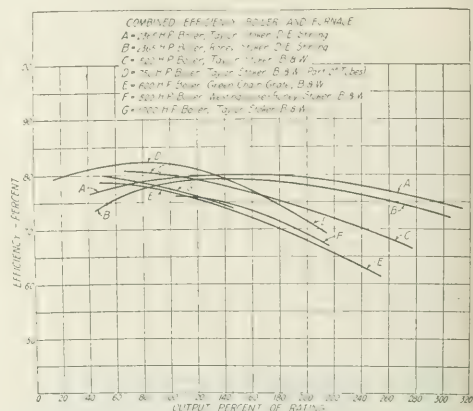


FIG. 4—EFFICIENCY CURVES FOR VARIOUS STOKERS

ception to this statement. As the net output of steam for a given coal input is affected relatively more at low loads than at high loads by the steam consumed by the auxiliaries, it is advisable to operate the boilers at about 25 per cent higher than their most efficient rating as shown by the curves to obtain the best plant efficiency. The principal factor influencing the load to be carried by a boiler is the relation between fixed and operating costs. Forcing a boiler, however, will tend to deteriorate the furnace walls faster.

#### Increasing Plant Efficiency with Low-Pressure Turbines

In our plant the generators and auxiliaries are at present driven by non-condensing reciprocating engines. Could we increase the economy very much by replacing the auxiliary drive with motors and by installing low-pressure turbine-generators utilizing the exhaust steam from the high-pressure units?

G. G. H.

Such a change is not always justified, as it involves the maximum investment with little gain in plant efficiency. A much better plan would be to use the apparatus now installed and utilize all of the exhaust steam to heat the boiler-feed water and operate a low-pressure turbine-generator for supplying energy to station lamps and motors and for assisting on peak loads. With the arrangement as suggested in your question, energy for operating the auxiliary motors would have to be supplied through the generator leads, transformers and feeder cables, thereby losing energy in each and cutting down their net load-carrying ability. If the existing equipment is used, the auxiliary engines will not have to be discarded, additional feeder and switching equipment will not have to be installed, and the only expense will be for the low-pressure turbine. Where the supply of exhaust steam is intermittent it may be advisable to install a regenerator, but it should not be required to carry peak loads for more than a few minutes, as interest charges on the investment may overbalance the cost of supplying live steam to the low-pressure turbine. Moreover, the probabilities are that, owing to the change in load, the boilers would be blowing off and thereby wasting steam which might be utilized as suggested.

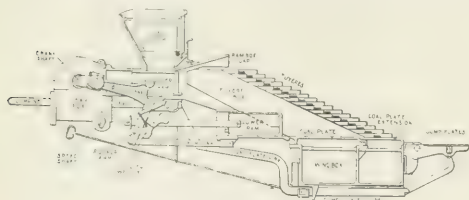


FIG. 3—UNDERFEED STOKER

maximum boiler hp which it will develop, requires only 0.08 to 0.10 man-hour attendance per hour of operation, will burn 60 lb. to 75 lb. of coal per square foot of grate surface per hour, and can be maintained for 2.5 to 4 cents per ton of coal fired.

The efficiencies of modern stoker installations are shown by the accompanying curves. These indicate

# Digest of Current Electrical Literature

## Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

### Generators, Motors and Transformers

**Transformers.**—E. A. H. DINHAM-PEREN.—A paper read before the South African Institute of Engineers in which the author deals with the more important points in the selection, installation and operation of transformers used for supplying three-phase energy from a three-phase system.—*London Electrician*, Oct. 2, 1914.

**Large Induction Motors.**—G. MOORES.—The first part of an illustrated article on some features of the mechanical design of large induction motors. In the present instalment the author deals with the general arrangement and ventilation.—*London Elec. Review*, Oct. 2, 1914.

**Permitted Temperature Rise.**—H. M. HOBART.—The author gives a convenient table showing, for various kinds of machines, the limits for the "observable" temperature rise prescribed in the standardization rules of the American Institute of Electrical Engineers.—*Gen. Elec. Rev.*, October, 1914.

**Mercury Vapor Converter.**—J. EPSTEIN.—An illustrated translation in abstract of his recent German article on working tests of a single-phase mercury converter.—*London Electrician*, Oct. 2, 1914.

### Lamps and Lighting

**Manufacture of Incandescent Lamps.**—The manufacture of the half-watt lamp at the works of the British Thomson-Houston Company is described in the *London Electrical Engineering* of Sept. 17. The methods of manufacture at the Osram lamp works and at the Edison works are described in the *London Electrical Engineering*, Sept. 24, 1914.

**Line Voltage and Lamp Voltage.**—M. D. COOPER.—An article on the economic significance of the relation between line voltage and lamp voltage. The author finds that the rated voltage of incandescent lamps is on many occasions not the most economical value of electric pressure to apply. After a detailed discussion of the many factors influencing the quality and cost of electric energy, the author describes several cases in which all persons concerned were benefited by lamp operation at a slight over-voltage, or at least not below rated voltage. To substantiate the argument presented in favor of an over-voltage operation, the author concludes with facts taken from electric census reports, which show that the tendency of practice has been in this direction for a number of years.—*Gen. Elec. Rev.*, October, 1914.

### Generation, Transmission and Distribution

**Calculation of Voltage Regulation on Long Three-Phase Transmission Lines.**—B. SOSCHINSKI.—The author discusses the method of maintaining the voltage at the end of a transmission line constant by adjusting the power-factor by means of synchronous motors at the end of the line. The author gives the formulas for the calculation of the voltage drop and the wattless volt-amperes. By means of examples it is shown that the extra expense is warranted and that certain essential advantages are obtained in operation.—*Elek. Zeit.*, Sept. 10, 1914.

**Rating of Motors.**—H. M. HOBART.—A summary of the reasons why various electrical associations have

agreed to specify that all electric motors should be rated in kilowatts instead of horse-power.—*Gen. Elec. Rev.*, October, 1914.

### Traction

**Crank Drive in Electric Locomotives.**—J. BUCHLI.—An illustrated translation in abstract of his German article in which the author investigates the source of the mechanical troubles in electric locomotives and finds that the play in the bearings may give rise to resonance oscillations owing to the "static indeterminateness" of the transmission through driving rods. Means for overcoming the trouble are discussed, and reference is made to the improvement in the Löttschberg locomotives.—*London Electrician*, Oct. 2, 1914.

**Railway Signaling.**—H. M. JACOBS.—His second article on the subject. The author deals with automatic block and interlocking signals, the former being installed along the right-of-way, while the latter are placed at terminals, cross-overs, etc., and are controlled from towers. The automatic block signals are built for operation on alternating-current and direct-current circuits, the direct-current signals receiving their current in most cases from storage batteries at convenient points along the route, while the alternating-current signals are supplied with energy from transmission lines. The interlocking signals are either manually operated or are controlled through electric-pneumatic or all-electric devices.—*Gen. Elec. Rev.*, October, 1914.

### Installations, Systems and Appliances

**Starting Rotary Converters.**—E. P. HILL.—An article on precautions in starting rotary converters from transformer tapings. The method of starting by low-voltage taps from the transformer is applicable only to machines up to about 300 kw, the difficulty on larger sizes being the disturbance of supply from the large watt-

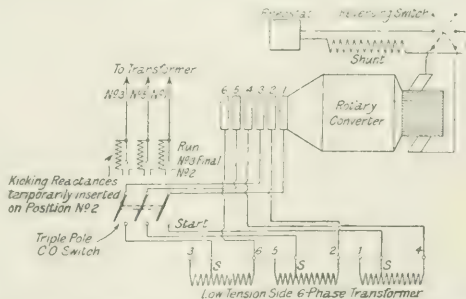


FIG. 1—CONNECTIONS FOR TAP STARTING OF SIX-PHASE ROTARY CONVERTER

less current drawn during the initial starting period. There is, in addition, the trouble that the polarity to which rotary converters will build up is subject to no control whatever and must be reversed should it build up incorrectly. This latter point is in practice not productive of much difficulty, as a field change-over switch can be used, and there is, in addition, always the possi-



bility of opening the main switch momentarily or rapidly reversing the polarity by slipping a pole. The main poles of the converter are fitted with grids, which act as the squirrel-cage rotor of an induction motor and, together with the iron loss in the pole shoes, produce sufficient torque to bring the armature up to approximate synchronous speed. When the field switch is closed, the machine builds up and pulls into step on the low-voltage side of the change-over switch, and on the switch being thrown over full voltage is applied, the rush of current being controlled entirely by the amount of reactance in the transformer circuit. Should the machine be fitted with commutating poles, it is necessary to short-circuit their coils during starting to prevent the rotary "locking" at half-speed; that is, behaving as if it had twice its real number of main poles. If this precaution be neglected, a much slower start obtains, and sparking trouble occurs on the direct-current brushes. Again, the fact that the machine is running at only half speed may easily be overlooked, and on switching over after the usual lapse of time a flash-over occurs. It is advisable to wait on the starting side until the phase swinging dies down before changing over. Frequently surges in the supply (especially in traction circuits) cause a few seconds to elapse before a steady condition is reached, and after being instructed an attendant, by the characteristic note, can tell when the time for switching over has arrived and thereby avoid a flash on the commutator and other ill effects. When the machine has to meet stringent guarantees of voltage regulation and efficiency, the reactance necessary to limit current rushes has to be temporarily inserted during starting period by a kicking contact on the change-over switch, as shown in Fig. 1, and attendants are tempted to throw over the switch on to the final position without pausing, as is intended, on the kicking contact. A stop is sometimes provided to insure correct working, but some makers prefer to leave this to the discretion of the attendant in case he should, by the use of the stop, burn out the grid resistors. A pause of from one to two seconds should be made on the kicking contact, when it will be found that a very satisfactory start results. The brush friction loss of tap-started converters has considerable influence on the time taken to come up to speed. An unskilled attendant becomes much alarmed by the fact that the machine will not come up to speed, whereas wiping the commutator with a little lubricant will at once rectify matters. Too heavy brush tension or a rough commutator will cause this trouble, but probably the transformer tap is too low when this symptom appears.—*London Elec. Eng'ing*, Oct. 1, 1914.

#### Wires, Wiring and Conduits

**Rating of Bare Copper Conductors.**—W. COATES.—American and German firms have mostly adopted a temperature rise of 30 deg. C. as standard for switchboard connections. British builders are usually more conservative, and work to a limit of 20 deg. C. The author gives tables for the maximum permissible direct-current load in amperes for temperature rises of 20 deg., 30 deg. and 40 deg. C. Three tables are given—the first for single copper strips, the second for copper strips in parallel at different spacings, and the third for round copper rods.—*London Elec. Review*, Sept. 18, 1914.

**Switches.**—H. G. FRENCH.—An illustrated article on some recent developments in lever and disconnecting switches.—*Gen. Elec. Rev.*, October, 1914.

#### Electrophysics and Magnetism

**Quantum Theory.**—S. DUSHMAN.—In his third paper on recent views on matter and energy the author discusses various applications of the quantum theory.—*Gen. Elec. Rev.*, October, 1914.

#### Units, Measurements and Instruments

**Adjustments of the Thomson Bridge in the Measurement of Very Low Resistances.**—F. WENNER AND E. WEIBEL.—An illustrated description of two new procedures for carrying out those adjustments which make the correction terms of the Thomson bridge equation negligibly small. Both procedures require the use of a variable double ratio set (so adjusted that for any reading of the dial switches the lack of equality of the two ratios  $\alpha \beta$ —Fig. 2—is so small that no appreciable

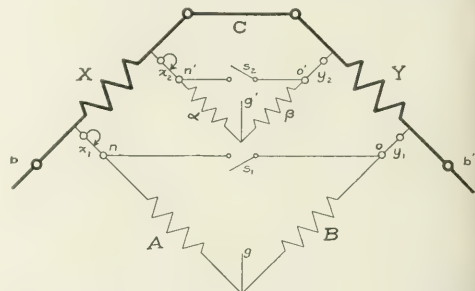


FIG. 2—THOMSON BRIDGE EQUIPPED TO MEASURE VERY LOW RESISTANCES

error is introduced on this account) and variable low resistance to be used in the connections  $x_1$  and  $x_2$  between the terminals of the ratio set and the potential terminals of the four-terminal conductors under comparison. (1) With the test current supplied through the terminals  $b$  and  $b'$ , the bridge is balanced by an adjustment of the dial switches of the double ratio set. (2) With the test current supplied through the terminals  $n$  and  $o$ , the bridge is balanced by an adjustment of the variable low resistance forming a part of  $x_1$ . (3) With the test current supplied through the terminals  $n'$  and  $o'$ , the bridge is balanced by an adjustment of the variable low resistance forming a part of  $x_2$ . (4) With the test current supplied through the terminals  $b$  and  $b'$ , the bridge is balanced by an adjustment of the dial switches of the double ratio set. In the other procedure the test current is supplied through the terminals  $b$  and  $b'$  only, but means are provided for connecting the terminals  $n$  and  $o$  and  $n'$  and  $o'$  by conductors of low resistance. The adjustments are made in four steps, of which (1) and (4) are the same as given above. In (2) the terminals  $n$  and  $o$  are connected, while the bridge is balanced by an adjustment of  $x_1$ , and in (3) the terminals  $n'$  and  $o'$  are connected while the bridge is balanced by an adjustment of  $x_2$ . Either procedure gives very accurately  $x = ay/b$  where  $x$  and  $y$  are the resistances of the four terminal conductors under comparison and  $A$  and  $B$  are the resistances between  $n$  and  $g$ , and  $g$  and  $o$ , when the final adjustment is made. Both procedures differ from those previously used mainly in that they do not require changing over to a simple bridge by opening the low-resistance connection between the resistances under comparison. Where the resistances under comparison and the resistance of the connection between them are very low it is more or less impracticable to change over to a simple bridge during the adjustments. In such cases procedures have been found more satisfactory.—*Journal Wash. Acad. of Sciences*, Oct. 4, 1914.

**Use of Thermo-Electric Apparatus in High-Frequency Systems.**—AUGUST HUND.—This paper deals with thermo-electric phenomena and shows their application to technical apparatus. The scope of the paper is to show the use of certain apparatus which may be built very readily for laboratory purposes and which are

very convenient for measuring currents up to the highest frequencies independently of the shape and length of wave.—*Gen. Elec. Rev.*, October, 1914.

**Effect of Wave-Form on the Readings of Moving-Iron Instruments.**—R. B. BURROWES.—An investigation as to what difference, if any, a moving-iron instrument indicates for currents having the same root mean square values but of different wave forms. With this object in view experiments were made on a switchboard type of ammeter working on the above principle, the range being from 0 amp to 10 amp, the scale divisions at the lower end being crowded. The following effects were investigated: shape of *B-H* curve for the moving iron, effect of hysteresis, effect of ripples, and effect of frequency. The results are given in diagrams and tables.—*London Electrician*, Oct. 2, 1914.

**Refractometry.**—G. A. SHOOK.—His second article on the subject illustrated by diagrams. The author discusses the instruments of Butyro, Abbe, Zeiss, Pulfrich and Féry, and their availability and suitability in different cases.—*Met. and Chem. Eng'g*, October, 1914.

#### Telegraphy, Telephony and Signals

**Frequency-Increasing Apparatus.**—A note on a recent British patent (No. 13,637, 1913) of the Marconi Wireless Telegraph Company, Ltd., and C. S. Franklin. The source of alternating current the frequency of which it is desired to increase is connected in series with a rectifier and a polarizing direct voltage of requisite strength, which may be in the same direction as, or opposed to, that half of the current which normally passes through the rectifier. The rectified current is led through the primary of a suitable transformer, having a secondary connected to a capacity, and tuned to have a time period equal to half that of the original voltage. The frequency of the induced voltage in the secondary will then be double the original frequency. By using two or more transformers with primary and secondary circuits suitably arranged, higher transformation ratios can be obtained. During operation the battery which is used to supply the polarizing voltage may become charged, and the surplus energy can be utilized to help drive the alternator through a motor. The apparatus is, of course, particularly adapted for producing high-frequency oscillations for wireless signaling.—*London Elec. Eng'g*, July 9, 1914.

**Capacity of Wireless-Telegraph Antennas.**—G. W. O. HOWE.—The first parts of a paper read before Section G of the British Association at the recent meeting in Australia. The capacity considered in this paper is the actual static capacity, and not the equivalent capacity of the antenna considered as part of an oscillatory circuit. When raised to a potential above or below that of the earth the charge is distributed over the antenna in a way which is not easy to calculate but which must be such that all parts of the antenna are at the same potential. If the antenna were made up of a great number of short pieces, placed end to end but insulated from each other, it would be possible to distribute the charge uniformly, but the potential would then vary from point to point in a way which is easily calculated. If now we assume that all the separate pieces of wire are connected, electricity will flow from points of high to points of low potential until the potential is everywhere the same. The assumption made in developing the various formulas is that this final uniform potential is equal to the average value of the potential when the charge was uniformly distributed. This is only approximately correct, but the accuracy is more than sufficient for all practical purposes. This method has been applied to antennas of all the types usually employed.—*London Electrician*, Aug. 28 and Sept. 4, 1914.

#### Miscellaneous

**Lightning Protection of Buildings.**—JOSEPH MAYER.—A discussion of the regulations for the protection of buildings against lightning flashes. To distinguish between the suitability of the different lightning-rod systems it is not only necessary to study systematically the damage done by lightning but also to observe carefully the secondary phenomena (induction phenomena, expansion of air, etc.) which accompany the lightning flashes.—*Elek. Zeit.*, Sept. 10, 1914.

**Electrical Industry of Austria and Hungary.**—E. HONIGMANN.—A review of the conditions of the electrical industries of Austria and Hungary during the first half of the year 1914. Although there had been a decline of commercial activities at the end of 1913, the electrical manufacturing companies were able to pay very satisfactory dividends.—*Elek. Zeit.*, Sept. 10, 1914.

## Book Reviews

**ECONOMICS OF BUSINESS.** By Norris A. Brisco. New York: The Macmillan Company. 390 pages. Price, \$1.50.

The author combines a general study of efficiency methods with his discussion on the economics of business. He speaks of the factory as the center of investigation and study and of the waste of time, energy and material revealed. He regards as the most significant of the contributions to literature on business those which have been made by successful business men who recounted their own experiences, pointed out the broad principles to be derived therefrom and explained the methods by which the principles may be applied. From an analysis of such data and from a study of the methods of many successful business enterprises, the fundamental principles underlying business have been produced. The book has been written to give expression to these principles, and the author has packed a surprising amount of information into one volume.

**THE MANAGEMENT OF PUBLIC ELECTRIC SUPPLY UNDERTAKINGS.** By A. Hugh Seabrook. New York: McGraw-Hill Book Company, Inc. 212 pages. Price, \$2.50.

The subject of management, whether of public electric supply undertakings or of any other organized business, is not easily dealt with in a written treatise. Given the right man at the head of a business, its success is generally assured; but a schedule of the qualities and idiosyncrasies of such a man is not easily made, neither is it of much practical value when made. Again, details of organization, office and works routine, systems of charging and of account keeping, although of indisputable value, cannot alone determine the success or otherwise of a business undertaking. Mr. Seabrook, whose experience and position entitle him to an attentive hearing, handles his subject in the manner of a broad-minded man with high ideals and a sense of justice, without which no man can conduct a successful business of a permanent nature. Leaving out of account the fact that the benefit to be derived from a book of this nature is a factor of some uncertainty, this particular volume stands undoubtedly in the front rank. The chapter on tariffs and methods of charging is well worthy of study by American readers. This and the more general discussion of the problems of management, in which the writer expresses his views clearly, without reserve or hesitation, are perhaps the parts of the book most valuable to the reader who is not making a very detailed study of the subject.



# New Apparatus and Appliances

## An Illustrated Descriptive Record of Recently Developed Manufactured Products of Interest to Electrical Readers

### Small Scoop Reflector for Showcases

The National X-Ray Reflector Company, 235 West Jackson Boulevard, Chicago, has brought out a small scoop fixture for illuminating showcases which does not present much obstruction to the view, consumes very little energy, affords an even distribution of light, does



FIG. 1—SHOWCASE EQUIPPED WITH SCOOP REFLECTORS

not heat the showcases appreciably, is relatively inexpensive to maintain in operation, and conceals the lamps from the eyes of the customers and clerks. The reflector, lamp and socket are inclosed in a neat brass housing which is attached to a 0.375-in. brass conduit

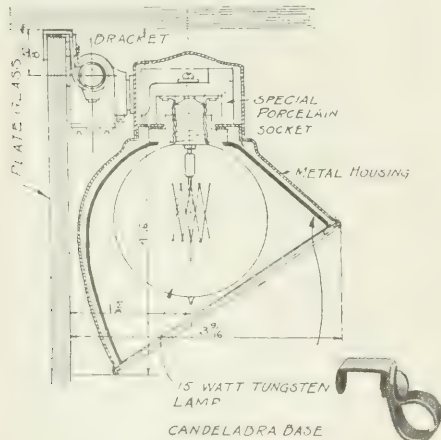


FIG. 2—DETAIL OF SCOOP FIXTURE

running along the upper outside edge of the showcase. A 15-watt round-bulb candelabra-base tungsten lamp is employed. The socket is consequently small, making the entire unit extend only 4 in. from the top of the case and occupy only 3 in. in width. The "scoopette,"

as it is called, produces even, intense illumination from the topmost shelf of the case to the lower edge of the front glass. The reflectors can be cleaned without removing the lamps, and all parts can be easily dusted. It is declared that fewer lamps with lower rating need be employed to illuminate a case when these fixtures are used; therefore the amount of heat generated is low. For installing the scoopettes and connecting them with floor receptacles the manufacturer has developed a complete line of standard equipment, including junction boxes, tubing, elbows, offset fittings, tubing caps, special porcelain sockets, metal housings, etc. Besides being adapted to showcase lighting, they can be employed in small and unusual-shaped windows, for pulpit, bed and chair reading lamps, and for bulletin-board, picture, sewing-machine and gage illumination.

### Rigid Protector for Linemen

The Withers lineman's protector, which is being introduced by the Associated Engineers' Company, 180 North Dearborn Street, Chicago, forms a rigid shield

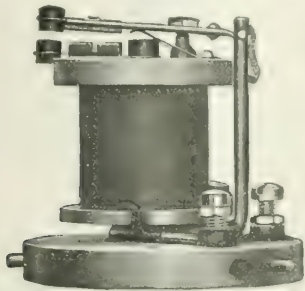


RIGID PROTECTOR FOR USE OF LINEMEN

which rests on the cross-arm and incloses the conductor with a 3-in. air space on all sides, thus gaining the advantage of this dielectric protection in addition to the insulating value of its own 0.375-in. rubber-composition walls. As shown in the illustration, the under side of the protector is open, allowing it to be quickly dropped over the wire, which is slipped into the end sockets securely fixing it in place, so that the guard cannot be loosened by wind or by the weight of the lineman's body. All weight is, of course, borne by the cross-arm on which the shield rests, and the lower edge is adapted for seating on both single and double arms. The protector is of molded rubber composition, without metal in its construction. Its weight is about 12 lb. and it can be dropped from a pole without injury. Slotted flexible tubes can be slipped over the conductors thus extending the range of safety protection. These tubes are furnished with the protectors, and the protectors themselves can be furnished in successive size arranged to "nest" in order to economize space on the line wagon.

### Automatic Cut-Out

An automatic cut-out designed for use with automobile or motor-boat lighting outfits to make the circuit when the generator is running and break it when the generator stops, thus preventing the discharge of the

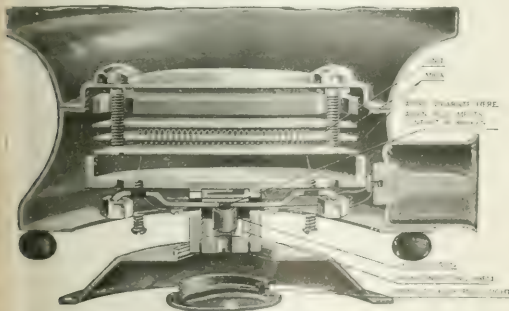


CUT-OUT FOR AUTOMOBILE LIGHTING OUTFIT

battery back through the generator, is shown in the accompanying illustration, which is two-thirds the actual size of the device. A primary shunt coil on the generator circuit operates the armature as soon as the voltage reaches the proper value and makes connection through the carbon contacts. As soon as these connections are made a series coil is thrown into the circuit, and the armature is held down by a sliding contact. When the generator stops the line circuit is opened by a spring. This device has double contacts of carbon and bronze and is entirely inclosed in a stamped-steel case, which is attached by a bayonet lock to the heavy fiber base. The outside dimensions are 2.75 in. by 2.75 in. The Carleton Company, 170 Summer Street, Boston, Mass., is the manufacturer of this cut-out.

### Fusible-Plug Safety Device for Water-Heating Appliances

A fusible-plug safety device for use on appliances employed in heating water such as percolators, samovars, chafing dishes, etc., is being made by Landers, Frary & Clark, New Britain, Conn. If the water in the receptacle is exhausted while the circuit is closed and the



SECTIONAL VIEW OF HEATING UNIT WITH FUSIBLE PLUG

device consequently is overheated, in about a minute, before any harm can result, a plug melts and the circuit is opened. A new fuse can be inserted in a very short time. In the accompanying illustration is shown a sectional view of the device attached to the receptacle, the

various parts being separated. The heating wire is of nichrome and is wound around mica into uniform grooves. It is made fast by insulating cement. Mica disks are placed above and below the unit as shown. Heat is distributed uniformly by means of a flanged plate beneath the unit. The heat expands this plate and forces the flange tight against the water compartment.

### Drink Mixer Illuminating Contents of Glass

Illustrated herewith is a drink mixer which is set in operation by a switch knob and button on the agitator shaft. When the shaft is revolving the base and contents of the glass are illuminated, giving a pleasing color effect which may be employed to attract attention to some advertisement. A universal-type motor is employed. All parts of the device are standardized and therefore interchangeable. The outfit is shipped knocked down to prevent breakage in transit, but no



ELECTRIC DRINK MIXER

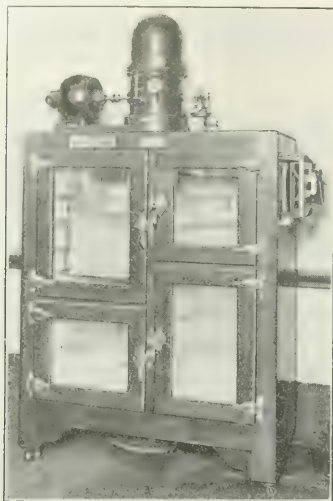
tools are required to assemble it. The mixer is manufactured by the Wisconsin Electric Company, whose works are at Racine, Wis.

### Domestic Refrigerating Equipment

Exhibited in operation at the recent electrical exposition in New York City was the domestic refrigerating outfit shown in the accompanying illustration. Under actual test, it is declared, the machine produced 100 lb. of ice with an energy consumption of only 2.5 kw-hr. At a rate of 10 cents per kw-hr. ice can, therefore, be made for 25 cents per 100 lb., which is very economical for a small machine. Although the manufacturers, Westerberg & Williams, Woolworth Building, New York City, have not yet placed the apparatus on the market, they intend doing so soon. They purpose making two sizes, one with a rating of 150 lb. a day for apartments and small houses, and the other with an output of 300 lb. a day for large residences. The equipment is designed to fulfill the exacting requirements of household refrigerating service where no trained labor is available for tending the machine. It is planned to make the initial cost low enough to be within the reach of the average family. During the exposition, which lasted from Oct. 7 to 17, the plant operated continu-



ously, maintaining a temperature of 28 deg. to 33 deg. Fahr., and simultaneously making 12 lb. of ice in four blocks. The compressor was driven by a 0.25-hp motor. Its operation is entirely automatic, the starting and

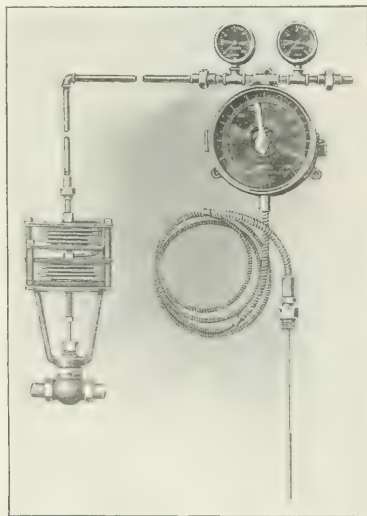


REFRIGERATOR EQUIPMENT FOR DOMESTIC USE

stopping taking place in response to the temperature of the refrigerator.

### Temperature Regulator

A temperature controller which is declared to be extremely accurate and reliable has been placed on the



TEMPERATURE CONTROLLER AND DIAPHRAGM VALVE

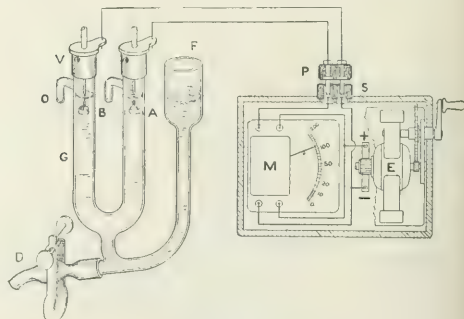
market by the Industrial Instrument Company, Foxboro, Mass. The entire equipment required for temperature regulation which is shown in the accompanying illustration includes two gages, the controller and

bulb, and the diaphragm valve. Either vacuum or pressure may be employed to operate the valve, which is made entirely of metal and is therefore practically indestructible. If the vacuum system is used, no moisture will collect in the piping, whereas it may do so if the pressure system is employed. The gage at the right indicates the pressure maintained in the supply system, and the one at the left shows the pressure operating the valve. If the pressure or vacuum fails, the valve will close automatically, thus preventing the overheating which might otherwise occur. The valve inside the controller case which determines the position of the diaphragm valve is controlled by a helical spring similar to that employed in recording thermometers made by the Industrial Instrument Company.

### Water Testing with Electrical Apparatus

An apparatus for determining the degree of hardness of water and the amount of impurities in distilled water and of sewage in rivers, etc., has recently been developed. The operation of this apparatus is based on the principle that the conductivity of water containing any electrolytic substance in solution is due almost entirely to the dissolved substance.

The complete apparatus is shown in the accompanying diagram, *G* being a bent glass tube containing the



WATER-TESTING APPARATUS

water under test, and *A* and *B* the electrodes for passing the electric energy through the water. The electrodes are connected by wires to a generator *E*; by turning the handle *W* energy is generated and is made to flow through the meter *M* and the water in the conductivity tube *G*. The pointer of the meter is deflected and comes to rest at some point upon the scale which directly indicates the conductivity of the water in the tube. The test is completed as soon as the pointer has come to rest.

The electrodes are short, hollow cylinders of platinum. The water is poured into the funnel *F*. By allowing the water to overflow through the outlet pipes *O*, *O*, every part of the tube is washed and any products of electrolysis which may have accumulated upon the electrodes are removed. The air vents *V*, *V* insure a steady flow from each outlet without any siphoning action. A drain pipe *D* of rubber is provided at the bottom of the tube for drawing off the contents at the conclusion of the test.

The tube is mounted on a strong teak stand. The meter and generator are inclosed in a box which is sealed, a window being provided for observing the dial. The water-testing outfit described above is being placed on the market by J. G. Biddle, 1211 Arch Street, Philadelphia, Pa.

### Composition Flush Receptacle

A compact shallow flush receptacle which is designed to fit any standard box has recently been developed by the Chelton Electric Company, 314 Armat Street,

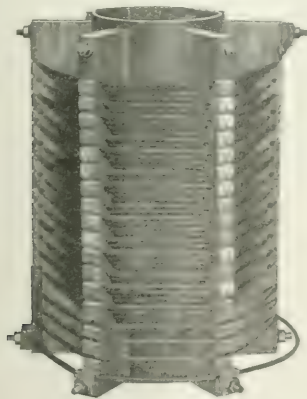


FLUSH RECEPTACLE

Philadelphia, Pa. Heavy long binding screws are employed. Not only is the cap of non-breakable composition, but the receptacle is also made of the same material. The plate is of brass and is beveled as shown in the accompanying illustration. The receptacle, plate and cap are interchangeable with similar types made by the above company.

### Conical-Type Reactor

A reactor which is compact, has desirable dimensions and is held together radially by tension in the conductors is shown herewith. The central core consists of diagonal notched supports for the conductors, which are of stranded copper. With the cable in place the reactor consists of a series of conical, superposed coils separated sufficiently to prevent flash-overs due to increase in potential between layers when there is a current surge. The supports are held together by tongue and groove joints. Absence of longitudinal bolts, usually

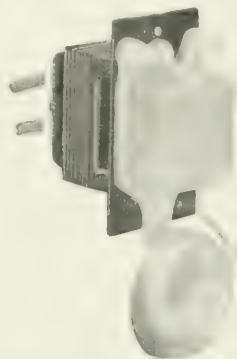


CONICAL-TYPE REACTOR

employed in reactors, increases the ability of this reactor to withstand surges and lightning discharges, it is declared. The General Electric Company manufactures the reactor.

### Bell-Ringing Transformer

A bell-ringing transformer designed to fit standard single-gang switch boxes is shown herewith. This transformer is adapted for use in residences where it



BELL-RINGING TRANSFORMER FOR RESIDENCES

is desirable to place the device near the bell. The transformer plate is drilled and tapped to take any standard iron-box bell. It will also take a standard flush switch plate where it is desired to make the finish conform to the finish of the hardware. The coils are independently wound and are designed to withstand a 2500-volt insulation test between the primary and secondary and the primary and ground, also 1000 volts between the secondary and ground. The device is designed for operation at a frequency of sixty cycles, a primary emf of 110 volts and a secondary emf of 10 volts. This transformer is made by the A. E. Rittenhouse Company, Honeoye Falls, N. Y.

### Adjustable Stand-Lamp Fixture

A fixture for stand lamps which can be adjusted from a height of 2 ft. 6 in. to one of 5 ft. 6 in., and which can be folded up as shown in Fig. 1 when not in use, is being manufactured by the R. M. Millar Electric



FIGS. 1 AND 2—LAMP FOLDED AND EXTENDED

Works, 9 Clinton Street, Chicago, Ill. Although the weight complete is only 2.75 lb., the device is stable, the manufacturers declare, and cannot be easily tipped over. Finished in brush brass, it has a shade and reflector.



## Jobber, Dealer and Contractor

### Quality in Contracting

If there is one phase of the electrical contracting business that has done more harm to the contracting trade as a whole than any other it is cut-throat competition. So loose-jointed is the electrical contracting business that a customer can with little difficulty play one contractor against another, seemingly to his own advantage. However, it is hardly natural to suppose that any contractor will continually do business at a loss, so that the only deduction to draw from an extremely low bid is that the work will be extremely low in quality. An enterprising electrical contractor of Brooklyn when making bids for electrical installations, while guaranteeing his own work, is careful to bring the quality of the work also to the attention of the customer. The accompanying illustration is reproduced from a blotter submitted by this contractor with all

### WHY ELECTRICIANS' ESTIMATES DIFFER

THIS answer is **QUALITY**. We never have a chance to explain this fact. No specification ever made was **COMPLETE**. ALL estimates differ on the one thing not specified. **QUALITY**. Each bidder quotes on HIS quality. All YOU do is specify location of outlets and switches. The manner of carrying out your directions depends upon the **HONESTY** and **SKILL** of the contractor doing the work. When the job is completed you will not know the difference as cost of the work will not show. You **WILL KNOW** the difference in a short time when repairs, due to poor quality and workmanship, will amount to as much or more than the first cost. **THE FIRST COST IS NOT THE ONLY THING TO CONSIDER.** The object that I am striving for is to have it known that my price is always for the **HIGHEST QUALITY** and the **BEST WORKMANSHIP**.

UNION AND COURT STREETS, BROOKLYN, N. Y.  
— TELEPHONE, HAMETON 814 —

**FRED'K A. ARMSTRONG**

### A BUSINESS-GETTING BLOTTER

bids. While it is within the bounds of reason that another contractor might do the same work at somewhat less cost and still not let the quality of the work suffer, it is improbable that a customer thus warned will slight the question of quality of the work. This would result in cleaner competition and business on a more profitable scale.

### Central-Station Merchandising Methods

In a paper read before a recent meeting of the new-business men of the Ohio Electric Light Association, Mr. J. E. North, commercial manager of the Springfield (Ohio) Light, Heat & Power Company, defended the merchandising plans of central stations. From time to time there has been considerable discussion as to whether or not a central-station company should sell lamps, motors and appliances. Mr. North, while not attempting to advise the larger central stations, in his own case considered it extremely advisable not only to sell the various articles but to sell them at a profit, because a net income from sales has a wonderful effect upon the net cost of the sales department. In his case the sales expense is reduced nearly 50 per cent. Mr. North does not think that there is a large objection to central-station companies selling motors and appliances so long as such sales are made at a profit, and he believes that the contractor or electrical-supply man is justified in complaining when central-station companies sell these articles at cost. Mr. North said:

"In the smaller city it seems that the supply people are not in a position to handle a large volume of appliance business. It probably could be done, but it seems that the necessary effort is not put forth. The average small supply dealer's window appears as though the toasters, irons, motors and wiring supplies had been

put in the window with a shovel. Special attention should be given to windows to make them present an attractive appearance. The best evidence that can be produced in favor of a central-station company selling lamps and appliances is the fact that the Springfield company's profit on sales for the first seven months of this year reduced the cost per kilowatt contracted from \$2.76 to \$1.51 and reduced the cost per contract from \$3.37 to \$1.92. The solicitors employed by a company selling appliances have an advantage over the solicitors of a company which does not sell appliances. If the solicitor understands that he is expected to contract for a certain amount of business to justify the salary he is receiving, or if he understands that the business contracted is not to exceed a certain cost per kilowatt, it is possible for him to make sufficient sales to keep the cost for new business normal, and it is not uncommon for a solicitor's salary to be paid from a profit on sales."

### Concentrated Purchases by Electrical Contractors

At the convention of the Electrical Contractors' Association of Massachusetts which was held at Worcester, Mass., recently, Mr. W. K. Tuohey, of Springfield, Mass., now president of the association, brought out the possibilities of economy through the concentration of purchases by electrical contractors. He contended that as jobbers in the plumbing supply trade refuse to sell to any but master plumbers with thoroughly satisfactory results, a similar policy might be tried to advantage in the electrical contracting field. Good will for one's competitor, charity toward his faults and a helping hand to assist him on his way will accomplish wonders for the industry, he said.

### Responsibility in Freight Shipments

In the shipment of goods by electrical jobbing houses and others misunderstandings sometimes occur in placing the responsibility for damages resulting during transit. The responsible jobber uses, of course, the greatest care in packing his shipments and in routing them to the customer. In many houses all goods are "checked" twice and a printed slip is packed inside the box listing all articles contained in the case or package. But for damages occurring to shipments during transit the railroad company must be held responsible, for when shipment is made "f.o.b." at the shipper's freight station the goods technically become the property of the customer when they are delivered to the transportation corporation. Following is the text of a notice which has been sent out among the Middle West trade and which states clearly the rules of practice as they affect shipper, railroad company and consignee:

"Where goods are sold delivered free on board car at point of shipment, the ownership passes to the customer when goods are delivered to the railroad and shipper has obtained receipt from the railroad.

"Shipper has no control over the method of handling goods after they are delivered to the railroad, and customers therefore must file with their local freight agent any claims for shortage or damage in transit.

"If shortage exists or packages appear damaged, freight agent make proper notation on freight bill before you pay it. If external appearance of package is good but contents are damaged, notify freight agent to send a once an inspector, who should be required to make notation of facts on your freight bill. The law requires that all claims for loss or damage must be made in four months from date of shipment, or otherwise the railroad cannot be held for damages."

# Industrial and Financial News

## Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

**Small Steam Lighting Outfit.**—What is said to be the smallest steam generating outfit built for practical purposes was recently made by the Westinghouse Electric & Manufacturing Company for the lighting of a small tug in New York. The machine can easily be placed in a wheelbarrow. It is 35 in. long, 17 in. high and 14 in. wide.

**Dimming Devices Being Exported.**—The Wirt Company, Germantown, Philadelphia, is exporting over 25 per cent of its product and its dimming devices are being sent to practically every foreign country where electricity is used for domestic lighting. The device is a small compact rheostat which fits into a lampholder or chandelier socket and is used to modify the intensity of light.

**Orders for Electric Cranes.**—The Cleveland (Ohio) Crane & Engineering Company has recently received orders for its electric traveling cranes from the following companies: The William Wharton, Jr., Company, Philadelphia, Pa.; the Pennsylvania Steel Company, Harrisburg, Pa.; the Bollinger-Andrews Construction Company, Josephine, Pa., and the Ford Motor Company, Detroit, Mich.

**Quick Performance of Transformer Manufacturer.**—The Packard Electric Company, Warren, Ohio, recently received a rush order from the Bliss & Van Auken Lumber Company, Saginaw, Mich., for two special 50-kw, sixty-cycle transformers to be designed for 2300 volts on the primary side and 600 volts on the secondary side. This order was received Monday noon, Sept. 21, and on Saturday morning, Sept. 26, the two units were delivered complete to the lumber company.

**Electric Trucks for England.**—Mr. E. J. Bartlett, manager of the truck department of the Baker Vehicle Company, recently returned from England and brought with him an order for twenty electric trucks from an English firm. Because of the fact that most of the gasoline trucks have been commandeered by the English government for use by the army, electric vehicles are being substituted. The unusual conditions brought about by the war have increased the opportunities of the electric-vehicle manufacturers not only in England but in the continental countries of Europe as well.

**Ball Bearings from Germany.**—In spite of the European war and the temporary suspension of shipments from German ports, the Hess-Bright Manufacturing Company, Philadelphia, Pa., is receiving large quantities of ball bearings from its factory in Berlin via neutral countries. Since Sept. 1 more than 125,000 ball bearings of various sizes have been received. The above company was fortunate to have a large supply of ball bearings on hand when the war broke out, which added to the increased output of the factory in Philadelphia and the importations from abroad has easily enabled the company to take care of all orders and provide adequately for new business.

**Electric Company's Foreign Trade Falling Off.**—The Pittsburgh Electric Specialty Company's foreign trade has decreased considerably on account of the present unfavorable conditions abroad. The company has some 350 agencies in various parts of the world. Recently shipments were made to England. In this country the company is more than holding its own. It is getting out a number of new electric devices which are meeting with favor as Christmas gifts. One of these is a light vacuum cleaner with a complete set of attachments at a rather low price. Another popular appliance is a small electric stove and a luminous toaster. Articles suitable for Christmas presents are being packed in attractively decorated boxes.

**Electric Blowers for "Unit Orchestras" and Organs.**—As a result of the increasing demand for mechanical musical instruments in theaters and music halls, the Kinetic Engineering Company, Philadelphia, Pa., is selling a large

number of its electrically operated blowers for organs and so-called "unit orchestras." The blower manufactured by the above company consists of several fans mounted on the same shaft and operated in series, each fan adding to the pressure created by the previous fan, thus raising the pressure step by step to the highest required. Among the manufacturers of pianos using this blower are the Rudolph Wurlitzer Company, the J. P. Seeburg Piano Company and the Peerless Piano Company. For "unit orchestras" motors rating as high as 35 hp are used. If necessary, the blower can be designed to create both a suction and a blowing action. The demand for a motor-driven blower for use with church organs is also quite large.

**Latin-American Trade Situation.**—That the Latin-American countries are looking to the United States for the capital and the market for their products which they formerly found in Europe is emphasized in "Statements on the Latin-American Trade Situation," a pamphlet just issued by the Bureau of Foreign and Domestic Commerce of the Department of Commerce, giving the addresses made by representatives of Latin-American countries at a conference with American business men recently held in Washington. The pamphlet contains the statements made by the ministers from Bolivia, Uruguay, Peru and Cuba to the United States, the consuls-general of Costa Rica and Colombia in New York, the minister from Ecuador to England, and others, besides the opening remarks of Secretary of State William J. Bryan and a statement by Secretary of Commerce William C. Redfield. Many obstacles to the development of Latin-American trade with the United States were commented on, notably the matter of credits and that of a proper understanding of the Latin-American way of doing business on the part of business men in the United States.

**Wireless-Telephone Sets for Railroad.**—In the *Electrical World* of May 30, 1914, was described a radiotelephone apparatus used on one of the through fast trains and at the Scranton (Pa.) station of the Delaware, Lackawanna & Western Railroad. Extensive experiments were carried on by Mr. L. B. Foley, the railroad company's superintendent of telegraph, and they proved so satisfactory that two complete sets were subsequently purchased from the De Forest Radio Telephone & Telegraph Company, 101 Park Avenue, New York. The wireless telephone put out by this company is proving popular on private yachts, houseboats and large estates. It is also well adapted for use in the Revenue Service, coast and inland surveying and river and harbor work. An inquiry from a mine owner in Mexico suggests another field for its employment. During the past few years revolutions have been recurring with periodic regularity, and with the inception of each new outbreak the first thought of the revolutionists seems to be connected with the cutting of wires. The mine owner referred to has a telephone line connecting two mines and the wires have of late been frequently cut. A wireless telephone, of course, would be an ideal substitution in such a region.

**Foreign Magneto Works Tied Up on Account of War.**—The plants of the Bosch Magneto Company, of London, and of the affiliated company of Paris have been operated under governmental supervision since the war began, and the products of the two plants are being utilized chiefly for war purposes. A great many of the aeroplanes and motor cars used by the armies and navies of the countries at war are operated with Bosch magnetos, and of course the magneto equipment is an important part of each vehicle. Since the war commenced the Bosch Magneto Company of New York, which has hitherto filled orders only from North America and the Philippine Islands, is shipping its products all over the world, and particularly to



England and France. The American company is receiving some raw material from Germany, chiefly from the plant concern in Stuttgart. The immediate effect of the war on the Bosch company of New York was a sudden drop in business, but this condition is now considerably alleviated and it is expected that the business for October will be fully 20 per cent greater than that for September. The company's products are supplied to dealers (including garages) and to manufacturers. The business with the latter is not so good as with the former owing to a general retrenchment.

**Copper Report for 1913.**—A general report on copper for 1913 was recently issued by the United States Geological Survey. Statistics are given of the mining, smelting and refining of the metal. The smelter production of copper in 1913, it is stated, showed a slight decrease from that of 1912. This decrease was due to abnormal conditions in certain districts; otherwise there would have been a substantial increase. These conditions affected especially the output of the Lake Superior district, where a strike of miners was in progress for more than five months of the year. The decrease in Alaska was due to the partial destruction of the plant of the largest producer of that district, and the decrease in Montana can be attributed in part to unusual conditions. There were no important new producers added during 1913, but there were notable increases made in the production of several companies that have recently entered the producing class. The refinery production was the largest in the history of the industry, the excess over the smelter production resulting in a material reduction in the stocks of unfinished material. There is no doubt that the cost of producing copper was considerably higher for 1913 than for the preceding year. This may be attributed to several causes, the most important of which is probably the decrease in the metal content of ore treated from an average of 1.71 per cent in 1912 to 1.67 per cent in 1913. Among other causes are increase in taxes and increase in cost of labor in certain camps due to a decrease in working hours. A compilation of the cost per pound by companies giving this item in their annual reports, the Lake mines excepted, shows an average increase of 0.65 cent per lb. The selling price of copper for 1913 averaged about 1 cent per lb. less than for 1912. It is therefore evident that the profits for the year were materially lower than for the preceding year, though there was a good profit on most of the copper produced. Both domestic consumption and export of copper showed an increase in 1913 over 1912, and the stocks of refined copper were small at the close of 1913. It is apparent, however, that during the last few years the producing capacity of the world has increased faster than the consuming capacity, and that if all mines make their greatest possible output a surplus of copper will result. The production of copper in 1913 by smelters from copper-bearing materials from the United States was 1,224,484,098 lb., valued at \$189,795,035, as compared with 1,243,268,720 lb., valued at \$205,139,338, in 1912, and with 1,097,237,749 lb., valued at \$137,154,092, in 1911. The production for 1913 showed a decrease from the previous year of 18,784,622 lb., or about 1.5 per cent, in quantity and \$15,344,303, or 7.43 per cent, in value. Twenty-four states and territories contributed to the copper production of 1913. According to smelter returns, the three leading states, Arizona, Montana, and Michigan, produced 69 per cent of the total output of 1913; the same states produced 72 per cent of the output in 1912. The eight leading states, including Utah, Nevada, Alaska, California and New Mexico, produced over 96.78 per cent of the total output in 1913.

#### NEW YORK METAL MARKET PRICES

	Oct. 20	Oct. 27
Copper	11.57 1/2 to 11.62 1/2	11.40 to 11.60
Brass, base	11.20 to 11.30	11.30 to 11.35
Electrolytic	11.10 to 11.20	11.10 to 11.25
Casting	11.10 to 11.20	11.10 to 11.25
Copper wire base	12.75 to 13.00	12.75 to 12.75
Lead	3.50	3.50
Nickel	40.00 to 45.00	40.00 to 45.00
Sheet zinc, f.o.b. smelter	8.00	8.00
Spelter, spot	5.10 to 5.15	5.10 to 5.15
Straits tin	29.00	30.75
Aluminum, 98 to 99 per cent	18.00 to 18.50	18.00 to 18.50

#### COPPER EXPORTS

Total tons to Oct. 27 22,482

\*Nominal.

## Corporate and Financial

**Arkansas Light & Power Mortgage.**—The Arkansas Light & Power Company, of Little Rock, Ark., has filed a mortgage with the Guaranty Trust Company of New York to secure a one-million-dollar issue of two-year 6 per cent gold notes. The mortgage is dated Sept. 1, 1914.

**First Buying of Bonds.**—What is probably the first sale of public utility bonds was made recently by the Rockland Light & Power Company, of Nyack, N. Y. The company sold \$50,000 of first mortgage 5 per cent bonds to Perry, Coffin & Burr, of Boston. The bonds are part of an authorized issue of \$1,000,000 due Nov. 1, 1938, and of which previous to this sale \$605,000 was outstanding. The last selling price of this security was 96 and interest.

**Pacific Gas & Electric to Buy Notes.**—The Pacific Gas & Electric Company, of San Francisco, Cal., has asked for tenders as of Oct. 31 for \$2,500,000 of its one-year 5 per cent gold notes maturing March 25, 1915, being part of an outstanding issue of \$7,000,000. The committee in charge will add accrued interest to and including Oct. 31, amounting to \$5 per thousand-dollar note. The committee consists of representatives of the Bankers' Trust Company, Harris, Forbes & Company and N. W. Halsey & Company.

**Annual Report of Sherbrooke Railway & Power Company.**—The annual report of the Sherbrooke (P. Q.) Railway & Power Company for the year ended June 30, 1914, shows gross revenue from all sources of \$141,990, from which is deducted \$87,970 for operation, maintenance and management, leaving \$54,020 as net revenue. This is further increased to \$57,237 by \$3,217 as balance to credit of 1913. From this is deducted \$56,080 for bond interest and other miscellaneous accounts, included in which was \$3,292 for disputed taxes for three years 1911, 1912 and 1913, leaving \$1,157 as a balance carried to profit and loss. In submitting the report to the stockholders at the annual meeting, Sept. 28, 1914, Mr. C. J. McCuaig, president of the company, made the following statement: "The industrial depression which affected the whole of the Dominion of Canada during the past eighteen months affected both the street-railway earnings and the energy revenue, as several manufacturers reduced their motor-service requirements. The prospects, however, for increased earnings in 1915 are as favorable as can be expected, although they must be necessarily affected to some extent by the European war. During the past year the company acquired the assets and undertakings of the Burroughs Falls Power Company, Ltd., at Ayers Cliff, P. Q., which adds another electric-lighting system to those already owned, and a further interest was acquired in the Lennoxville Light & Power Company, which controls the lighting and power business of Lennoxville and Huntingdon. The acquisition of these companies should still further increase the revenue of the company. During the existing financial conditions in the past year your directors were unable to sell sufficient securities to cover the entire cost of these extensions and purchases, and advances were obtained from the company's bankers to cover the balance required."

**Boston Edison Report.**—In discussing the year's work of the Edison Electric Illuminating Company of Boston, Mass., President C. L. Edgar pointed out that the gross earnings have increased almost exactly 10 per cent, and as the kilowatt-hours manufactured correspond closely with this, the average price has not changed. The connected load has increased 3 per cent faster than the energy sold and the gross earnings, probably on account of the increasing use of tungsten lamps. The expenses for the year were unusually high, chiefly on account of the partial use of the general service buildings and resulting separation of clerical, stenographic and filing forces. The savings resulting from the opening of this great property, which was described in the *Electrical World* of July 11, 1914, are reflected in the lower cost of freight, teaming, handling and in the ability to buy in larger quantities. These savings affect the construction accounts more than the operating accounts, so that for the future the expenses will be higher than if the property had not been put into service, but the construction accounts will be lowered by an amount much in excess of the increase in expenses. Mr. Edgar said that no additions or improvements which the company has

made in the past dozen years have had so satisfactory an effect, looked at from either the physical, financial or organization standpoint. For the present the company is financing extensions by notes. The connected load increased 13 per cent during the year, and in the past four years the incandescent lamp load (50-watt equivalents) has increased from 1,432,407 to 2,245,547, arc lamps from 10,919 to 12,297, motors from 57,094 hp to 106,205 hp, and the total load in 50-watt equivalents from 2,408,926 to 3,973,881.

**Atlantic Gas & Electric Status.**—In a circular to the stockholders of the Atlantic Gas & Electric Company, for which a receiver was appointed recently, Mr. Thomas C. Perkins, of Hartford, Conn., who was instrumental in distributing the common and preferred stock of the company, said: "A majority of the board has found it expedient to put the company temporarily into the hands of a friendly receiver. The firm of Meikleham & Dinsmore were the bankers for the company, being under agreement to pay cash for such stock, bonds and other securities as the company might issue from time to time to provide for the development and extensions of the various subsidiary companies. These securities were in turn either sold to other brokers like ourselves, who, after carefully investigating the matter, purchased a large block of preferred and common stock of the Atlantic company, or were placed through Meikleham & Dinsmore's own organization. It now transpires that Meikleham & Dinsmore had during the last year borrowed from their bank connections in New York and elsewhere, on their own notes, about \$1,000,000 as temporary loans, secured by the securities which they had bought and paid for as aforesaid, expecting to sell the same later on to investors. It further transpires that, owing to the tightening of the money market, some of the large banks holding much of this firm's paper called a meeting of those holding these notes, which resulted late in July in a committee being formed representing these banks. This committee stopped Meikleham & Dinsmore from selling securities or negotiating other loans for the Atlantic company, thus leaving that company without any bankers in a time of most severe complications in the financial world. No one can criticize Meikleham & Dinsmore as to their good faith in this matter, they having invested almost their entire capital in the company, as well as having borrowed to their credit over \$1,000,000 to carry out their obligations to it. A large amount of money had been provided—considerably over \$1,000,000—for the building of a large modern power plant at Easton, Pa., also another power plant at Boonton, N. J., and transmission lines and other developments, which greatly increased the efficiency of the subsidiary companies in New Jersey and Pennsylvania. Most of the work was finished and paid for, but the Atlantic company was left in the position where, in order to complete certain construction work, it had to assume obligations to pay \$300,000 or \$400,000, which it naturally expected to obtain through Meikleham & Dinsmore. With a view to preparing the way for the obtaining of new banking connections for the enterprise, I had the Atlantic company retain the services of Stone & Webster, of Boston, to make an investigation and audit of the affairs of the company and all its subsidiaries so we should have an absolutely independent showing of the exact condition of the Atlantic company, how much money was needed, what its earnings were and what its future would be. This report substantiated what we always understood of the affairs of the Atlantic company as to its present and future earnings. The extraordinary financial conditions brought about by the European war situation have so far made it impossible to liquidate the claims against the Atlantic company, although the last statement submitted to me by the treasurer, covering the twelve months ended Aug. 31, showed net earnings in excess of preferred dividend requirements. Plans are in process for straightening out the affairs of Meikleham & Dinsmore and to put the Atlantic company on a sound basis, but in the meantime some of the smaller creditors have made a receivership necessary. I expect to organize an independent shareholders' committee, consisting of myself and associates, whose clients are interested in this stock, and to ask deposits of the preferred and common shares, thus placing us in a position not only to assist toward helping straighten out this situation but to protect the interests of our clients and the stockholders to the greatest extent possible."

## SHOWING OF NEW ENGLAND UTILITIES

Comparative Returns for August Indicate Gains Over the Same Month a Year Ago

Although many of the industries of the New England States are at a standstill, the central stations still showed a gain in August, 1914, over the same month in the preceding year. The decline of the foreign trade due to the war shut off one of the large avenues for the marketing of New England's products, and the effects of such conditions are readily seen in Tables I and II. While the income per-

TABLE I—COMPARATIVE RETURNS FOR MAY, JUNE, JULY AND AUGUST FOR THE CENTRAL STATIONS IN THE NEW ENGLAND STATES

	INCOME, DEBITED TO GROSS SALES —DOLLARS—			ENERGY OUTPUT IN Kw.-hr.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
May	\$1,264,127	\$1,575,126	8.4	51,519,410	49,782,133	3.5
June	1,467,791	1,356,552	8.3	50,456,031	47,268,312	11.6
July	1,504,397	1,440,597	4.4	50,644,731	45,801,737	10.4
Average	788,705	1,388,758	7.5	52,398,832	49,576,035	5.5

centage increases do not seem to have been vitally affected, the percentage figures for output growth tell a different story. Out of the twenty-six companies reporting to the *Electrical World* from New England, nine registered output decreases in comparison with 1913; four showed income decreases as well, and two showed income decreases alone. To be sure, a couple of these companies were showing a decrease before the war started.

The returns have as far as possible been segregated by states. Where a holding company sent in gross figures for New England the figures were used only in Tables I and II and not in the figures by states. This resulted in there

TABLE II—RETURNS FOR APRIL, MAY, JUNE, JULY AND AUGUST FOR ALL NEW ENGLAND COMPANIES REPORTING TO ELECTRICAL WORLD

	INCOME, DEBITED TO GROSS SALES —DOLLARS—			ENERGY OUTPUT IN Kw.-hr.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
April	\$1,501,773	\$1,384,225	8.5	43,386,624	39,181,988	10.8
May	1,745,160	1,609,234	8.4	52,782,247	50,779,103	3.9
June	1,560,872	1,442,178	8.3	53,463,013	48,049,756	11.1
July	1,670,819	1,530,410	9.2	54,074,533	49,255,893	9.8
Average	1,834,583	1,707,649	7.5	55,801,224	52,913,483	5.4

being but one company reporting from Vermont, and consequently the figures for that State are not here given. Ten companies, mostly large companies, reported from Massachusetts. Their total income for August, 1914, was \$814,490 and for the previous August \$746,658. This was a 9 per cent increase. The output grew 3.8 per cent, from 23,410,625 kw.-hr. to 24,344,104 kw.-hr. Two companies reported from Rhode Island. They serve, however, most of the State. Their income increased 15.4 per cent, from \$133,230 to \$153,756, and their output increased 18.5 per cent, from 3,843,552 kw.-hr. to 4,556,740 kw.-hr. Three companies in Connecticut reported a 5 per cent income growth, from \$103,063 to \$108,345. The growth in output was 3.7



per cent, from 3,750,610 kw-hr. to 3,891,809 kw-hr. Three Maine companies reported for last August a total income of \$232,795 as against \$238,744 this August, or a 2.25 per cent gain, and the total output increased from 5,489,947 kw-hr. to 5,672,061 kw-hr., or 3.4 per cent. From New Hampshire three companies reported a total income of \$63,033 as compared with \$60,943 in the previous year, or a 3.5 per cent increase. The increase in output was 6.6 per cent, from 2,066,187 kw-hr. to 2,204,597 kw-hr.

The same companies which formed the compilation for the states have been grouped according to the population they serve. The first group contains five companies in cities of over 100,000 inhabitants. The total income for these companies in August, 1914, was \$750,559 and in the previous year was \$679,666, a 10.5 per cent growth. The output grew 5.1 per cent, from 21,470,393 kw-hr. to 22,559,816 kw-hr. The second group was made up of seven companies in cities having between 50,000 and 100,000 inhabitants. Their total income increased 4.8 per cent, from \$439,726 to \$461,178, and their total output grew 15 per cent, from 11,686,154 kw-hr. to 12,837,833 kw-hr. The third group contained four companies operating in towns whose population is between 25,000 and 50,000 inhabitants. While two of the companies showed slight gains in income, the other two showed sufficient decreases to make a total decrease of 0.6 per cent, from \$66,748 to \$66,384. Three of the companies showed decreases in output, making a total decrease of 7.1 per cent, from 1,738,711 kw-hr. to 1,612,349 kw-hr. The fourth group contained six companies operating in towns of less than 25,000 population. The total income increased 10 per cent, from \$98,263 to \$107,948. The total output increased but 2 per cent, from 4,488,098 kw-hr. to 4,580,044 kw-hr.

Cities with from 50,000 to 100,000 population seem to be little if at all affected by the war. In fact, a review of returns for July shows the August figures to be better. The hardest blow seems to have been to those companies in towns of between 25,000 and 50,000 inhabitants. This was owing to the fact that the towns of this group, with one exception, were purely manufacturing towns. The one exception was the only one to register an increase. That town has practically no manufacturing. The companies in the last group show practically the same state of affairs as did the companies in the largest cities.

## Trade Publications

**Steel Chains.**—The Link-Belt Company, Chicago, is distributing Booklet No. 124, entitled "Steel Chains."

**Flexible Armored Conductors.**—Realflex steel-armored conductor is referred to in a folder issued by the Western Conduit Company, Youngstown, Ohio.

**Switch Boxes.**—Prices of Union switch boxes are given in a leaflet which is being distributed by the Mohawk Electrical Supply Company, Syracuse, N. Y.

**Belt-Driven Alternators.**—A description of the construction of belt-driven alternating-current generators made by the General Electric Company is given in Bulletin No. 40,400.

**Springs and Screw-Machine Products.**—Booklet No. 6 prepared by the Wallace Barnes Company, Bristol, Conn., contains information regarding springs and screw-machine products.

**Lamp-Dimming Device.**—A lamp-socket device containing resistance for dimming the lamp is described in a pamphlet which is being sent out by the Wirt Company, Philadelphia, Pa.

**Oil and Gas Engines.**—Answers to questions regarding oil and gas engines are given in special Bulletin No. 207 issued by the Chicago Pneumatic Tool Company, Fisher Building, Chicago.

**Washer and Wringer.**—The Horton Manufacturing Company, Fort Wayne, Ind., refers to its electric washer and wringer in two folders issued recently, one entitled "What They Said at the Bridge Party" and the other "Co-operation—That's Us."

**Train Operation.**—Circular No. 1546 issued by the Westinghouse Electric & Manufacturing Company, East Pitts-

burgh, Pa., shows some of the advantages of employing multiple-unit trains.

**Heavy Traffic Centers.**—Special publication No. 1549 of the Westinghouse Electric & Manufacturing Company contains illustrations of operating conditions in many of the large traffic centers in this country.

**Railway Motors.**—Special Publication No. 1552 of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., illustrates some railway equipments from installations in various parts of the country.

**Intercommunicating Telephones.**—The Menominee Electric Manufacturing Company, Menominee, Mich., has just issued Catalog No. 25 describing its line of intercommunicating telephones and apartment-house equipments.

**Glass Reflector Bowls.**—An illustrated price list of glass reflector bowls made by the Phoenix Glass Company, 15 Murray Street, New York City, is contained in Catalog No. 28. Catalog No. 27 contains a price list of various designs of green-plated reflectors.

**Railway Exchange Data.**—Considerable information of value to persons connected with the operation of electric railways is given in the "Westinghouse Railway Data Exchange" No. 10, issued by the Westinghouse Electric & Manufacturing Company.

**Motors.**—The Menominee Electric Manufacturing Company, Menominee, Mich., has issued a motor bulletin describing its complete line of single-phase, multi-phase, direct-current and universal motors with ratings up to and including 1 hp.

## Business Notes

**I. Libson Company.**—I. Libson, formerly with the Sunlight Reflector Company, of Brooklyn, N. Y., is president and treasurer of the I. Libson Company, 214 State Street, Brooklyn, manufacturer of reflectors.

**The Fafnir Bearing Company,** New Britain, Conn., has terminated its selling arrangements with the Rhineland Machine Works Company, of New York, and will market its product direct from the New Britain office. D. D. Davis, formerly with the Rhineland company, will be in charge of the new sales organization.

**The Hammond Electric Bank Protection Company,** Los Angeles, Cal., has recently been formed and will manufacture electrical devices for installation in vaults of banks to give warning of robbers. W. D. Hammond is president and general manager and F. C. Mason is consulting engineer. Both Mr. Hammond and Mr. Mason have been for the past nine years active in the bank-protection field.

## New Industrial Companies

**The Reflecto Electric Sign Company,** of Dallas, Tex., has been chartered with a capital stock of \$10,000 by E. C. Jeffress, Ira F. De Loachs and T. W. Erwin.

**The Modern Electric & Machine Company,** of Indianapolis, Ind., has been incorporated by Louis H. Knue, H. W. Ransdall and Theodore A. Meyer. The company is capitalized at \$5,000 and purposes to manufacture and deal in electrical devices.

**The Garfield Electrical Company,** of Chicago, Ill., has been incorporated by M. J. Kennedy, H. B. Courchens and William J. Maher. The company is capitalized at \$1,000 and purposes to manufacture and deal in electrical equipment and devices.

**The Vapoform Sales Company,** of Paterson, N. J., has been incorporated with a capital stock of \$50,000 to deal in vapoform products, electric sterilizers, etc. The incorporators are H. H. Brown, G. B. Jackson, A. T. Bennett and W. H. Plog, of Paterson, N. J.

**The Model Manufacturing & Electric Company,** of Wheeling, W. Va., has been incorporated with a capital stock of \$25,000 to manufacture electrical appliances. The incorporators are Clarence C. Adams, of Bridgeport, Ohio; David Pittsley, James R. Affolter and John C. McAllister, of Wheeling, W. Va.

## Personal Mention

**Mr. F. W. Moneur** has resigned as sales manager of the Canadian Tungsten Lamp Company, Ltd., Hamilton, Ont.

**Mr. George W. Walters**, for the last five years superintendent of distribution for the Pacific Power & Light Company in Astoria, Ore., has resigned.

**Mr. M. B. Knapp**, formerly of the Republic Railway & Light Company, has been appointed superintendent of the Hocking Power Company at Nelsonville, Ohio.

**Mr. E. M. Baldwin**, of the Baldwin & Stewart Electric Company, Hartford, Conn., has been elected president of the Electrical Contractors' Association of Connecticut, which was recently organized.

**Mr. Henry H. Lyons**, of the Cataract Power & Conduit Company, Buffalo, N. Y., has been elected president of the Buffalo Section of the National Electric Light Association as successor to Mr. Paulding F. Sellars.

**Mr. H. S. Green** has resigned as general manager of the Rock River Light & Power Company, of Sterling, Ill. The company's new plant near Sterling has been leased by the Illinois Northern Utilities Company for a long term of years.

**Mr. Raymond A. Lander**, formerly connected with the industrial engineering department of the Rochester (N. Y.) Railway & Light Company, has become identified with the Saginaw (Mich.) Power Company as new-business promoter.

**Mr. W. P. Lewis**, for some months electrical engineer in Albuquerque, N. M., has accepted the offer of assistant superintendent on the hydroelectric installation being made on the Mohawk River by the Cohoes Company, of Cohoes, N. Y.

**Mr. F. A. Nash**, who has been for many years active in the direction of the work of the Omaha Electric Light & Power Company, Omaha, Neb., has retired from the position of president of the company and has been appointed chairman of the board of directors.

**Mr. A. M. Sumner**, who recently resigned as assistant superintendent of the Rockingham County, Light & Power Company, of Portsmouth, N. H., was presented with a gold watch fob bearing the Masonic emblem by the employees of the company, as token of their appreciation and esteem.

**Mr. Fred R. Jenkins**, manager of the Chicago Central Station Institute, has been appointed chairman of the committee on the education of salesmen of the Commercial Section, National Electric Light Association, vice Mr. F. C. Henderschott, of the New York Edison Company, who had been named for the position but was unable to serve.

**Mr. Hammond Mathews**, who has been chief electrician of the Arizona Copper Company, of Clifton, Ariz., has resigned to accept a position with the Arizona Power Company at Prescott, Ariz. Mr. Mathews has been connected with the Arizona Copper Company about four years, and prior to that time was connected with the San Juan Water & Power Company, of Durango, Colo.

**Mr. W. C. Rowse**, who has been experimental engineer for the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has just been appointed professor of mechanical engineering at the University of Manitoba, Winnipeg, Canada. The provincial government has set aside a large tract and appropriation for the new engineering buildings of the university, which will be built shortly.

**Gen. George H. Harries**, president of the Louisville (Ky.) Gas & Electric Company, has been elected president of the Omaha (Neb.) Electric Light & Power Company. General Harries will devote part of his time to the Omaha property, although maintaining his home at Louisville, where he will continue in charge of the local gas and electric properties for H. M. Byllesby & Company.

**Mr. C. W. Kellogg, Jr.**, has been appointed manager of the Mississippi River Power Company, Keokuk, Ia., for the Stone & Webster Management Association. Mr. Kellogg was formerly manager of the El Paso (Tex.) Electric Company, the El Paso Electric Railway Company, the El Paso & Juarez (Mexico) Traction Company, the Beaumont (Tex.) Electric Light & Power Company, and the Port Arthur (Tex.) Light & Power Company for the same interests.

**Mr. W. P. Southard**, manager of the Las Vegas (N. M.) Light & Power Company, has been unanimously re-elected president of the Commercial Club of that city. Mr. Southard is considered one of the most able of the Federal Light & Traction Company managers, and it is the public policy of the Federal company to urge its representatives to take interest in public affairs in the cities in which it operates.

**Mr. David F. Atkins** has been appointed acting chief engineer of light and power of the department of water supply, gas and electricity, New York City, by Mr. William Williams, the new commissioner. Mr. Atkins is a native of Massachusetts and came to New York eight years ago. Prior to his present appointment, he was division engineer of lighting of the department. He succeeds Mr. Charles F. Lacombe.

**Mr. J. Harry Pieper**, who was on Oct. 21 elected statesman of the Southern California Jovian Electrical League, has been with the Southern California Edison Company since September, 1909. He was previously identified with



J. HARRY PIEPER

the electric-sign industry for some years in Boston and New York, and went to Los Angeles to promote electric-sign development for the Edison company. Two years ago last January, in addition to his sign work, he took up for the company the promotion of electric-vehicle business. Mr. Pieper is still in charge of the Edison company's vehicle and sign promotion activities, with the title of assistant to the general agent, received in December, 1913. He has been a Jovian for two years, having been a director for the year 1913-1914 and chairman of the program committee. Surprises sprung on Mr. Pieper by members on Oct. 21 included the presentation of a birthday cake and, after an earnest speech of congratulation on the good results for the league derived from his activities during the past year, a toy automobile with 10-in. wheelbase. This jest was followed up by his "real friends, not on the committee," with the presentation of a handsome scarfpin from the league.

**Mr. W. W. Freeman** has been elected president of the Union Light, Heat & Power Company, of Cincinnati, and the South Covington & Cincinnati Street Railway Company, subsidiaries of the Columbia Gas & Electric Company,



W. W. FREEMAN

vice Mr. James E. Ernst, resigned. Mr. Freeman prior to going to Cincinnati was connected with the Alabama Power Company at Birmingham, Ala., and prior to that was for many years vice-president and general manager of the Edison Electric Illuminating Company of Brooklyn. He is a past-president of the National Electric Light Association and of the Association of Edison Illuminating Companies and is one of the best-known executives in the central-station field. His career has been rather remarkable and is indicative of the possibilities open to men of initiative and enterprise.

Born in Exeter, Ontario, on June 8, 1872, Mr. Freeman took up work in the lighting industry as a stenographer with the Brooklyn Edison company, advancing step by step to be vice-president and general manager. News of his resignation from the Brooklyn Edison company was received with regret by the employees of that organization, and the way in which those employees still idolize Mr. Freeman is a striking tribute to the personal character and magnetism of the man.



## New England

GLoucester, Mass.—Within the next six months the Gloucester El. Co. expects to purchase one 7.0-kw engine-driven alternator, one 30-kw exciter set, with necessary condensing apparatus and switchboard apparatus. F. L. Munger is superintendent.

FREDERICK, Md., Jan. 13.—It is reported here that the Government is planning to build a power plant at the old Western mill on the Potomac River. The proposed plant will have an output of 15,000 h. p. maximum, and will supply electricity, it is said, for lighting the streets and operating the street railway system of Washington.

[illegible]

HAVANA, ILL.—The City Council awarded the contract for lighting the city to the Central Illinois Power Co. for a period of one year. Un-





## New Incorporations

**DUQUOIN, ILL.**—The Carriers Mill Electric Co. has been organized with a capital stock of \$25,000 to construct and operate an electric-lighting plant. The incorporators are H. E. Kimmel, W. E. Taborn and J. W. Hesse.

**LAKEVIEW, IND.**—The Akron & Lakeview Utility Company has been incorporated by W. K. Stevenson, V. J. Lidecker and others. The company is capitalized at \$25,000 and

proposes to furnish electricity to cities and towns in this vicinity.

**ROANN, IND.**—The Roann Lt. & Pwr. Co. has been incorporated with a capital stock of \$10,000 to supply electricity. The incorporators are George H. Brodbeck, Dow Van Buskirk, R. F. Schuler, and others.

**LEWISTON, MAINE**—The Androscoggin Lt. & Pwr. Co. has been organized with a capital stock of \$2,000,000. The company is a merger of the Libbey and Dingley interests in Lewiston and the Chisholm interests in Rumford. Harold S. Libbey is president

and Julius E. Parkhurst treasurer and clerk.

**FESSENDEN, N. D.**—The Fessenden Lt. & Pwr. Co. has been incorporated with a capital stock of \$35,000 by Abram Baldwin, H. C. Witcomb, of Oberon, and O. J. Kaufman, of Velva.

**ALLENTOWN, PA.**—The Lehigh Township El. Lt. & Pwr. Co. and the Walnutport El. Lt. & Pwr. Co. have been granted charters. Each company is capitalized at \$15,000 and proposes to operate electric light and power plants. The incorporators are H. R. Fehr, Charles N. Wagner and A. H. Cantlin.

# Weekly Record of Electrical Patents

## UNITED STATES PATENTS ISSUED

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York, N. Y.]

- 1,111,848 (issued Sept. 29, 1914). MEANS FOR ELECTRICALLY DETERMINING TRANSMITTING POWER. W. E. McCoy and S. D. Sprong, New York, N. Y. App. filed April 1, 1912. A rotating power-transmitting shaft, two generators mounted thereon between the driving motor and the load and having terminals of like polarity connected in circuit with an electric meter interposed.
- 1,113,955. ELECTRIC INCUBATOR. E. F. A. Carey, Missoula, Mont. App. filed June 16, 1914. Maintains constant predetermined temperature.
- 1,114,003. MAGNETO. E. J. Kane, Chicago, Ill. App. filed Aug. 25, 1911. Inclosed rotor has an oscillatory movement.
- 1,114,007. ELECTRICAL SIGNALING SYSTEM. E. E. Kleinschmidt, New York, N. Y. App. filed Jan. 12, 1909. Improved track circuit.
- 1,114,044. TYPEWRITING - MACHINE OPERATOR. L. R. Roberts, Rutherford, N. J. App. filed March 16, 1910. Rotary power driver is rendered operative by depression of the keys.
- 1,114,048. CALLING DEVICE. H. O. Rugh, Sandwich, Ill. App. filed Sept. 1, 1910. For selective signaling circuits.
- 1,114,049. SIGNALING SYSTEM. H. O. Rugh, Sandwich, Ill. App. filed Sept. 1, 1910. Employing selective call boxes.
- 1,114,071. MAGNETIC SEPARATOR. G. Ullrich, Magdeburg, Germany. App. filed July 3, 1913. For simultaneously treating various kinds of ores.
- 1,114,078. TRAIN SIGNALING AND CONTROLLING SYSTEM. J. H. Webb, Jr., Denver, Col. App. filed June 8, 1908. Dispatcher controls all semaphores in his division and can stop trains independent of engineers.
- 1,114,089. ELECTRIC-LIGHT-ADJUSTING SOCKET. D. Yarnada, Santa Ana, Cal. App. filed Nov. 17, 1913. Carries light-adjusting resistance sections.
- 1,114,096. MINER'S BLASTING BOX. J. Bee-neck, Nanticoke, Pa. App. filed Dec. 11, 1912. Has a key-controlled circuit-closer.
- 1,114,118. RAILWAY TRAFFIC CONTROLLING SYSTEM. C. J. Coleman, New York, N. Y. App. filed July 30, 1910. Connection from signal to signal effected through track rails as conductors.
- 1,114,130. TROLLEY HANGER. J. T. Gaff, Atlanta, Ga. App. filed Oct. 11, 1913. Adapted for use with differently sized wires.
- 1,114,149. ELECTRIC SWITCH. C. J. Klein, Milwaukee, Wis. App. filed Nov. 21, 1912. Operated by a single push-button.
- 1,114,174. CONTROLLING APPARATUS FOR TELEPHONE SWITCHING SYSTEMS. E. C. Molina, East Orange, N. J. App. filed Oct. 2, 1907. Has a single primary-controlling apparatus governing a plurality of secondary controllers.
- 1,114,207. ELECTRIC CIRCUIT LIGHTER. H. G. Weeks, Chicago, Ill. App. filed Aug. 5, 1912. Cigar is heated by highly heated air instead of by direct contact with heater unit.
- 1,114,225. INTERRUPTING DEVICE. C. N. Cahusac, New York, N. Y. App. filed May 19, 1912. Electromagnetically closes circuit springs at definite periods.
- 1,114,275. ANNUNCIATOR. A. Lungen, New York, N. Y. App. filed Dec. 19, 1911. Made of a minimum number of stampings.
- 1,114,283. TROLLEY. J. M. Olinger, Springfield, Ohio. App. filed May 14, 1913. Trolley pole is quickly detachable from its stand.
- 1,114,340. NON-RENEWABLE PAPER R C

- Cole, Hartford, Conn. App. filed March 17, 1913. Terminals, once assembled, cannot be removed without causing visual damage.
- 1,114,361. ELECTRIC DYNAMO. W. K. Howe, Rochester, N. Y. App. filed April 28, 1912. Annulus of magnetic material expanded into engagement with polar projections.
- 1,114,366. WIRE TERMINAL. G. C. Knauff, Chicago, Ill. App. filed Feb. 21, 1913. Particularly for sockets of auto-lighting systems.
- 1,114,379. PARTY-LINE EXCHANGE. N. E. Norstrom, Chicago, Ill. App. filed May 29, 1909. Improvements in substation apparatus.
- 1,114,380. TROLLEY BASE. W. J. Paul, Everett, Mass. App. filed Sept. 19, 1912. Pressure of the trolley is transmitted in line with the center of rotation of the trolley stand.
- 1,114,404. ELECTRIC HEATER AND HUMIDIFIER. W. J. Smith, Twin Falls, Idaho. App. filed May 16, 1914. Water jacket is so that vaporized liquid mixes with the heated air.
- 1,114,405. DYNAMO-ELECTRIC MACHINE PROVIDED WITH COMMUTATING POLE PIECES. C. H. Smoot, Hollis, N. Y. App. filed Sept. 5, 1911. Compensates for the demagnetizing action of the armature.
- 1,114,408. CORRECTING DISTURBANCES ON TELEPHONE AND OTHER LIKE WIRES. J. B. Speed, New York, N. Y. App. filed Oct. 29, 1912. Neutralizes the fundamental frequency and harmonics of the disturbing circuit by application of alternating currents possessing characteristics similar to said components of the disturbing current.
- 1,114,409. APPARATUS FOR CORRECTING DISTURBANCES ON TELEPHONE AND OTHER LIKE WIRES. J. B. Speed, New York, N. Y. App. filed Nov. 4, 1912. Beam of light produces a visual diagram indicative of the disturbance.
- 1,114,413. ELECTRIC SADRION. E. F. Traubert, Los Angeles, Cal. App. filed August 21, 1913. Heating wire threaded spirally through perforations in a mica sheet.
- 1,114,427. AUTOMATIC RAILWAY SIGNALING SYSTEM. C. L. Bonn, Hawkeye, Ia. App. filed Dec. 16, 1909. Indicates the respective positions of the trains.
- 1,114,428. AUTOMATIC RAILWAY-SIGNAL AND RELAY TROOPER. C. L. Bonn, Hawkeye, Ia. App. filed Oct. 24, 1910. Accumulates impulses and later impresses them on the line.
- 1,114,429. AUTOMATIC RAILWAY SIGNALING DEVICE. C. L. Bonn, Hawkeye, Ia. App. filed Jan. 10, 1910. Indicating at station the positions of the various trains.
- 1,114,430. INDUCTION AUTOMATIC STOP AND CAB-SIGNAL SYSTEM. C. L. Bonn, Waterloo, Ia. App. filed July 26, 1912. No insulation required between adjacent blocks.
- 1,114,432. AUTOMATIC SIGNALING DEVICE. C. L. Bonn, Waterloo, Ia. App. filed Jan. 6, 1913. Cab signal embodying a pivoted magnetic needle and means for deflecting it.
- 1,114,477. RAILWAY SIGNAL. R. F. Hudson, Richmond, Va. App. filed Aug. 4, 1910. Traffic rails serve for conductors along the line of way.
- 1,114,496. SOUND INTENSIFIER. C. D. Lvon, St. Louis, Mo. App. filed June 13, 1912. Hollow conical shell attached to the perforated outer diaphragm of an ordinary telephone transmitter.
- 1,114,515. ELECTRIC-CIRCUIT SHUNT. W. H. Pratt, Lynn, Mass. App. filed Feb. 3, 1913. For measuring instruments.
- 1,114,516. ELECTRICAL MEASURING INSTRUMENT. D. R. Price, Brant Rock, Mass. App. filed Feb. 10, 1913. Electrostatic type.

- 1,114,517. INDICATOR. J. B. Purvis, Detroit, Mich. App. filed Dec. 31, 1910. For speed and direction; particularly for marine engines.
- 1,114,528. CASING FOR ALARM DEVICES. G. I. Rockwood, Worcester, Mass. App. filed Dec. 31, 1913. Fire alarm; clapper-operating waterwheel actuated by water released by sprinkler, and a diaphragm-operated electric alarm.
- 1,114,534. EXCITATION OF DYNAMO-ELECTRIC COMMUTATOR MACHINES. A. Scherbus, Baden, Switzerland. App. filed May 23, 1908. Uses a single or polyphase commutator-exciting machine.
- 1,114,548. TRANSFORMER. G. Stern, Berlin, Germany. App. filed Aug. 22, 1913. Plug switch by which the terminals of the groups of windings can be differently connected, beneath the surface of the oil.
- 1,114,558. PROTECTIVE DEVICE. E. B. Wedmore, Rugby, England. App. filed Aug. 19, 1909. For relays of the time-limit type.
- 1,114,565. ELECTRIC BURGLAR-ALARM SYSTEM. J. P. Williams, New York, N. Y. App. filed June 1, 1910. Permits access to guarded structure by authorized persons.
- 1,114,578. STOCK QUOTATION INDICATOR. R. W. Bumstead, Boston, Mass. App. filed June 22, 1905. Indicates maximum and minimum as well as market quotations.
- 1,114,597. SIGNALING SYSTEM. F. A. Emery and A. A. Adams, Brookline, Mass. App. filed March 13, 1909. Particularly for transmitting indications of range.
- 1,114,612. ELECTRICAL RECORDER. A. S. Hibbard, New York, N. Y. App. filed Feb. 14, 1912. For keeping tally on output of machines.
- 1,114,626. SERIES-MULTIPLE SWITCH AND CONDENSER FOR WIRELESS-TELEGRAPH SYSTEMS. T. B. Miller, Seattle, Wash. App. filed April 23, 1913. Series-multiple switch and condenser, mechanically and electrically associated.
- 1,114,625. METHOD FOR CLEANING METALS. A. A. Nelson, Chicago, Ill. App. filed Feb. 25, 1914. Employs an alkaline electrolyte.
- 1,114,636. INDICATOR OR DETECTOR FOR LUBRICATING SYSTEMS. A. A. Nelson, Iowa City, Ia. App. filed July 9, 1913. Oil-supported float short-circuits magneto when oil is low.
- 1,114,642. APPARATUS FOR ELECTRICALLY CONTROLLING AIR BRAKES. E. L. Orcutt (deceased), Somerville, Mass. App. filed July 12, 1908. Has an electrically operated valve for setting the brakes and manual valve for releasing the brakes.
- 1,114,654. FUSE CARTRIDGE. J. W. Steelman, Philadelphia, Pa. App. filed May 16, 1913. Fuse wire clamped between wedge-shaped blocks.
- 1,114,665. MANUFACTURE OF ELECTRICAL CONDUCTORS. T. B. Allen and L. B. Coulter, Niagara Falls, N. Y. App. filed Nov. 21, 1911. Impregnates a silicon-carbide article with a colloidal solution of graphite.
- 1,114,667. PROCESS OF MAKING ELECTRODES FOR SECONDARY BATTERIES. J. Apozanski, Moscow, Russia. App. filed Dec. 14, 1910. Rapidly dries the paste filled in the grids and impedes the exit of gases.
- 1,114,680. ELECTRIC SWITCH. H. W. Denhard, San Francisco, Cal. App. filed Oct. 31, 1911. A stationary cam member accelerates the movement of the operating member.
- 1,114,682. ELECTRIC SWITCH. F. L. Eager, Waterbury, Conn. App. filed June 16, 1911. Trolley wheel closes indicating circuit.
- 1,114,697. ELECTRON - DISCHARGE APPARATUS. A. W. Hull, Worcester, Mass. App. filed Dec. 29, 1913. Electron discharge produced within a positive field.

# Electrical World

THE CONSOLIDATION OF ELECTRICAL WORLD AND ENGINEER AND AMERICAN ELECTRICIAN

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## Regulation and the Mayors

In the program for the conference of mayors which is to be held in Philadelphia next week it is natural to find a preponderance of public regulators. A rough classification of the speakers shows that six are presumably identified with the company point of view, three are from state commissions, four will certainly speak for city regulation, and six, although active on the public side of regulation, have had parts in various movements for local and for either state or federal control. Those who are placed in the last-named group under our admittedly arbitrary classification are Congressman Robert Crosser and Messrs. Delos F. Wilcox, Edward W. Bemis, Charles E. Merriam, Frederick C. Howe and Louis D. Brandeis. Representatives of the companies are fortunate in their opportunity to say a word for the abused and misunderstood privately owned public utility. It is to be expected that argument will result from the presentation of views given by different sides of the living issue between producer and consumer. It is a meeting primarily of the mayors, and, however much they may want their ideas to prevail, they have courteously given the other side a chance to be heard. The results accomplished by the discussion will be the test of the real value of the conference, and prejudgment should be withheld. What the mayors are likely to hear, if they do not know it already, is that there is a very earnest sentiment in favor of regulation among public service corporate officials and a willing acceptance by most companies of policies that give fair protection to capital accounts and the rate of return. On the other side they will undoubtedly hear pleas for municipal control and, to cite the allotment of a part in the program to "fifteen-minute reports from managers of typical municipal plants," likewise for municipal ownership. On the whole, however, it is regulation that is the apparent accepted subject of the gathering.

## Economics in Distribution

Opportunities to save money either in first cost or in the operating expenses of electrical distribution systems are far from exhausted, and it is a question if any branch of electrical service offers a better field for study on a rainy day than does this. It will repay many engineers associated with central stations to analyze the mechanical details of lamp suspension, transformer mountings, motor supports and many other similar matters. In factory work transformers are now sometimes placed on concrete piers instead of being hung on complex wooden frames involving a considerable bill for material in erection; lamps that are installed over

suburban railway-station platforms without roofs can be effectively supported from a catenary steel wire of long span, doing away with the need of frequent and obstructing wooden or iron posts; and in some classes of work, as in grain elevators and other plants where the office lighting constitutes a very small proportion of the total illumination service, without demands for extremely close voltage regulation, the installation of separate transformers for lighting is being abandoned. All the energy used in many such cases is billed at a single rate, and, with care in circuit designing, the service reasonably meets the requirements at a considerable saving in investment. The advent on the market of portable substations and of standard structural-steel line towers of small size is also a movement in the right direction. The older the far-sighted electrical man grows, the more he sees that close attention to the mechanical side of his profession, whether in distribution work or elsewhere, pays adequately.

## Satisfactory Gas Rate-Making

The recommendation that was made to the American Gas Institute by its committee on rates, that a permanent committee be established to deal with this subject, is a step in progress whose importance should not be belittled. It is significant of more rapidly changing conditions that the committee says: "There is ample evidence to show that it is a serious question if a flat rate for gas will be commercially satisfactory in the future." The committee might have gone further and expressed the same doubt with respect to the present, if not also to the past. The commercial point of view is not the only one to be considered, however, and the committee does not hesitate to say, in the abstract which is published in this issue, that commissions are considering these questions. With the urban electric railway the gas company has clung to the flat rate when other privately owned public utilities have found promise and prosperity in advanced methods. Steam railroad, long-distance interurban electric railway, electrical central station and telephone have thrived financially and physically on rate-making proportioned according to cost or value of service. Decreasing rates for gas, due to city agitation and commission and court decisions, make the issue more acute for companies now than in the earlier years of the industry. This consideration compels action even if the commercial possibilities of better rate-making do not do so. Plenty of unoccupied area remains for the sale of both gas and electrical energy, and the action of the Gas Institute will accelerate development in the electrical industry.



### Stability of the Central-Station Industry

The state of electrical central-station business, like the news of the day, is the subject of interest, study and discussion. In presenting accurately the conditions of the industry the *Electrical World* has a live concern in business conditions. There is a sane, middle body of business men who are neither terrorized by depressing signs nor over-buoyed by jubilant prosperity. As a whole the electrical industry cannot regard its achievement and progress with any other feelings than pride for the past and hope for the future. With good reason it is an optimistic industry. Yet it is not ever so blind as to be unwilling to see and accept judgment forced by hard facts. From the beginning the leaders of the industry have refused to accept discouragement. They have been pushing and alert when business justified expansion, careful only when caution was imposed by banking or temporary trade conditions. But underlying these policies, dominating all other influences, is the steady upward growth which has always been characteristic of electrical central-station history. Growth has gone on in spite of all hindrances. It is going on now. Though the terrible European war, paralyzing the world-wide commerce of nations, has stopped expansion, it has not stopped intensive electrical development in this country. The difficulty of raising new capital has not stopped intensive cultivation in districts where constructed facilities already exist.

Statistics submitted to the *Electrical World* by 60 per cent of the central-station industry in New England show 7.5 per cent gain in gross revenue in August over August, 1913. The gain in July was 9.3 per cent, in June 8.3 per cent and in May 8.4 per cent. Returns from 78 per cent of the central stations in the Pacific and Mountain States show a gain of 4.6 per cent in August over August, 1913. Returns from 71 per cent of the central stations in the Atlantic States show that in August they gained 8.2 per cent over August, 1913. This compared with gains of 10.2 per cent in July, 6 per cent in June and 14.5 per cent in May. These facts accord in general with the statements from prominent men published in these columns, that increases are still maintained, though they may be at reduced rates. Elsewhere in this issue Mr. S. R. Bertron says that so far this year the lighting companies represented by his firm have increased in gross income 6 per cent over last year. Allowing for the reduction in general trade activity in the early months, this is a fair average gain. He reiterates his confidence in public utility securities.

We present in this issue the wholesome discussion of conditions by Mr. Holton H. Scott, president of the N. E. L. A. Saying that conditions are being readjusted rapidly and that increases in gross income are still shown, Mr. Scott declares that new-business campaigns of the central stations will lead to increased output and thus inevitably to demands upon manufacturers and jobbers. He is, of course, relying upon the recuperative power of the industry, which has never failed. If the central-station industry continues to put forth its best efforts, it will continue to show good results. It

cannot overcome in a moment the effect of the still cautionary banking control which restricts security markets. It can maintain its present encouraging record of gross and net earnings. It can build up new business by determined effort. It can obtain new customers to replace those whose consumption is lessened. It can study more effectively than ever before new avenues for application of energy in each community. Best of all, it can still be, what it has proved itself many times fitted to be, the optimist industry.

### Parallel Operation of Transformers

It is well known that when direct-current shunt generators are operated in parallel between the same busbars at equal internally generated emf the share of the load which each generator will automatically acquire is the ratio of its conductance to the sum of all the generator armature-circuit conductances. This is the same ratio as though the generators were devoid of emf but were supplied with current collectively from a separate source. Each generator armature circuit would give passage to a share of the current determined by the above ratio.

When a plurality of transformers operate in parallel on the same primary and secondary busbars the actions are at first sight confused by the magnetic interlinking between the primary and secondary mains. But if the secondary circuit is reduced arithmetically to its equivalent energy-consuming circuit at primary pressure, thereby changing the transformer in imagination from a step-down to a level transformer, it is known that the primary and reduced secondary circuits, now at equal pressure, may be connected conductively through the total impedance of the transformer windings, thus making a simple conductive system. A plurality of transformers in parallel become a group of equivalent reactors or impedance coils connected in parallel between the primary and the leveled-up secondary mains. The share of the current supplied through each transformer is the ratio of its conductance to the total conductance of the group, except that current, power and conductance must all be interpreted vectorially or worked out by means of two-dimensional arithmetic.

The application of some of the above principles is illustrated in an article by Mr. Richard C. Powell, on another page of this issue, on the parallel operation of subway transformers. When such transformers are operated together in parallel they divide the load in the proportions of individual admittances to the total admittance of the group. If the reactance factors, or ratio of reactance to resistance, of all the individuals in the group are the same or—to express the same idea in other terms—if the impedances of the equivalent transformer reactance coils have the same argument or angle, then the ratios of single to total admittances will be identical with the ratios of single to total conductances, just as in the direct-current case; but if, as commonly happens when the banked transformers have different sizes, their reactive factors are different, the ratios of

single to sum-total admittances may differ considerably from the corresponding ratios of mere conductances, and the transformers may not share the loads in equitable proportions. It is pointed out in the article that in the case of two transformers whose reactive factors differ considerably the disparity in load sharing may be practically serious. It may even be desirable to insert reactance artificially in the circuit of one transformer in order to bring about a better load distribution, lest either excessive heating or excessive plant installation be involved.

### The Electric Vehicle Abroad

In his paper presented at the Philadelphia convention of the Electric Vehicle Association, Mr. P. D. Wagoner showed quite clearly that our foreign friends, who were early in the electric-vehicle field, have exhibited commendable activity in invention. However, a canvass of all Europe indicates that only a few more than 3000 electric vehicles are in use there, and hence little need be said regarding the actual results obtained. This state of affairs is rather extraordinary, since the electric road vehicle had its origin in France, like the storage battery, and the French automobile makers have been for years in the front rank of progress. Adding to this the facts that gasoline is considerably more expensive abroad than here and that the roads are on the average much better, it is altogether extraordinary that progress has not been more rapid.

In this country the central stations have not been sufficiently awakened to a sense of their responsibility in the matter of charging stations. The trouble with the electric-vehicle business here resides chiefly in the inconvenience and difficulty of obtaining a recharge when necessary, and the electric-vehicle business will expand just in proportion as provisions for recharging are multiplied. The electric trucks and delivery wagons in particular are vastly more prominent in American practice than in Europe, which again may be in part accounted for by the fact that such vehicles are essentially those for city and suburban use, where no considerable radius from a convenient charging station has to be covered. In fact, the enterprising company which owns a considerable fleet of electric delivery wagons is quite certain to have its own charging station and organized repair staff, so that the vehicles will always be in condition. With respect to electric trucks, experience abroad seems to confirm experience here in showing a very good degree of economy. As compared with gasoline-vehicle practice the electric vehicle is nearly always much under-powered. It can go onto low speed and climb a hill if necessary, but there is no temptation for the driver of an electric truck to try scorching up a hill or, having delivered his load, to go on a wild "joy" ride back to the store. His facilities for scorching are very limited, although he has ample power to do the legitimate work for which the truck was designed. This fact alone is enough to give the electric vehicle the advantage in cost of operation if other conditions are anywhere nearly equal. Nor is there any waste of

energy by an electric delivery wagon when stopping to make deliveries, while with a gasoline vehicle the engine is kept running at considerable cost for fuel and repairs. These humble but practical virtues of the electric system of driving make for success, and it is not surprising to learn that the use of electric vehicles abroad, while still limited, was decidedly on the increase up to the time of the beginning of the war. We are rather inclined to think that since then the advantages of the electric vehicle have become in places very manifest, since it is about the only type which has not been commandeered for military purposes or, if not actually seized, deprived of its motive power by lack of fuel.

### Seat of Light Action in Selenium

Selenium is a remarkable substance from an electrical point of view. It was first obtained in 1817 by Berzelius. It exhibits two modifications, like sulphur—one amorphous and insoluble in carbon disulphide, the other crystalline and slightly soluble therein. The two modifications bear interesting physicochemical analogies to those of sulphur; but whereas sulphur, so far as is known, is always an insulator, selenium has a very appreciable electric conductivity which is affected by incident radiant energy within the limits of the visible spectrum, that is, by light.

Some experiments on selenium and deductions therefrom have recently been published in the *Philosophical Magazine* by Drs. F. C. Brown and L. P. Sieg, which, if they are corroborated, indicate that selenium possesses the power not only of responding electro-conductively to light at the point of incidence but also of transmitting that response to short distances beyond the point of incidence. If we grant the proposition that the electric conductivity of a plate of selenium is improved by illumination, we should naturally expect that if the plate is kept dark except at a single point where a beam of light falls, the conductivity of the plate would be modified only at this point and the rest of the plate would remain unaffected. Of course, if the action were thermal, we might expect to see it transferred from the illuminated spot to the outlying dark regions, in the slower and definite manner of heat conduction. The authors state, however, that in cases examined the change of conductivity was transmitted from the illuminated point to the outlying dark regions at a speed greater than could be accounted for by thermal conduction. It is claimed that this peculiar propagation of increased electric conductivity along the substance of a selenium crystal from the point where light falls to outlying dark regions indicates a new property of matter, not accounted for by acknowledged physical principles. If so, it is very important to clear up this action by experimental investigation. We know something about the conduction of mechanical stresses in matter, of electrons and electrical stresses, of chemical action, of heat, and of nervous stimuli in living organisms. Is it possible that the conduction of electric conductivity in selenium belongs to none of these modes of propagation?



# The News of the Week

## Activities and Events in the Electrical Field— Reports of Meetings—Commission Findings, Etc.

### Engineers to Determine Franchise Value

The Board of Estimate and Apportionment of New York City has authorized Mayor Mitchel to appoint engineers to determine the value of a franchise which the New York Edison Company asked to construct a transmission line along the Catskill Aqueduct. Two engineers in city departments and one outside engineer will be appointed. The company proposes to give energy for siphon service in return for the franchise.

### Electrical Manufacturers' Club

At the meeting of the Electrical Manufacturers' Club scheduled to be held at the Homestead, Hot Springs, Va., Nov. 4 to 7, as already announced in these columns, the program included addresses to be made by the Hon. Joseph E. Davies, Commissioner of Corporations, United States Department of Commerce, Washington, D. C., and by Mr. W. S. Kies, of the National City Bank, New York City. Mr. S. O. Richardson, Jr., Toledo, Ohio, is president of the club.

### Sale of Athens (Ohio) Municipal Electric Plant

The village of Athens, Ohio, has sold its municipal electric-light plant to the Hocking Power Company, of Nelsonville, Ohio, for \$15,000. A twenty-five-year franchise was granted to the company. The franchise provides for the following schedule: Residence lighting, 7 cents per kw-hr., with a discount of 5 per cent for prompt payment and a minimum monthly charge of 50 cents; commercial, 6 cents with 5 per cent discount and additional quantity discount; other commercial energy, 4 cents to 1 cent; wholesale energy, from less than 1 cent to 3 cents; street lighting (all night, 365 days per year), 80 cp, \$20 per year; 100 cp, \$25 per year; 250 cp, \$50 per year.

### N. E. L. A. Educational Committees

Mr. John F. Gilchrist as chairman of the National Electric Light Association committee on relations with educational institutions has appointed sub-committees with the following chairmen: Committee on lectures, Prof. H. E. Clifford; committee on courses and curricula, Prof. C. F. Harding; committee on employment of graduates and undergraduates, Prof. George D. Shepardson; committee on supplying information to economic departments, Prof. C. F. Scott.

The committee on lectures will probably arrange for a certain number of lectures to be given during the year by men in the electrical business before the student bodies of the colleges, and by members of the faculties of the colleges before sections of the N. E. L. A. The committee on employment of graduates and undergraduates will work out a plan under which central stations will avail themselves of the services of students during periods of vacation or after graduation. The committee on courses and curricula will determine for the benefit of students who expect to make public utility work their lifework what training is particularly desir-

able. The committee on supplying information to economic departments will take charge of disseminating the important literature of the central-station industry and important information in the economic departments of all of the colleges, so that those departments may be posted in the most recent practice of utility companies.

### Society for Electrical Development Adopts Membership Employee Button

To stimulate co-operative good fellowship and as a ready means of recognition of this affiliation both on the part of the member and the general public, the Society for Electrical Development, Inc., has brought out a membership employee button. The button, which may be mounted as a vest pin or stickpin or used in the coat lapel, is of blue and white enamel on gold plate, and is  $\frac{5}{8}$  in. in diameter. The cost postpaid is \$1, and the button is available for executives, salesmen, clerks and other responsible employees of members of the society.



### Mr. Burdett Advocates Electric Refrigeration

The special commission named by the Massachusetts Legislature to investigate the question of placing the ice business under state regulation and the expediency of permitting electric-service companies to undertake this business heard at Boston on Nov. 4 Mr. Everett W. Burdett, counsel for the Massachusetts Electric Lighting Association. Mr. Burdett opposed the authorization of ice-making and merchandising by local central stations, pointing out that success in this field has been confined to small municipalities in the South and West where the combined business can be handled under a single management. The off-peak, low-rate possibilities of electric service in the field of private refrigeration were pointed out by the speaker, who also urged the large number of ice harvesters and dealers present to investigate the economies of artificial ice manufacture on a large scale by the use of purchased energy. He predicted that unless the ice industry takes early opportunity to study the possibilities of electric service for wholesale production its commercial success, in face of the growing public demand for artificial ice, may be jeopardized.

### Jovians' Plan for Higher Individual Efficiency

Within the next sixty days the commercial division of the Jovian Order plans to inaugurate a movement to increase the efficiency of every individual in the electrical industry. The campaign will be propagated somewhat along the lines of the "Safety first" movement, the slogan being "Efficiency wins." This slogan will be printed on thousands of cards and signs suitable for hanging in offices and for outdoor use. Besides the printing and distribution of these signs the plan includes the publication of hundreds of thousands of single-sheets, pamphlets and envelope-stuffers bearing

pathy, hard-hitting arguments on the value of efficiency as the road to personal advancement. Thousands of picture stamps bearing the slogan of the movement and a word or two that carries a "punch" will be used as stickers for envelopes and letters. The plan also includes efficiency talks before Jovian leagues and articles in the daily and electrical press, as well as papers from men who have achieved acknowledged success, not only in every branch of the electrical industry, but in each department of every branch. Large quantities of these papers will be printed in pamphlet form and will be placed at the disposal of the employers of the industry for distribution among employees. On the whole, it is expected that the campaign will induce electrical workers to think of efficiency as often as they now think of safety.

### Electric Automobile Salon at Boston

The second annual electric automobile salon at Boston, Mass., was opened in the ballroom of the Copley-Plaza Hotel on Nov. 2 under the auspices of the Electric Motor Car Club of Boston. This distinctive event, which President L. D. Gibbs of the club declared to be the only salon of its kind known in the world, was attended by a representative number of leaders in the social and professional circles of Greater Boston. At the formal opening, which occurred on Monday evening, Mr. Gibbs referred appreciatively to the growth of the electric passenger and commercial vehicle, emphasizing the economic possibilities of the latter and sketching the attractive features of the modern private passenger car when electrically operated.

The increase in the use of electric pleasure cars, and indeed of electric commercial cars, in the Greater Boston territory, said the speaker, has not been sporadic; it never will be. But it will be as certainly continuous as will be the steadily increasing commercial, industrial and social advancement in this part of the country. Economy in commercial operation has been the first consideration and may be credited with 80 out of 100 possible points for the electric vehicle, so as business has grown the use of the electric truck has grown. Growing business almost uniformly means—at least in careful New England—growing profits, increased resources from which to achieve improvement in domestic and social life. Here the electric pleasure automobile has entered the field. It may be a peculiar comparison, but the man who sees his electric truck going about its work with steadiness and efficient sobriety is most likely to appreciate what a similar mechanism will do under his pleasure car. We have passed through our attack of speed mania, the speaker went on to say; it was as catching as measles. For a long time few ever thought of purchasing a car without a guarantee of at least 60 miles an hour. There was a time when bicycles geared to at least 60 were in demand, but when it was found that high gears, although conducive to high speed, were equally conducive to leg-ache and heart trouble the public became more reasonable. Dangerous possibilities of high speed in the hands of inexperienced and irresponsible persons have handicapped, if not the manufacture, at least the enjoyment of automobiles.

More than 16,000 complimentary cards of admission were sent by the club and by Boston representatives of the manufacturers of passenger cars and accessories to selected persons within a radius of 40 miles from Boston, and attractive posters were distributed in the leading hotels, clubs and prominent business houses. The suburban electric railway cars carried dasher signs calling attention to the salon. As was the case last year, any orders taken by the exhibitors were voluntarily

offered by the purchasers, the soliciting of patronage at the salon being forbidden.

A pleasurable feature of the salon was an arrangement for exhibition and general dancing in the small ballroom adjoining the large one. The salon was under the management of Mr. C. H. Miles, of the Edison Electric Illuminating Company of Boston, and was open from 10 a. m. to 11 p. m. daily from Monday to Friday inclusive.

### Depreciation and Rates Discussed Before American Gas Institute

Among the many papers which were presented at the annual meeting of the American Gas Institute held in New York recently were several of particular interest to the electrical industry. The text of these papers, abstracts of which are published herewith, is subject to final revision for publication in the Gas Institute *Proceedings*. Mr. Halford Erickson, Railroad Commission of Wisconsin, presented a paper on "Depreciation Problems." Dr. A. C. Humphreys, president Stevens Institute of Technology, read a paper on "In Rate-Fixing by Commission Should 'Depreciation' Be Deducted from Plant Valuation?" A report was presented by the committee on rates which recommended the establishment of a permanent standing committee to deal with this subject. On hearing the report the meeting recommended the creation of the committee, and the matter now goes to the board of directors for definite final action. The members of the committee that presented the report on this subject are Dr. William McClellan, chairman; Messrs. A. E. Forstall, R. G. Griswold, C. N. Jelliffe and A. S. Miller.

#### Mr. Erickson on Depreciation

In his paper Mr. Erickson dealt mostly with the financing and the accountability of depreciation and with certain questions that are involved in distinguishing between depreciation and ordinary repairs.

There is still considerable dispute as to how depreciation should be measured or determined, said Mr. Erickson. Some depend on life tables of such property as that involved; others again upon their own judgment in the matter, based on the inspection of the property and the operating and other local conditions. Both methods are important. Life tables properly kept, classified and used throw a great deal of light upon the question. This may also be said of personal inspections of the property and the conditions by which its life is affected. Especially is this true when the inspections are made by competent parties. The best and most satisfactory way, however, is to use both methods.

Only in exceptional cases, such as the destruction of property due to unforeseen and undeserved calamities or causes, and under highly abnormal conditions in certain other respects, is it justifiable to charge renewals or replacements to capital. In order to prevent serious fluctuations in the operating expenses and in the net earnings it is best to provide for depreciation in advance through regular annual charges against earnings; the charges are adjusted as closely as possible to the rate at which depreciation is accrued. Larger plants, such as railways, are often in position to adjust their renewals so that the cost remains fairly constant from year to year. In such cases it may not be necessary to provide for depreciation in advance, since the cost of the renewals can then be charged directly to operating expenses. Under this practice, however, there is often a great deal of accrued depreciation that is not offset by assets in other forms. Without reserves of some sort the investment cannot be kept intact.

That depreciation in a broad sense includes repairs is



evidenced by the fact that it is the purpose of depreciation to keep the cost of the property intact. For it is obvious that the integrity of the investment cannot be maintained through depreciation allowances alone unless these allowances are also large enough to cover such losses as those which are made up by repairs. While it is suggested herein that depreciation and repairs should be kept apart, these suggestions do not mean that it is believed that these items cannot possibly be properly dealt with if combined into one. On the contrary, such combinations might be practicable not only in the provisions that are made for these costs, but also in the expenditure of these provisions.

Nevertheless, there are certain advantages in keeping depreciation and repairs apart that should not be overlooked, said Mr. Erickson. Such practice seems to be more natural and therefore more easily understood. It would seem to enable closer estimates of the respective cost of these items than can be had in any other way. It tends to facilitate the closest practicable adjustment between the depreciation that has taken place in the property and the reservations made to offset such depreciation.

#### Paper of Dr. Humphreys

Dr. Humphreys said that, apart from the method pursued as to the making of the estimate and the accuracy of the estimate, however prepared, depreciation, meaning the accrued liability for the deferred or periodic renewals of plant, should not be deducted from the valuation of the plant. In opposing deduction from plant valuation for depreciation it is assumed that the plant is maintained through current expenditures for repairs and renewals in a condition to render to the ratepayer effective and economical service; that the cost of deferred or periodic renewals is included in the cost of service and that, therefore, the public service corporation can be held liable for such renewals when necessary and that depreciation so defined is not the reduction in worth or value as viewed by a possible purchaser but is the accrued liability of the owner to renew all parts of plant as these parts become uneconomical or inefficient for operation because of physical decay, obsolescence or inadequacy.

Dr. Humphreys added: "If we who are trying to protect honest investments in public utility properties—properties which have been efficiently maintained by well-advised expenditures from income for repairs and renewals—had to contend only with the views of the 'experts' who are retained and paid to depreciate the value of such investments, our task would be far less difficult to meet than is the fact. Unfortunately, the representatives of the public service corporations are not infrequently led astray on this question. Some are misled by their failure to differentiate between actual depreciation and the accrued and accruing liability for renewals in prospect. Others are not so misled but weakly argue that, as the commissions and courts take the position that depreciation should be deducted, they might as well conform to this position. Not only is this not honest to the public service corporations but it is not honest to the commissions and courts, for the honest members of these bodies have the right to look to us to educate them in matters more particularly pertaining to our profession."

An earnest protest was entered by Dr. Humphreys against the methods "pursued by not a few 'valuation engineers'; namely, in following, more or less blindly, tables of average lives for the several types and parts of plant. When we reflect that these tables, if founded upon actual facts at all, are the result of averaging widely differing data, we should be able to see that no such average is applicable to a specific case, though it

might be of value in connection with generalizations. The fact is, I presume, that these tables are, as a rule, not the average of actual results, though they may be the average of differing opinions."

#### Report of Committee on Rates

The committee recommended the establishment of a permanent committee on rates for the following reasons:

"(1) In these days of increasing operating expenses and constantly lowering selling prices of gas it becomes important that every consumer pay as large a part as possible of the cost of giving him the product and service. (2) It is of the utmost importance that a schedule of rates be used which will induce the greatest possible use of gas. This means that if a consumer, by his use, can earn a lower rate, this will induce him to increase his use. (3) It is desirable to know definitely where and to what extent discrimination, if any, exists, and how best to eliminate it. (4) Commissions are considering these questions, and it is desirable for companies to be well informed in regard to them. (5) Should it become desirable to introduce gas rates other than flat rates, a preliminary period of investigation, education and discussion is necessary to facilitate changes. (6) Should a company see the desirability of a new kind of rate, and very reasonably lack the courage to make the change on account of the delicate relation usually existing between the company and its public, it would be strengthened greatly in its determination by the work and assistance of such a committee."

#### CONVENTION OF KANSAS UTILITY MEN

Kansas Gas, Water, Electric Light and Street Railway Association Discusses Service Costs, Rates, Rural Distribution and Electric Merchandising

The seventeenth annual convention of the Kansas Gas, Water, Electric Light and Street Railway Association was held at Arkansas City, Kan., Oct. 22, 23 and 24. Most of the morning and afternoon of the first day were given over to registration and to a picture-show session at which films prepared for electrical manufacturers and for the Electric Vehicle Association of America were shown. An illustrated paper on high-efficiency lamps, by Mr. R. S. Obermeyer, Kansas City, Mo., was also read at this meeting.

At an evening meeting called so that more time might be given to papers Mr. M. T. Flynn outlined in detail the office-record system of the Standard Electric Light Company, Kansas City, Kan. In the discussion of this paper both Mr. E. A. Wright, Manhattan, and Mr. W. H. Fellows, Leavenworth, stated that all record keeping in the companies with which they were connected was accomplished by three clerks. The Manhattan company has 2200 accounts and the Leavenworth company has 7000 accounts. Others who spoke were Messrs. A. L. Newman, Arkansas City; J. R. Murphy, Great Bend, and L. K. Green, Concordia.

#### Cost of Distribution and Overhead Charges

Ignoring the production cost of electrical energy, said Mr. E. A. Wright, of the Manhattan Ice, Light & Power Company, the costs of serving the company's various classes of business during the last fiscal year were: Residence lighting, 8.95 cents per kw-hr.; business lighting, 5.15 cents per kw-hr.; street lighting 2.45 cents per kw-hr., and motor service, 0.221 cent per kw-hr. Adding production cost at 2 cents per kw-hr., it is seen that the actual cost of serving these patrons ranged from 10.95 cents per kw-hr. for residence lighting to 2.221 cents per kw-hr. for motor serv

ice. These data were secured by apportioning the fixed charges and operating expense among the various classes of customers and assuming distribution losses, except in the case of street lighting, as being 20 per cent of the energy delivered to the customers. The plant from which the figures were compiled serves a population of 7800 people, not including 2500 student residents who are in the city nine months of the year. During the year the company had an average of 1472 electric meters on its lines, serving forty-one motor-service customers, 252 business-lighting patrons, 1179 residences and the municipal street lighting.

Discussion which followed the paper showed that some thought 20 per cent distribution losses too low an assumption, but Mr. J. R. Murphy, Great Bend, said that with a 41 per cent load-factor his plant had shown 22.5 per cent and 18.5 per cent distribution losses for the last two years. Others who spoke were Messrs. C. G. Lafite, Eureka, and W. R. Waggoner, Salina.

Following this technical paper and discussion, the meeting was enlivened by a paper entitled "Has Business a Humorous Side?" by Mr. L. O. Ripley, Wichita.

#### Electric Service for the Farmer

Mr. C. L. Brown, Abilene, in a paper on rural electric service declared that the telephone and the magneto on the farmer's automobile have created a demand for farm lighting and motor service. In most cases the farmer is willing to pay well for the service as he balances the cost of electric service against the cost of acetylene or gasoline-engine lighting plant. The Riverside Light & Power Company, of which Mr. Brown is secretary, now has twenty-seven rural customers, from whom it derives an average monthly revenue of \$4.18. Some of these customers are served from iron-wire circuits operating at 2300 volts.

In the discussion of the paper it was shown that Kansas farmers are paying as much as \$350 for their share in electric-service lines, and the minimum bill demanded by the companies ranges from \$1.50 to \$5. Construction practice varies in the different communities, some operators favoring iron, some copper-coated and others copper wire. Those who participated in the discussion were Messrs. A. L. Newman, Arkansas City; J. R. Murphy, Great Bend; M. T. Flynn, Kansas City; W. H. Fellows, Leavenworth; L. K. Green, Concordia; T. Harvey, Wichita; L. C. Spake, Chicago; D. Holman, Larned, and C. G. Lafite, Eureka.

A paper of particular interest to the gas and water utility operators presented by Mr. N. R. Waggoner, Salina, described practical methods of making electrolysis tests and of providing remedies for electrolytic troubles. Insulating pitch coverings for all pipes and insulating joints at 500-ft. intervals were favored by the speaker.

Mr. C. L. Draper, Kansas City, Mo., read a short paper pointing out the value of electrical information gathered by manufacturers and distributed among the central stations to help in developing electric-service business.

#### Papers on Rates and Finance

In a paper entitled "Rate Making" Prof. George Shadd, Lawrence, expressed his belief that rates ought to be made so that they would automatically aid in the development of off-peak business. He declared further that in estimating plant valuation cognizance should be taken of intangible or going value as well as the physical value of the property, and a fair return should be made to accrue to the company over and above all operating expenses, depreciation and interest necessary to attract capital. Too often rates are based on some schedule which has proved satisfactory in some nearby town or on guesswork which is sometimes termed "ex-

perience" by the rate makers. The logical basis for rates, concluded the speaker, is plant data, estimated for a new plant or taken from the records of a going concern.

The consensus of opinion of those who discussed this paper indicated that rates of some Kansas plants ought to be revised on this scientific basis.

"When Bonds Come Due" was the title of a paper by Mr. H. P. Wright, Kansas City, Mo. Any company that increases its gross business 15 per cent a year, said the speaker, will soon become insolvent unless it has facilities for financing other than its net receipts. For this reason it is impracticable for a growing central station to try to set aside a heavy sinking fund. The modern and safe method of meeting bond debts is to build up a credit upon which new capital can be borrowed to meet bond payments and to carry on necessary construction. It is now an established principle, said Mr. Wright, that utilities will be permanently financed on borrowed capital and amortization will not be resorted to. In closing, Mr. Wright advised that all refunding bonds should include a clause providing for adequate maintenance of the property.

Another paper on rates by Mr. J. R. Murphy, Great Bend, reviewed the existing electric-service rate situation in Kansas, showing that in general rates in that state are netting the companies earnings which are very near those in neighboring states. Mr. Murphy advised as a business expedient that existing rates for business lighting might be reduced to compete with gas and rates for outline and window lighting where there is no gas competition might be increased if necessary, as these loads occur at about the same time and have the same effect in increasing station peak loads.

#### Effect of Washing Kansas Coal

Describing the effects produced by washing three carloads of Kansas coal to be used under boilers, Prof. A. A. Potter, Manhattan, said that the effect of washing on boiler operation was that the total amount of ashes handled with washed coal was 22.7 per cent less than with unwashed coal. As a result of the better fuel resulting, evaporation of the boiler in pounds of steam per hour from and at 212 deg. Fahr. was increased 23.6 per cent, evaporation of the boiler per square foot of heating surface was increased about 20 per cent, horse-power rating of the boiler was increased 20 per cent, and the total efficiency of the boiler, furnace and grates was increased 10.7 per cent. Professor Potter also stated that about 17 per cent of the coal was eliminated in washing but that this residue was used in a gas producer and did not represent a total loss.

Those speaking in the discussion of the paper were Messrs. H. W. Magruder, Liberal; V. A. Crawford, Pittsburgh, Pa., and P. J. Walker, Lawrence.

Choosing the title "Co-operation" for his paper, Mr. H. W. Magruder, Liberal, divided the subject into three parts. Collectively, said he, the central-station companies can do and ought to do much to better the utility laws of the State and give publicity to the facts concerning operation of both private and municipally owned utilities. Individually each company ought to refrain from making any statements tending to create unfavorable public sentiment against its neighbor corporation. Within its own organization each company should strive for harmony and co-operation among its staff and employees.

#### Is the Supply Jobber a Nuisance?

Defending the electrical supply jobber as a necessity instead of a nuisance, Mr. F. B. Uhrig, Kansas City, Mo., declared that the district branch of the Western Electric Company in Kansas City carried 8700 different kinds of apparatus and supplies in stock. These goods



are made by 140 different manufacturers, and the interposition of a jobbing house between these manufacturers and the central-station buyers enables the latter to receive shipments over night which otherwise could not be obtained in a week. Hence the jobber's readiness to serve gives him a real place in the industry. As indicative of the character of jobbers' business, Mr. Uhrig cited the fact that the average order of electrical jobbing houses in the United States amounts to but \$20.

Mr. L. O. Ripley, Wichita, in discussing the paper said that purchasing departments of central stations were beginning to realize that by dealing with the jobber and buying in small shipments money can be saved.

#### What One Horse-Power Means to the Industries

Prof. B. F. Walker, Lawrence, in a thoughtful paper showing how much increase in value is given to material by processes of manufacture, quoted statistics from forty-five industries. In these forty-five various and common industries of the United States an average increased value of \$777 per horse-power utilized is given to the material by manufacture. This added value in



PRESIDENT-ELECT H. W. MAGRUDER

each instance, declared the speaker, is an indication as to the amount a particular industry can pay for its power.

Reading a paper on "The Central Station and the Electric Meter," Prof. C. F. Reid, Manhattan, maintained that the customer's meter is one of the most important parts of the electric-service company's system. An error in a customer's meter makes itself felt in direct proportion on the company's cash book, while a few per cent saving in fuel, for which all are striving, has only a minor effect. For this reason more attention should be paid to testing meters and keeping them constantly corrected. Following these assertions, Mr. Reid discussed the elements of meter testing in detail.

#### The Next Convention and the New Officers

Adopting the report of the time and place committee, the delegates decided that the next convention will be held at Topeka on Oct. 21, 22 and 23, 1915. The election of officers resulted as follows: President, Mr. H. W. Magruder, Liberal; vice-presidents, Messrs. W. R. Murrow of Independence, N. R. Waggoner of Salina, Otto Thies of Dodge City, and E. A. Wright of Manhattan; executive committee, Messrs. C. L. Brown of Abilene, T. B. Cole of Pittsburg, A. M. Patton of Topeka, S. M. Brockway of Olathe, and F. G. Haskins of Pratt.

The president-elect, Mr. H. W. Magruder, was born at Edina, Mo., in 1880 and received his education in the

schools of Pratt, Kan. In early manhood he entered the government railway mail service and later financed the electric plant at Liberal and was made president of the new company, the Liberal Light, Ice & Power Company. Through the seven successful years which have ensued since the building of the Liberal plant Mr. Magruder has held this position.

#### Entertainment

Among the entertainment features which helped to enliven the convention were an automobile trip to the United States Indian Industrial School at Chilocco, Okla., returning through a newly developed gas and oil field in Kansas, a Jovian rejuvenation and a dance. The twenty-four candidates initiated into the Jovian Order are said to be the first to enter under the thirteenth administration.

### RAILWAY ELECTRICAL ENGINEERS

#### Car-Lighting Men Meet in Seventh Annual Convention— Over Half the Cars in Use on Principal American Railroads Now Electrically Lighted

The seventh annual convention of the Association of Railway Electrical Engineers opened at the Hotel LaSalle, Chicago, Monday evening, Oct. 26, with a reception and dance in the "blue room" of the hotel. At the same time the exhibits made by manufacturers and others, which occupied both the great ballroom and the "red room" on the nineteenth floor, were thrown open for the inspection of the early arrivals. Thirty-five associate members of the association made displays. These exhibits included all kinds of car-lighting equipment, lamps, generators and batteries, as well as apparatus for motor drive in railroad shops, shop-lighting fixtures and equipment for electric service in and illumination of railroad yards, stations, terminals and rights-of-way.

#### Association Growth and Membership

On Tuesday morning the first regular session was opened by President C. R. Gilman, Chicago, Milwaukee & St. Paul Railroad, with the reading of his address. Reviewing the early rapid growth of the car-lighting engineers' body and its later conservative and substantial development, President Gilman referred with pride to the work accomplished by the organization since it was formed six years ago. He quoted John Stuart Mill on the effectiveness of co-operation, and pointed out that results in any field demand hard work, self-denial and a respectful regard for the opinions of others. Basing the promise of the future of the association upon its past, President Gilman predicted even greater effectiveness of the organization's efforts during the coming year.

The report of the secretary, Mr. Joseph A. Andreucetti, Chicago & Northwestern Railway, revealed a flourishing condition of the association treasury and a membership enrolment as follows: Active senior members, 173; active junior members, 137; associate members, 221.

The committee on loose-leaf binders, through its chairman, Mr. J. R. Sloan, Pennsylvania Railroad, reported the action of the Atlantic City convention in June in adopting the 6-in. by 9-in. size as standard.

#### 19,000 Electrically Lighted Railroad Cars

Topics of car-lighting, shop and station equipment, shop motors, traveling-crane apparatus, etc., were covered in the report of the committee on data and information, of which Mr. Edward Wray, *Railway Electrical Engineer*, Chicago, was chairman. According to the

figures contained in the report, more than one-half of the cars in use by the principal American railroads are now electrically lighted. The number of electrically lighted railroad cars has increased from 11,017 in 1911 to nearly 19,000 in 1914, an increase of about 72 per cent.

Greatest growth has been shown by the straight-storage-battery and axle-generator system, while the number of head-end installations has increased by about one-third the percentage of axle-lighting installations. Nearly 260,000 cells of lead storage battery are now in use in the car-lighting field, compared with 32,000 cells of nickel-iron battery, although the number of cells of the latter has increased nearly six times in the last two years.

#### Purchase of Central-Station Energy by Railroad Shops

Of the 415 railroad repair shops reported, nearly 200, representing, however, only about one-third of the total power demand, purchase energy from local central stations. The remainder of the energy is generated in private plants operated by the railroad companies. The fifty roads cited employ 184 industrial trucks for baggage handling and 124 other trucks about their freight houses. The 10,000 motors in use in the railroad shops aggregate 190,000 hp, about 35 per cent of which is in direct-current equipment. The three-phase motors make up 50 per cent of the total number and 52 per cent of the total horse-power.

#### Locomotive Headlamps

At the session of Wednesday morning the committee on electric headlamps, Mr. C. R. Sugg, Atlantic Coast Line, chairman, recommended that headlamp generators be mounted directly in front of the cab, that a standard rating of candle-power and voltage be adopted for the lamps in the cab, that 18-in. by 10.5-in. deep reflectors be employed when rebuilding headlamps, that 1-in. conduit be used instead of the handrail for conveying lamp leads forward, that open wiring be employed in the cab interiors on account of its accessibility for repairs, and that slow-burning weatherproof wire be adopted for locomotive work.

Among those who took part in the discussion were Messrs. G. E. Murray, J. A. Andreucetti, J. E. Gardner, C. R. Gilman, J. B. Cartwright, J. L. Minick, C. W. Bender and W. H. Rolinson. The economies to be derived from standardization were pointed out, although several different ideas were expressed concerning the proper voltage to be adopted. The success of the 6-volt system for automobile lighting was cited as an argument in its favor for locomotive headlamps. Weatherproof wire withstands the heat of the locomotive without "tarring," although objection was raised to open wiring on account of the tendency of everyone to make repairs. State laws concerning headlamps show the widest variety of specifications, some being based on the diameter of the reflector, the watts at the lamp, visibility at a stated distance, etc. Co-ordination of these laws is needed.

#### Wireless Telephony Between Trains

Dr. Frederick H. Milliner, of the Union Pacific Railroad, Omaha, Neb., traced the history of wireless communication and described his own experiments looking to wireless telephonic communication with moving trains from station points. It is Dr. Milliner's plan to use as "extended aeriels" the telegraph wires already in place, insulating them thoroughly and providing condenser shunts for the high-frequency currents around the telegraph keys. The transmitting equipment adopted employs a bank of arcs to produce the high-frequency current. The inventor asserted that a

baggage car can be equipped with transmitting equipment for less than \$200. Perikon detectors have been used in the receivers experimented with. Already the system has been successfully tried on a section of siding, according to Dr. Milliner.

#### Industrial Trucks

The report of the committee on industrial trucks was read on Wednesday afternoon by Mr. T. V. Buckwalter, Pennsylvania Railroad, chairman. For general railroad service the committee recommended as standard the 2-ton truck, with an average speed of 5 miles per hour at full load. An alternate speed of 7 miles an hour was suggested for unobstructed runs. Specifications were also proposed, and accepted by the association, for standard tire sizes respectively 10 in., 16 in., 20 in., 22 in. and 27 in. in diameter. For general truck service 24 volts was urged as standard, this pressure to be supplied by twelve cells of lead battery or twenty-one cells of nickel-iron battery. This lower pressure affords more substantial battery construction than is possible at higher voltages where the motors would, on the other hand, have better efficiency. Messrs. W. Gassaway, W. L. Bliss, L. G. Pomeroy, G. E. Murray and D. J. Cartwright took part in the discussion.

#### Electrification of Railroads

As actually read, the report of the committee on electric traction, Mr. H. M. Van Gelder, New York, chairman, was confined to a description of the several systems of electrification available, together with an enumeration of the principal installations of main-line and terminal service in Europe as well as in the United States. Tunnel electrification was suggested as a means of augmenting train movements over a single-track road, and the advantages of electrifying mountain divisions were described. Electric locomotives can be grouped to form the equivalent of the heaviest steam locomotive, the cost of helper service is reduced, tunnels are made safer, water-power is usually available for operation, forest fires are avoided, and the possibility of dynamic braking reduces wear on the brake equipment.

In making recommendations for energy supply the committee declared that where suitable central-station service is available it will be found more economical and more reliable for the railroad company to purchase its energy supply than to attempt to generate power in its own plant. The road is also in this way spared a large initial investment and the necessity of organizing and equipping a special and separate department.

The 1913 wire specifications of the association were during the year revised by its special committee, Mr. W. A. Del Mar, New York Central Railroad, chairman, to conform to the 1914 standardization rules of the A. I. E. E. and rules and specifications adopted by the wire and cable committee of the American Electric Railway Association. Sample order forms for specifying wire formed the second part of the report. In the description of tests a number of minor modifications were included, based on experience with the previous specifications.

#### Axle-Lighting Equipment

Mr. H. R. Bucks, chairman, read the report of the committee on axle-lighting equipment at Thursday morning's session. Taking into account certain railroads operating in the northwest section of the United States which favor the head-end system of lighting, 23,477 cars, or 84 per cent of the electrically lighted cars in the United States, Canada and England, are lighted by the axle-generator system. Of the remaining 16 per cent about nine-tenths could be converted to axle-lighting without loss. Data were given in the report con-



cerning operating costs in the United States and England, and particular attention was called to the high cost of maintaining the dynamos as compared with all other parts of the equipment. Battery maintenance, for example, was found to amount to only about one-half that for generators. Summaries of the systems of various manufacturers were also included.

Methods of determining and recording costs were touched on in the discussion. One speaker referred to the use of glass battery jars in Europe and cited a case in which a set of stoneware jars had gone through a derailment on an American road, after which it was carelessly loaded onto a teamster's wagon and returned uninjured to the battery-charging terminal. The need for standardization of truck dimensions was also discussed. Among those who spoke in the discussion were Messrs. D. J. Cartwright, L. J. Pomeroy, George B. Colegrove, L. S. Billau, E. J. Kelley and W. L. Bliss.

#### Axle-Driven Generator in Baggage Car

Mr. K. R. Hare, chief electrician of the Northern Pacific Railroad, described the system of head-end lighting from an axle-driven generator mounted in the baggage car, which has been developed by the Northern Pacific Railroad. Experiments in this direction began in 1909, and the latest type of unit, installed this year, comprises a 20-kw, six-pole, commutating-pole, compound-wound, 80-volt Gould generator which runs at speeds of from 300 r.p.m. to 2100 r.p.m. A Morse silent chain drives the generator from a counter-shaft. This outfit has already run 40,000 miles without a failure. The maximum lamp load is 100 amp and the generator is in operation about 80 per cent of the time. Cells of battery are placed beneath the postal car, the dynamo car, the sleepers and the observation car. The head-end axle-lighting system presents a number of advantages, including the absence of excessive heat in the baggage or express car and the avoidance of terminal charging.

Messrs. G. S. Anderson, E. S. M. MacNab, J. E. Gardner, W. H. Keirn, T. V. Buckwalter, H. R. Bucks, J. R. Sloan, S. W. Everett, L. S. Billau, L. J. Pomeroy and W. L. Bliss took part in the discussion.

#### Rules for Car Wiring

The report of the committee on standard rules for car wiring included specifications for complete car-wiring systems to conform with the Underwriters' rules. The chairman, Mr. S. W. Everett, Atchison, Topeka & Santa Fé Railroad, pointed out that care must be taken to correct the inference previously given that the association approves only the hot-galvanizing process. Mr. D. J. Cartwright recommended making 2.5 in. the standard length for fuses.

#### Outside Construction and Yard Facilities

Mr. J. L. Minick, Pennsylvania Railroad, read the lengthy report of the committee on outside construction and yard lighting, which recommended close adherence to the rules of the National Electrical Code and the standard specifications of the National Electric Light Association for railroad crossings. Dimensions, spacings and lay-out of pole structures were given in detail. For permanent construction concrete poles were proposed. Liberal illumination was recommended at switches, in addition to adequate general lighting for the entire yard. The report concluded with a comparison of the principal arc and incandescent illuminants. Among those who took part in the discussion were Messrs. H. R. Bucks, C. D. Axtell, L. S. Billau, E. W. Jansen, D. J. Cartwright, G. B. Colegrove, E. J. Kelley, D. B. Pastorius and J. L. Ohmans.

The report of the committee on yard facilities for

charging storage batteries, Mr. D. B. Pastorius chairman, recommended the provision of duplicate power facilities for charging plants, allowance of rating at least 50 per cent above the peak load of ordinary demand, the use of small motor-generators for rectifying alternating-current service, and the provision of platforms, preferably of concrete, in railroad yards.

#### Election of Officers

By unanimous vote the following officers were elected for the year: President, Mr. H. C. Meloy, Lake Shore & Michigan Southern Railroad, Cleveland, Ohio; senior vice-president, Mr. E. W. Jansen, Illinois Central Railroad, Chicago, Ill.; junior vice-president, Mr. C. J. Causland, Pennsylvania Lines West, Chicago, Ill.; secretary-treasurer, Mr. Joseph A. Andreucetti, Chicago & Northwestern Railroad, Chicago, Ill. Messrs. L. C. Hensel, Frisco Lines, St. Louis, Mo., and J. L. Minick, Pennsylvania Railroad, Altoona, Pa., were added to the executive committee.



PRESIDENT-ELECT H. C. MELOY

Mr. Harry C. Meloy, the president-elect, is supervisor of electrical appliances for the Lake Shore & Michigan Southern Railway Company, with headquarters at Cleveland, Ohio. Mr. Meloy is forty-nine years of age and began his railroad experience in the mechanical department of the Pennsylvania Railroad at the latter's Altoona shops. Later he was employed by the Union Switch & Signal Company at Swissvale, Pa., and then by the Norfolk & Western Railway, where he first took up electrical work. Returning to the Pennsylvania, Mr. Meloy was soon afterward called to Cleveland, where he became chief electrician at the Collinwood shops of the Lake Shore, in charge of power and train-lighting. Four years ago he was appointed to his present position.

Coincidentally with the Association of Railway Electrical Engineers' election, the Railway Electrical Supply Manufacturers' Association held a business meeting on Friday morning and chose officers as follows: President, Mr. W. F. Bauer, Edison Storage Battery Company, Chicago; vice-presidents, Mr. T. Mount, Consolidated Railway Electric Lighting & Manufacturing Company, New York, and Mr. Fred F. Skeel, Crouse Hinds Company, Chicago; secretary, Mr. J. Scribner General Electric Company, Chicago; directors, Messrs. A. J. Cole, W. Fawcett, Edward Wray, C. W. Bender and J. Scribner. As the closing entertainment feature of the convention the manufacturers' association on Friday evening tendered the railway electrical engineers a dinner-dance in the great ballroom of the Hotel LaSalle.

# The Industry Maintains Its Earning Power

**President Scott of the National Electric Light Association Believes that General Average Results Will Continue to Show Increases in Gross and Net Earnings—Mr. S. R. Bertron Says that Earnings Under Present Conditions Justify Belief in Stability of Well-Managed Public Service Corporations**

## MR. HOLTON H. SCOTT ON CONDITIONS

**President of National Electric Light Association Finds that They Are Being Adjusted Rapidly**

Mr. Holton H. Scott, president of the National Electric Light Association and general manager of the Doherty Operating Company, expressed encouraging and hopeful views regarding the situation in a talk with a representative of the *Electrical World*.

"Our operations extend over sections in all parts of the United States except the Pacific Coast, and we try to keep closely in touch with general business conditions in the communities which our various public utility companies serve," Mr. Scott said. "The cities in the Southern States dependent upon the cotton industry undoubtedly feel the direct effects of the present conditions more than any other part of the United States with the possible exception of the districts dependent upon the oil market."

"The oil market conditions have materially improved during the past thirty days, and although prices are still far below normal, the pipe-line companies are now marketing a considerable portion of the production. With the beginning of the shipment of cotton general business conditions are bound to improve in the Southern States."

"I have just returned from a trip to Oklahoma and Kansas and other Middle Western States. Except in certain parts of Oklahoma directly affected by the oil market, I found things normal. In fact, Kansas and the other largely agricultural States seem to be very prosperous and the people are decidedly optimistic."

"In Ohio we operate several public utility companies, and in two of the cities—Warren and Massillon—large steel works were under construction when the European war broke out, and notwithstanding this condition work on these new factories has been continued without a break. Many of the manufacturing towns in Ohio are operating, at least up to this date, at their normal capacity. It really does one a lot of good to get away from New York and meet people who still retain their optimism."

"It is idle to say that public utility companies are not affected by the present unprecedented condition, but there are so many fields of endeavor in enlarging the uses of gas and electrical energy that even if the increment of increases is reduced the general average results should continue to show increases in the gross and net earnings. For example, this is a time when many men are thinking of increasing the efficiency of their various manufacturing plants, and this condition makes possible the widening of the field for electrical motor service."

"There has been considerable curtailment by central-station companies in construction items, and the efforts of the managements have been confined to increasing the business without extending the lines and enlarging the power stations. This work will eventually be reflected in renewed prosperity to the whole electrical business, because new uses are being found for the application of electrical energy, and this, of course, means more sales of appliances by manufacturers and jobbers."

"The National Electric Light Association membership represents fully 90 per cent of the gross electrical central-station business of the United States and Canada, and through that membership it is in touch with a very large proportion of the population of those countries. I have had occasion in the last few months to come into contact with many heads of the member companies, and my observation leads me to say that these men are not only not pessimistic but are confident that the present disturbed conditions are being rapidly readjusted."

## MR. S. R. BERTRON ON UTILITIES

**Gratifying Stability of Their Earnings Under Conditions Caused by the European War**

Mr. S. R. Bertron, of Bertron, Griscom & Company, of New York, in speaking of present conditions to a representative of the *Electrical World*, said that the stability in earnings of public utility corporations is a gratifying, although not an unexpected, element in the situation.

"We believe that public service company securities are the best that we can offer to our customers where the companies themselves have good franchises and are well managed," said Mr. Bertron. "They supply public necessities at a minimum cost under special franchise requirements, and every dollar of revenue is received in cash. There is less, if any, shrinkage in income in properties of this character in bad times than in any others that we know. Even under the present depressed conditions the earnings of most electrical central stations and gas companies are ahead of last year, while street railways show only a very small shrinkage from last year, if any, varying from 1 to 4 per cent. Up to the present this year the lighting companies in which we are interested show an average increase in gross over last year of about 6 per cent and the street railways about three-quarters of 1 per cent. The net result is that, instead of showing a normal increase in business, public service companies as a whole show some increase, even though a small one."

"These facts justify our belief in the stability of well-managed public service corporations. The safety of the securities of these companies as investments is more and more apparent, and they will increase in popularity as their advantages are more generally appreciated. At present the average rate of return to investors in public service securities is higher than the soundness of conditions justifies and in time it will approach more nearly to the rate of return on municipal bonds and high-grade railway securities."

Mr. Bertron was asked about the effect of the conditions arising from the European war upon capital expenditures of public service properties.

"The companies which we represent," Mr. Bertron answered, "spend normally about \$7,000,000 annually in new capital. On account of the difficulty of raising new capital now, expenditures of this character are being made only in necessary cases. Just when our policy in this respect will change depends upon financial con-



ditions here. It is not necessary to assume, and we do not conclude, that we shall need to wait until the end of the war before undertaking new financing. It is probable that before the war is over financial conditions here will have improved to an extent that will permit the resumption of something like normal extensions.

"As business becomes adjusted to conditions and as the new currency act produces the promised release of a large volume of funds, and as economies of the people generally begin to tell in increased bank balances, the result should produce more comfortable rates for money. I think there are indications now that we are gradually approaching that stage of the situation. The improvement of conditions in the South resulting from the extension of credits now promised by bankers to the cotton growers will be a material factor and a favorable factor throughout the country at large.

"At the same time it should be remembered that a large demand for money will arise when settlement day comes in Europe, when the nations now at war begin to count their losses and to start the necessary work of reconstruction. Except indirectly, in taking back such securities as foreigners may want to sell in order to buy new obligations of their own governments, this country will not need to participate in meeting this demand for funds from abroad, although it may do so in certain instances.

"I should not be surprised if a great number of Europeans should desire to place their funds in a country that is not liable to be at war and should invest here in sufficient volume largely to offset the operations of those who are compelled to liquidate by force of circumstances."

Mr. Bertron was asked how he regarded present conditions as compared with those experienced in 1907.

"As applied to us, they are just about the same as during the panic of 1907," he said, "except that at that time Europe was not involved and we could look to it for aid, and I am not sure but that public service companies are in better shape now for the reason that conditions which preceded the panic of 1907 were very different from the conditions which preceded the outbreak of the war this year. Prior to 1907 general business of this character had been exceedingly active and was so up to the time of the panic, and the companies were expanding in full expectation of a continuance of prosperity and favorable markets for securities. At this time, however, on account of the lessened activity in general business and the depression throughout the country, public service properties were not making normal extensions and improvements at a normal rate. Consequently their construction operations did not have to be curtailed suddenly to as great an extent as was the case seven years ago."

## MATTERS IMPORTANT TO EXPORTERS

Mr. Charles S. Powell Suggests that Consuls Be Asked to Furnish Needed Information

Mr. Charles S. Powell, consulting engineer of Cleveland, has written a letter to Secretary of Commerce Redfield calling attention to various matters which are of importance to American exporters. Mr. Powell suggests that definite instructions be given to the various consular agencies to supply at the earliest possible moment reliable and complete information regarding the districts in which they are stationed on the following general lines:

How are foreign goods landed at the port of destination? Is the port dock supplied with cranes? Are there

railroad facilities to the dock or landing place? Description of available railroad facilities. If goods are not transported inland by rail, what is the largest package in weight and dimensions that can be conveniently handled and what is the mode of transportation? Give plan of dock at harbor and photograph of landing place with details of equipment used in handling goods. What are governmental requirements regarding size and weight of packages?

Mr. Powell believes that the government is in a position to supply information of this kind better than any other organization.

## DANGER OF UNWISE EXPORT CREDITS

Manufacturer Urges Careful Discrimination Between Those Entitled to Credit and Those Who Should Pay Cash

A manufacturer in an interior city writes as follows to the *Electrical World*:

"I should like to take the liberty of suggesting that your publication can do decided good in the electrical field at least and save some manufacturers money.

"Since the war started and newspapers and periodicals began to talk about the possibilities of export in South America the wildest schemes have been suggested. At the present time it is wise to be extremely careful with reference to the extension of credits in every way. A great many people with business in South America are just as good as gold to-day, and there are others who were not good before the war started and are worse off to-day. What I shall be sorry to see is many American manufacturers going into the export field with the expectation of accomplishing a great deal and ending by losing a lot of money and forever after keeping out of the export field.

### Wonderful, Satisfactory Business

"It is a wonderful, satisfactory business, but, like everything else, you have got to handle it properly. I think your publication can be of some value in the electrical field by acting as a check on too much enthusiasm and too much confidence in the other man's promise to pay. Of course, on the one hand there are many people who are worth a lot of credit, and those people ought to receive it; but there are other people from whom one wants cash in advance, and there are more of them to-day than there were a month ago.

"I think that many of the electrical manufacturers who have not been exporting can obtain a whole lot of real practical experience by forming in their several towns what might be termed an export committee, under the guidance of some of those manufacturers of other lines who have been exporting; in other words, a sort of a round-table discussion. If some clever salesman drifts in and wants to sell an interest in a trade tour or a card in a consular index, let them follow the policy of deferring the signing on the dotted line until they have had the time and opportunity to take it up at the round-table discussion.

"I, personally, am interested in the development of electrical manufacturers' export trade because I feel that the more South American people become accustomed to dealing with American manufacturers generally and obtain satisfaction, the easier it is for us to sell our own product. We have in our city a lively export committee formed by a representation of several lines of manufacture. We obtain our best results by inviting into that committee everybody who is interested in export, say for lunch once a week or once in two weeks, and the man who is puzzled will usually find some one who can answer his question because he has been through a similar experience."

## PUBLIC SERVICE COMMISSION NEWS

### California Commission

The Mount Whitney Power & Electric Company, of Visalia, Cal., will apply to the commission for authority to issue \$418,000 preferred stock at 90, proceeds to be used in retiring floating debt. This is the third public utility corporation of California to follow the example of the Pacific Gas & Electric Company in issuing preferred stock. The others are the Southern Pacific Milling Company and the Northern California Power Company.

The commission has authorized the Holton Power Company to issue \$200,000 of 6 per cent first and re-funding mortgage gold bonds at not less than 80. The proceeds are to be used for various additions and betterments. Before the company shall pay any dividends it must authorize out of earnings amortization of the difference between the money received from the bonds and par.

In accordance with the commission's decision in the case brought by the city of Salinas against the Coast Valley Gas & Electric Company, a new schedule of electric-lighting rates went into effect in Salinas on Oct. 6. They provide for the reduction from 10 cents for the first 50 kw-hr. to 8 cents for the first 20 kw-hr., a minimum meter charge of \$1 per month and a service charge of \$1. The latter charge will be refunded if the consumer remains twelve months at one location.

The Southern Sierras Power Company has requested authority to issue \$300,000 first mortgage 6 per cent twenty-five-year gold bonds at not less than 90.

### Indiana Commission

The Indianapolis electric situation just now is complex. The Merchants' Heat & Light Company has been successful in obtaining a contract with the city of Indianapolis to light its streets for the next ten years. The Indianapolis Light & Heat Company has had the contract for the last ten years.

Meanwhile, investigations as to rates and service of the companies have been proceeding under the Public Service Commission with complications at almost every step. Suits and petitions have been filed. A decision from the commission relative to rates is expected at any time.

The Merchants' company has surrendered its franchise to the commission, and this week the Indianapolis company surrendered to the commission all franchise privileges it might have relating to rate-making power or service. This surrender was in line with a recent surrender to the commission of the rate-making power by the Citizens' Gas Company, of Indianapolis, when the latter sought to merge with the Indianapolis Gas Company. Certain contractual rights existing in the lighting franchise between the city and the company made it improper to surrender the franchise of the company, its officers believed, and the commission therefore accepted the incomplete surrender offered.

Shortly thereafter the Merchants' company, which has expended \$130,000 in extending its equipment to begin operations next April on its street-lighting contract, petitioned the commission for authority to issue bonds to the value of 80 per cent of expenditures for new construction. The commission refused to allow the issue in full, withholding its approval of \$28,000 of the amount on the ground that this amount represents duplication of property of the Indianapolis Light & Heat Company. The case was taken to the courts.

### New York Commissions

In accordance with an opinion rendered by Commissioner Milo R. Maltbie and adopted by the Public Serv-

ice Commission, First District, the Northern Union Gas Company and the Central Union Gas Company have been called upon by the commission to discontinue the practice of charging a fee for taking a prepayment meter from a customer's premises and substituting therefor an ordinary black meter. The proceeding was instituted by the commission after the receipt of several complaints from gas consumers. The companies use two types of meters, the ordinary black meter and the prepayment meter. Formerly no charge was made for changing meters, but within the last year the companies have established a charge of \$2 for making the change. After hearings Commissioner Maltbie reported to the commission that a consumer of gas in this city who finds a prepayment meter installed in premises to which he has removed may, upon making the deposit required by statute, require the supply company to provide a black meter, and that the supply company has no legal right to make any charge therefor.

### Ohio Commission

The tentative plan of uniform accounting for electric utilities prepared for the Public Utilities Commission of Ohio by Messrs. Nau, Rusk & Swearingen, public accountants of Cleveland, has been sent to companies for consideration. The commission called a conference of representatives of utilities which took place in Columbus on Nov. 5. The final hearing will be on or before Dec. 10. Officers of companies were asked to put their criticisms and suggestions in writing and mail them to the commission or Messrs. Nau, Ruck & Swearingen. It was suggested that any additions or amendments be in such language and form as will make possible their incorporation into the text. Reasons for all suggestions, amendments, additions and criticisms were requested. The four divisions of utilities are as follows: Class A, average annual operating revenues exceeding \$75,000; class B, average annual operating revenues exceeding \$25,000 but not more than \$75,000; class C, average annual operating revenues exceeding \$5,000 but not more than \$25,000; class D, average annual operating revenues of \$5,000 or less.

The commission says that all of the accounts included in any scheme of accounts fall primarily into two grand divisions, namely (1) income and profit and loss accounts, (2) balance-sheet accounts. In this system each of these divisions is again subdivided into summary accounts (five in each division). The ten summary accounts are as follows: Income and profit and loss accounts—operating revenues (electric utility only), operation (electric utility only), maintenance (electric utility only), general expenses (electric utility only), miscellaneous revenue and expense (non-operating and sub-utility); balance-sheet accounts—fixed assets, investments and funds, current and nominal assets, liabilities, proprietary interests and income and profit and loss accounts.

### Wisconsin Commission

The Sheboygan Gas Light Company has been authorized to issue \$50,000 in preferred stock and \$300,000 in 5½ per cent bonds. The funds to be derived from the sale of the stock and bonds, the latter to be sold for not less than 75, are to be used in paying outstanding indebtedness and for needed improvements and extensions.

Upon petition of the city of Grand Rapids, the commission has fixed a price of \$72,000 to be paid by the city for the property of the Grand Rapids Electric Company, which the city voted to acquire at a recent election. The present value of the property was given by the commission as \$63,500 and the cost of reproduction as \$86,000.



## Current News Notes

**GOVERNMENT RADIO STATION AT SAN DIEGO.**—Work on the new government radio station at San Diego, Cal., will be commenced within a week, it is declared. The apparatus will be one of the most powerful in this country, and the station will cost approximately \$300,000.

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**ROCHESTER (N. Y.) SECTION OF A. I. E. E. TO BE FORMED.**—The directorate of the American Institute of Electrical Engineers has authorized the formation of a Rochester (N. Y.) section of this organization. The new section will be the first in western New York State.

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**SPECIAL TRAINS TO N. E. L. A. CONVENTION.**—At a meeting of the transportation committee of the National Electric Light Association, Mr. G. W. Elliott, chairman, held at the Hotel Sherman, Chicago, Oct. 29, preliminary plans were discussed for the routing of special trains to the convention at San Francisco in June. Itineraries will be arranged to include a number of the principal Western water-power and transmission plants.

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**CONFERENCE OF GOVERNORS.**—The seventh annual conference of Governors of States will be held in Madison, Wis., from Nov. 10 to Nov. 13. The sessions on Nov. 11 are to be devoted to "State Control of Natural Resources." An address will be made by Governor William Spry of Utah, and the remainder of the sessions on that day will be devoted to general discussion on this topic. On Nov. 14 an adjournment will be taken to the city of Milwaukee, where the delegates will be the guests of various business organizations.

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**CONNECTICUT CONTRACTORS FORM ASSOCIATION.**—The Electrical Contractors' Association of Connecticut was organized recently at New Haven, and Mr. E. M. Baldwin, of Hartford, was elected president and Mr. G. M. Chapman secretary. Sixty-five contracting firms are at present enrolled as members. The association is affiliated with the national organization. The executive committee is composed of Messrs. John Hotz, Bridgeport; G. M. Chapman, Waterbury; E. B. Wilcox, Meriden; T. A. Stewart, Hartford, and R. W. Hewitt, Torrington.

\* \* \*

**REPORTED COST OF ELECTRIFICATION IN CHICAGO.**—The report of the Chicago Association of Commerce committee of investigation on smoke abatement and electrification of railway terminals is not ready for final publication, but a newspaper writer says that it is understood that the preliminary report on the cost of making all the necessary changes to substitute electrical operation for steam operation on the railroad terminals of Chicago puts the figure at \$29,000,000. There is no official confirmation of this estimate. It is expected that the report will be ready in a month or two. The railroads entering Chicago have financed the committee, and it is reported that the investigation, now under way several years, has cost \$400,000.

\* \* \*

**THE ACCOMMODATING PROPERTIES OF BAMBOO TELEPHONE POLES.**—In a talk on his Philippine experiences given before the Chicago Jovian League, Oct. 5, Mr. J. A. Kick told of the extensive employment of bamboo for structural purposes in the islands, mentioning among other uses its application as a support for telephone wires. Such bamboo telephone poles are climbed with the help of bamboo ladders, but so great is the elasticity of the stalks, said Mr. Kick, that by the time a fair-sized lineman has climbed to the top of a pole he is back again nearly to the ground. On the other hand,

the native-wood poles used in heavier line construction in the Philippines are so hard as to defy the spurs of ordinary linemen's climbers. The Filipino workmen climb these poles with their bare legs, but an American lineman requires the aid of a ladder. Even these extremely hard woods are not, however, proof against the ravages of the ants which infest the tropics. In one instance cited by Mr. Kick a large pole on a main street was found to be but a hollow shell, the interior having been totally eaten away by the voracious insects.

\* \* \*

### SOCIETY MEETINGS

**CONVENTION OF THE DISTRICT HEATING ASSOCIATION.**—The 1915 meeting of the National District Heating Association will be held in Chicago from June 1 to 3, with the Hotel Sherman as headquarters. Mr. D. L. Gaskill, Greenville, Ohio, is secretary of the association.

\* \* \*

**A. I. E. E. NOVEMBER MEETING.**—At a meeting of the American Institute of Electrical Engineers to be held in New York on Nov. 13 two papers will be presented as follows: "Graphic Method for Speed-Time and Distance-Time Curves," by Mr. E. C. Woodruff, and "The Corona Produced by Continuous Potentials," by Mr. Stanley P. Farwell. The first paper relates to a simple method for obtaining speed-time and distance-time curves by means of charts, which avoids the usual step-by-step process with its tedious calculations. The second paper deals with an experimental investigation of the corona around small wires produced by continuous potentials up to 15,000 volts.

\* \* \*

**CHICAGO JOVIAN LEAGUE.**—Mr. L. G. Shepard, electrical engineer for the Federal Sign System (Electric), addressed the Chicago Jovian League Nov. 2, on the subject of the large motograph electric sign at the head of Michigan Boulevard, Chicago, described in the *Electrical World* of Oct. 17, page 771. Mr. Victor Despard was elected second tribune for Chicago, Mr. Victor Tousley having been previously appointed first tribune. Mr. G. A. Freeman was re-elected secretary-treasurer, and the following board of managers was chosen: Messrs. A. A. Gray, T. G. Grier, Nate Harvey, M. S. Hart, C. R. Kreider and J. G. Wray.

\* \* \*

**UTILITY REGULATION DISCUSSED BEFORE CHICAGO ELECTRIC CLUB.**—At the meeting of the Electric Club of Chicago on Oct. 29 Mr. Robert M. Feustel, chief engineer of the Illinois Public Utilities Commission, spoke on "Public Utility Service." In referring to the equity of regulation, Mr. Feustel declared that the life of the community depends upon the service of its utility corporations, and added that service can be rendered most economically by monopolies. At least 90 per cent of the rate cases heard by commissions start as service cases, said Mr. Feustel, and he advised managers to give particular attention to the service feature of their work.

\* \* \*

**PHILADELPHIA SECTION, I. E. S.**—On Nov. 7 at 8 p. m. in the Engineers' Club the Philadelphia Section of the Illuminating Engineering Society will hold a meeting at which Dr. Herbert E. Ives will present a paper entitled "Physical Photometry." The paper will deal with various methods which have been proposed to measure light without calling on the eye to estimate quantitatively. The requirements of a physical photometer in respect to sensibility and response to different colors will be outlined. The various physical photometers, including selenium and the photo-electric cell, will be described. The paper will be illustrated with lantern slides and by experimental demonstrations.

## Hydroelectric Development on Bishop Creek, Cal.—IV

Hydraulic and electric features of stations No. 2 and No. 3 of the Nevada-California Power Company—Tailrace water of former discharges directly into intake of latter. By C. O. Poole

**S**TATION No. 2 is placed parallel to the pipe line, and the nozzles of the waterwheels discharge at right angles to the pipe line, about half of this angle being taken up in the waterwheel nozzles, so the extra curvature to complete the angle does not cause any serious loss to the water flow, as the velocities are kept down to 18 ft. per second. Fig. 24 is an elevation. There are three 2000-kw generating units in this power house, with an overload capacity of 25 per cent. All of the electrical apparatus in this station is of Westinghouse make. Two of the units are driven by Pelton wheels, with Pelton governors operating the needles, and the stream deflectors. The control is so arranged that the needle and deflector can be operated with the governor, or the deflector alone can be instantly attached to the governor and the needle regulated and set to any position by hand. The last-named method is made use of at this plant most of the time, as the load is nearly constant, the governing being taken care of at one of the other plants. The third unit is provided with a Doble wheel and an auxiliary type of nozzle. This wheel is

controlled by a Lombard-Doble directly connected governor so arranged that when the main needle is closed to any appreciable extent during the cycle of regulation the auxiliary nozzle opens correspondingly and slowly closes by means of a cataract cylinder on the stem of the auxiliary needle. The isochronal movement of the two needles is the means of maintaining almost perfect regulation without serious fluctuations of pressure in the pipe line, and at the same time conserving the water over the cycles of regulation. The impact of the water from the auxiliary nozzle, which is placed directly below the main nozzle, is taken by an ensign vortex baffle-plate, which effectually stills the water and drops it into the tailrace. The elevation of the powerhouse floor is 7018 ft., and the effective head is 875 ft.

There are two 100-kw exciters, one driven by a tangential waterwheel mounted on one end of the shaft and the other provided with a waterwheel and a 150-hp, 2200-volt induction motor, the motor-driven set being used always when the Tirrill regulator is in operation, as neither of the units is provided with waterwheel gov-



FIG. 23—VIEW OF POWER STATION NO. 2, SHOWING PIPE LINE AND OPERATORS' COTTAGES



ernors. The exciters are wound for 120 volts. The generators are wound for 2200 volts, three-phase, sixty cycles, and operate at 300 r.p.m.

The switchboard consists of three generator panels and two exciter panels. All generators are connected to a single set of busbars, through non-automatic switches, and the energy is fed to the transformers through two sets of 750,000-circ. mil cables, carried underground to the transformers installed in a separate building.

Figs. 25 and 26 show the station interior, which, with the transformer house, is built of reinforced concrete, the former being provided with a 20-ton traveling crane. This crane is also used for handling the transformers when necessary, the latter being brought under the crane by means of a transfer truck and track. In the transformer house, which is 50 ft. from the gen-

1908 and has been in continuous operation ever since, excepting the twenty days when the steel Y failed.

### Generating Station No. 3

The tailrace water of station No. 2 discharges directly into the intake of station No. 3, with no loss of head except that necessary to carry the water clear of the waterwheels. The intake for station No. 3 is formed by constructing a reinforced-concrete dam across the creek. This intake pond is rather small, owing to the rapid fall of the stream at that point. The dam is 25 ft. high in the middle of the stream and tapers up with the profile to 10 ft. in height. Bedrock could not be had at this point in the stream bed, the whole canyon being a morain wash. A trench was dug across the stream and sunk to a depth of 6 ft. below the stream bed, where a

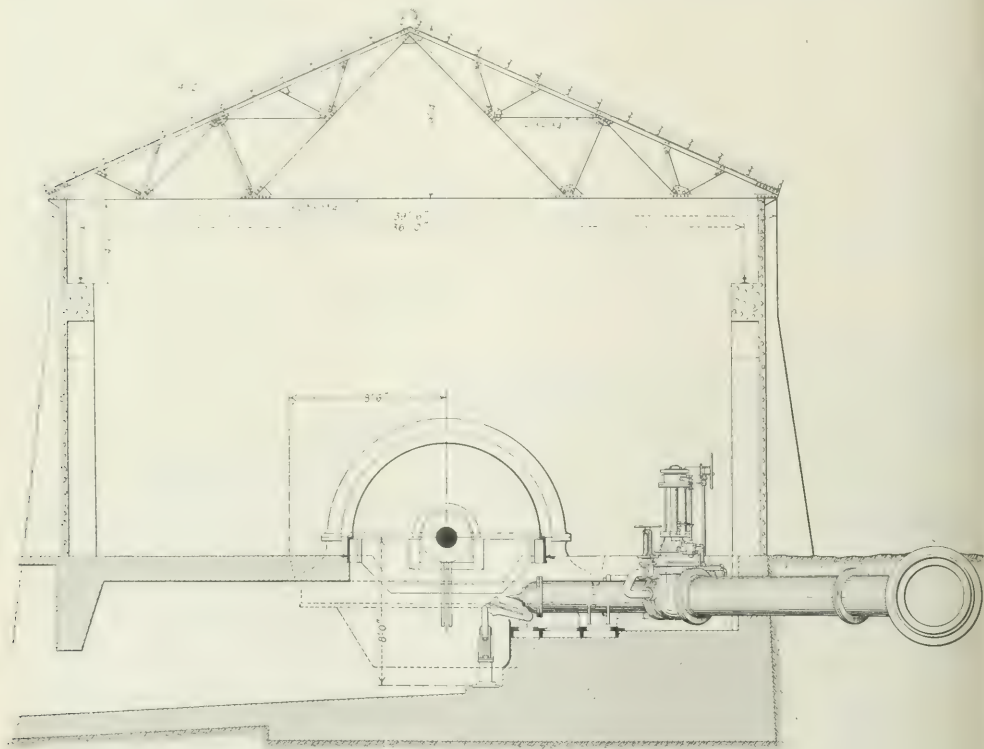


FIG. 24—ELEVATION OF GENERATING STATION NO. 2

erating station, are placed seven 1000-kw water-cooled transformers, two banks of three each, the seventh transformer being used for a spare. The transformers raise the voltage from 2200 to 55,000 and are connected in star with grounded neutral. The transformers are connected to a common bus on both high-tension and low-tension sides by means of oil switches.

Fig. 23 is a general view of the plant, showing the pipe line and operators' cottages. These cottages are of a standard type. They are of reinforced concrete, contain four rooms and bath, and cost \$2,200 each. The crew at this plant consists of one chief operator, two operators, two assistant operators, and one all-around helper. The watches are so arranged that there are always two men on duty. The plant was constructed in

firm formation of clay and gravel was encountered. The curtain-wall trench was sunk to a depth of 2 ft. into this formation, which served as a seal to cut the water off. Fig. 29 shows the general design of the dam. Fig. 27 is a view of the dam during construction and Fig. 28 is the dam completed.

It will be seen that the spillway section is of cyclopean construction, some of the stones in this section being as much as a cubic yard in bulk. The surface of the spillway section was finished to form, with a concrete mixture of one-two-four, and on top of this a finishing surface was troweled on to a thickness of 1½ in., this mixture being one part cement to two parts sharp sand. The 36-in. sluiceways are placed on the upstream face of the dam, each covering a 36-in. round port through

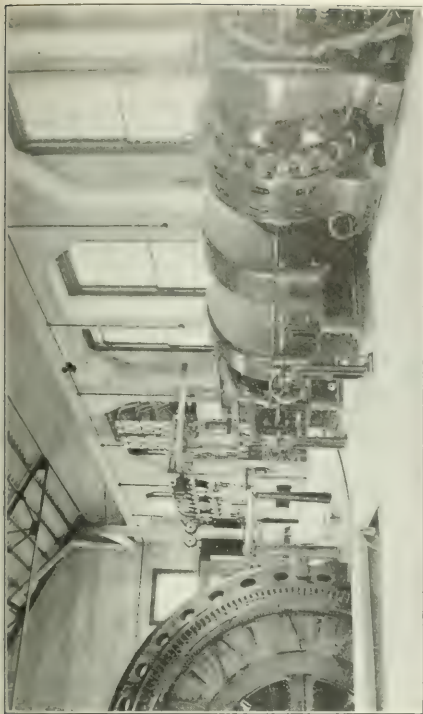


FIG. 26—SWITCHBOARD AND EXCITER UNITS

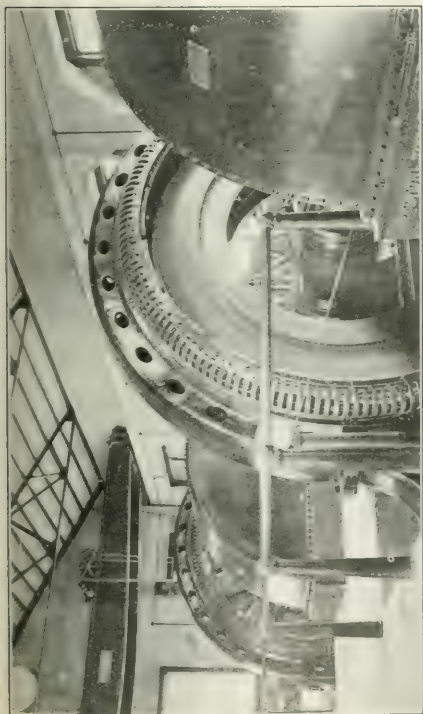


FIG. 25—INTERIOR VIEW OF STATION NO. 2



FIG. 28—DAM FOR STATION NO. 3 COMPLETED

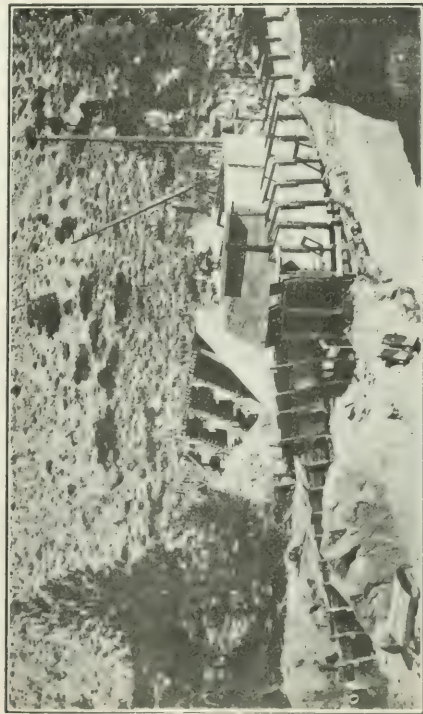


FIG. 27—DAM FOR STATION NO. 3 UNDER CONSTRUCTION



the bottom of the spillway section. These sluice ducts are found to be quite necessary each season, after the high-water period, to clear the pond of the accumulated deposit of sand and gravel. There are some special features in connection with the screen chamber that might be of interest. Fig. 32 shows its design. There are two draw-off pipes, 12-in. in diameter, arranged just back of the screens at the bottom of the two separate gravel pits. As the sand and gravel is washed into the chamber, it is caught in these traps and drawn out by opening the gates of the intake chamber. There is an emergency horizontal swing gate provided which automatically closes the opening to the flow pipe. Should a break occur in the wood-stave flow line and cause a sudden rush of water through the pipe, there is an auxiliary gate, 12 in. by 12 in., in the center of the large gate and operated by the same mechanism, that can be used for filling the pipe to equalize the pressure on the large gate so that it can be easily opened. An 18-in. standpipe on the flow line directly below the trap gate admits air to the flow pipe to prevent its collapse when the trap gate closes. The flow line is provided with 8-in. drop air valves every 1000 ft.

The unit costs of this intake dam were as follows:

Taking care of water	\$300.00
Placing gates and screens	600.00
	Per Cu. Yd.
Excavating above water line, earth	\$0.75
Excavating below water line, earth	1.00
Excavating below water line, loose rock	1.50
Concrete, one-two-four mixture, including reinforcing	16.50
Concrete, one-two-six mixture, including reinforcing	13.50
Spillway, allowing 40 per cent hand-placed rock	12.00
(Company furnished all gates and fittings. Reinforcing steel cost contractors, \$90 per ton laid down. Cement cost contractors \$6 per barrel, laid down.)	
Rock crushed on ground	\$1.00
Sand cost for hauling	1.00

#### Flow Line

The flow line is composed of redwood staves, made from  $2\frac{1}{2}$ -in. by 6-in. stock, 60-in. inside diameter. There are thirty-seven staves to the circle, and  $\frac{5}{8}$ -in.

steel bands are used with two shoes to the circle. The spacing varies from 10-in. to  $3\frac{1}{2}$ -in. centers. The bands are figured with a factor of safety of four, using the ultimate strength of the steel as 56,000 lb. per square inch. Steel dowels  $\frac{1}{8}$  in. by  $1\frac{1}{2}$  in. in size are used to join the ends of staves. The pipe is 13,029 ft. in length and is laid on a uniform grade of 4 ft. per 1000 ft. At a

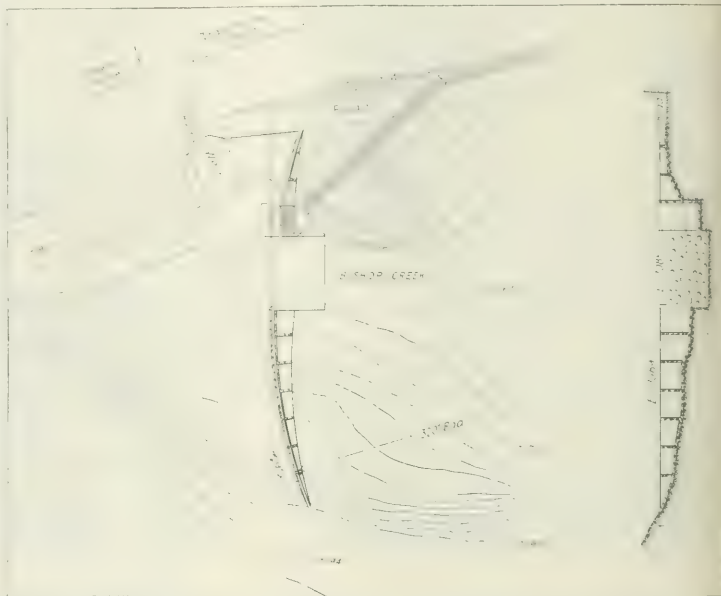


FIG. 29—GENERAL DESIGN OF DAM FOR STATION NO. 3

point 1200 ft. from the lower end there is a steel standpipe 54 in. in diameter and 136 ft. in length, laid in a trench on the hillside. Its upper end reaches over a divide and discharges the water down a hill away from the pipe line. At the junction of the wood-pipe and steel pressure line there is another steel vertical standpipe 54 in. in diameter and 80 ft. high. These standpipes are used for relief ports and act as surge tanks in supplying water to the station instantly for sudden fluctuations of load.

The flow line is laid on a morain-wash hillside, upon a bench excavated out to a width of 9 ft. Fig. 30 is a view of the pipe near the upper standpipe. After the leaks were all taken up the pipe was covered with earth to a depth of 9 in. Rock walls were used to retain the dirt on the lower side of the pipe. This pipe cost,

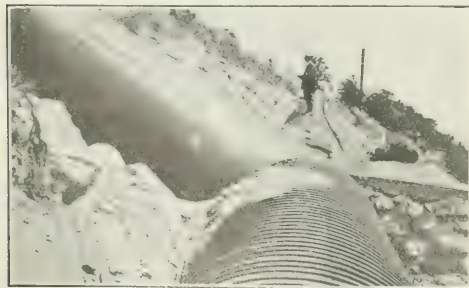


FIG. 30—REDWOOD PIPE LINE

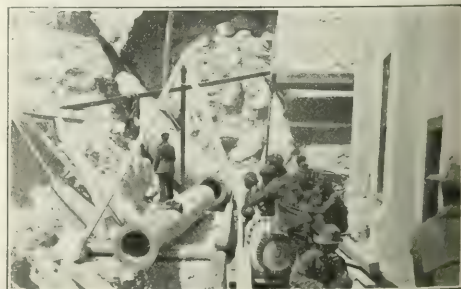


FIG. 31—LOWER END OF PRESSURE PIPE

complete, \$9 per lineal foot. There are a number of steel angle pieces in this line, used where the radii of the curves were too short to permit the pipe to make the bend.

#### Pressure Line

The steel pressure line joins the flow line at the lower standpipe and connects directly with a 54-in. cast-iron gate valve with bypass. The line is 4360 ft. in length, with diameters varying from 54 in. at the upper end to 48 in. at the lower end. The plates vary from  $\frac{3}{16}$  in. to  $\frac{3}{4}$  in. Fig. 31 is a view of the lower end taken during the construction period.

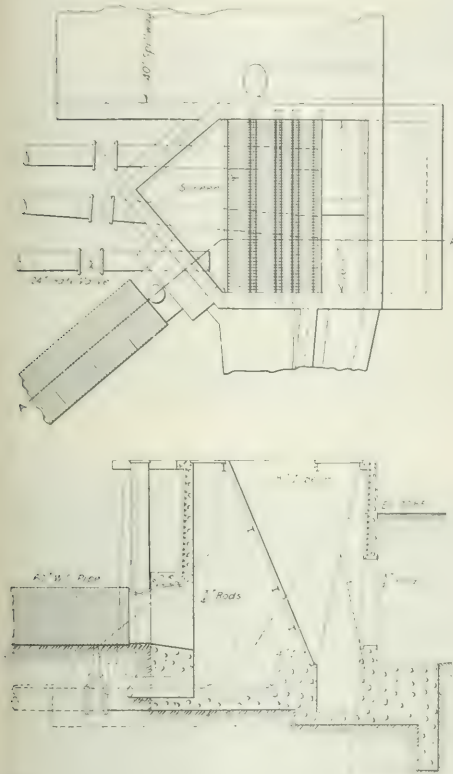


FIG. 32—DESIGN OF SCREEN CHAMBER

At the power house the pressure line terminates in a reducing manifold, this manifold being turned 53 deg. away from the general line of the pressure pipe. There are three 24-in. branches taken off, by means of cast-steel saddles riveted to the plates of the manifold, these saddles being lined up with gates and waterwheel nozzles before being riveted to the manifold, thus insuring a perfect fit. It has been found that this method of taking off branches is much more satisfactory and safe than using cast-steel Y branches. An 18-in. branch is taken off at the pipe angle and leads off in line with the pressure pipe, to which is connected an Allis-Chalmers relief valve, adjusted to blow off at 10 per cent over-pressure and relieve the pipe from undue pressure stress. This relief valve is very sensitive and automatically takes care of any abnormal pressure rise. The pipe line is securely held in place by means of eight heavy concrete piers placed at advantageous points.

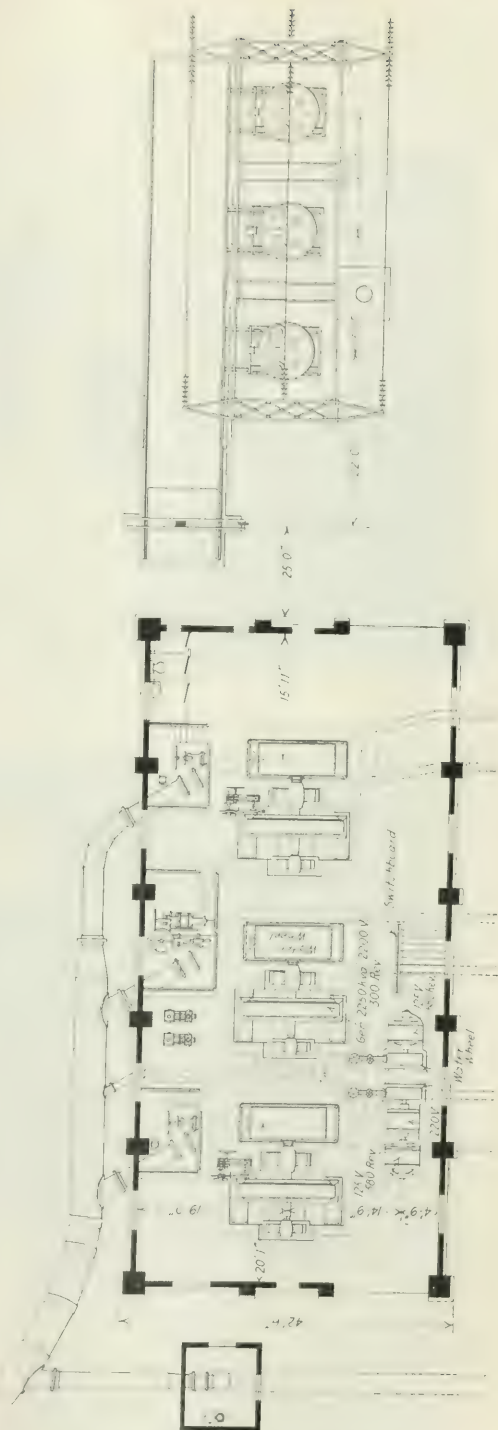


FIG. 33—PLAN VIEW OF STATION NO. 3



The pipe was painted with two coats of metal paint, both inside and out, one coat before leaving the shops and the second coat after being riveted together in the trench. The pipe was finally completely covered with earth to a depth of 1 ft., thus protecting it from the sun's rays and preventing excessive expansion and con-

of ground conditions with reference to the creek, and also to protect the power house from damage, should the pressure line develop a serious leak, by allowing the flow of water to pass into the creek. Fig. 33 shows the plan of the building, Fig. 34 its exterior, and Fig. 35 a general view of the plant. There are three separate



FIG. 34—EXTERIOR VIEW OF STATION NO. 3

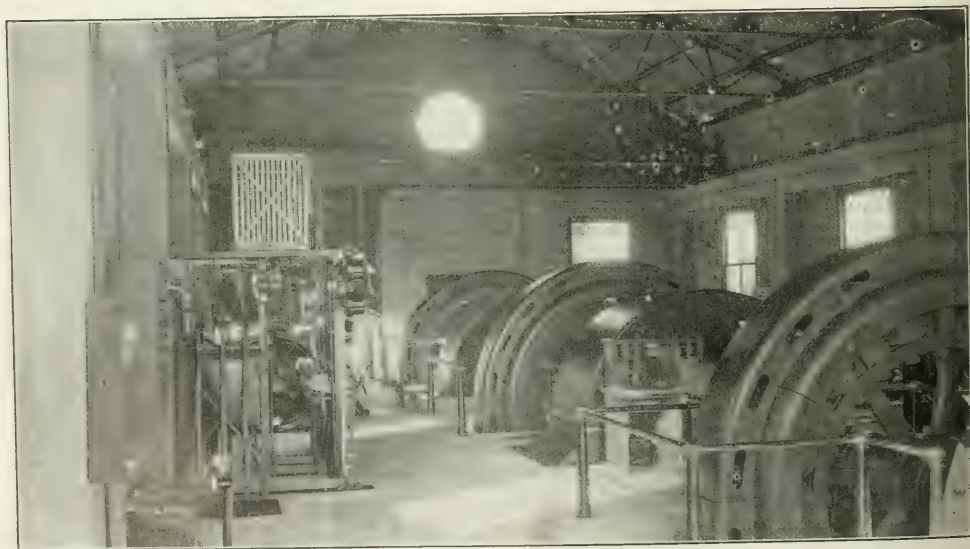


FIG. 35—INTERIOR VIEW OF STATION NO. 3

traction when the pipe is emptied for any purpose. The variation of temperature in the water is not sufficient to cause trouble, and there are no expansion joints in any of the pipe lines.

#### The Station

It will be noted that the station is situated to one side of the pressure pipe, this being done partly on account

tailraces leading from the building to the water level in the intake reservoir of station No. 4, one tailrace for each generating unit in the plant, thus permitting access to any one unit while the remaining two are in operation.

There are three 2250-kw Crocker-Wheeler generating units in this plant, wound for 2200 volts, three-phase,

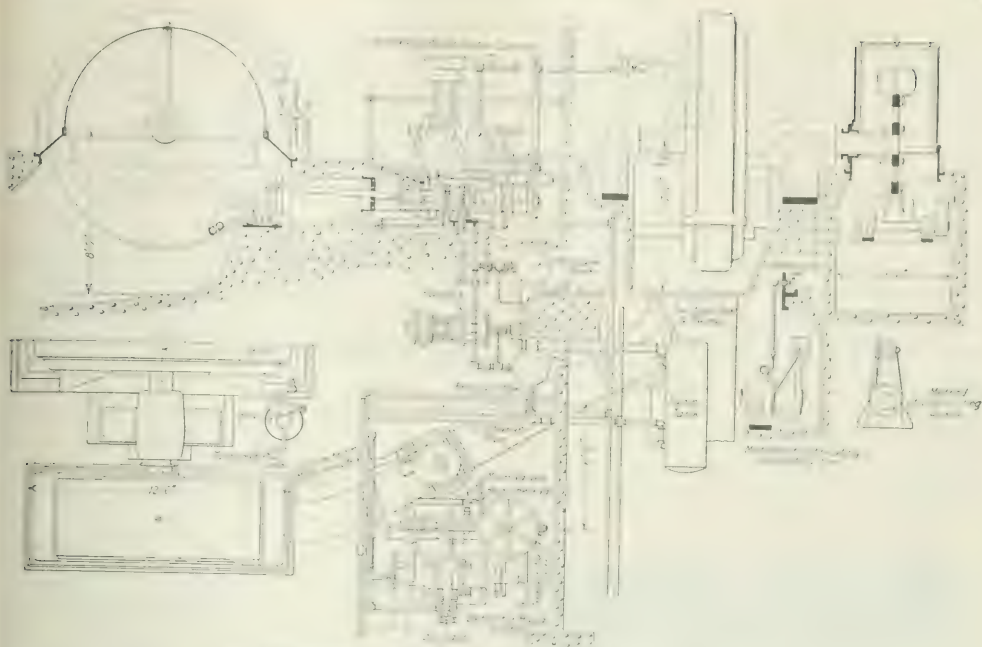


FIG. 36—GENERAL DESIGN OF WATERWHEELS AND GOVERNOR

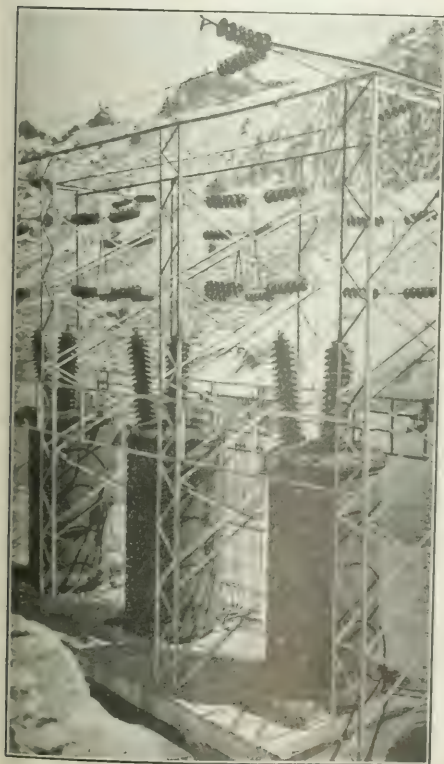


FIG. 37—OUTDOOR BUS STRUCTURE



FIG. 38—TIE LINE FROM STATIONS TO TOWER LINE



sixty-cycle, and operating at 300 r.p.m. There are also two 100-kw, 120-volt, 600-r.p.m., Crocker-Wheeler exciters, one being driven by an impulse waterwheel, the other driven by a waterwheel and by a 150-hp, 2200-volt, three-phase Crocker-Wheeler induction motor, either unit being ample to supply the excitation for the three generators. The exciters are controlled by a Tirrill regulator.

The switchboard consists of three generator panels and two exciter panels, the generator panels being connected with a common bus through non-automatic oil switches. The 2200-volt leads to the transformers tap on the end of the 2200-volt bus and drop down through an oil switch, by means of which the plant can be quickly disconnected from the system.

The hydraulic equipment consists of three impulse wheels mounted on the overhung shaft of each generator. The pitch diameter of the waterwheel buckets is 73 in. There are fifteen buckets per wheel, each bucket being secured to the cast-steel runner by means of two 2 $\frac{3}{4}$ -in. steel bolts. The buckets are also of cast steel. The wheel runners are fastened to the shaft by bolting to a 24-in. diameter flange forged upon the generator shaft. A boss projects through the wheel runner, centering it. Water is supplied to the wheel through an 8-in. orifice stationary nozzle. Two of the

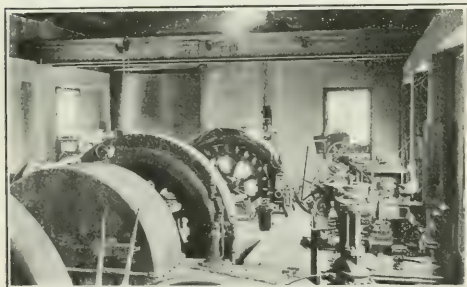


FIG. 39—INTERIOR OF STATION NO. 3

units are provided with hand-regulated needles and governor-operated balanced stream deflectors. The third unit consists of an automatic governor-actuated needle and stream deflector. The relation between the needle and stream deflector is such that water is quickly applied to the wheel by opening the needle and drawing the deflector out of the stream. When less water is required the governor causes a quick movement of the deflector into the stream, the needle slowly closes, and the deflector recedes from the stream proportionally to the closing movement of the needle, thus effecting regulation without serious variation in the water pressure. The effective head in this plant is 780 ft. The last described unit is controlled by a Woodward governor, and the other two units are supplied with Lombard governors. Any of the units can be controlled by hand, independent of the governors, and the deflectors can be locked in any position.

The hydraulic equipment, except the pressure-pipe relief valve, was furnished by George J. Henry, Jr., of San Francisco. Fig. 36 shows the general design of the waterwheels and governor. Fig. 39 is another interior view of the station, which is provided with a 20-ton traveling crane, made by the Cyclops Iron Works, of San Francisco.

The transformers at this plant are of the outdoor type, and are installed 80 ft. away from the powerhouse building. The bank consists of three 2000-kva water-cooled Westinghouse transformers, the low-tension

side being wound for 2200 volts, with two 5 per cent reducing taps, and the high-tension side wound for 87,000 volts, with four 2 $\frac{1}{2}$  per cent reducing taps and an extra tap for 55,000 volts. The transformers are all insulated and designed for star connection to 150,000 volts, which will be the voltage ultimately used. At the present time the 55,000-volt taps are being used, as that is the voltage of the transmission system at present. The transformers are mounted on trucks and so arranged that they can be rolled out upon a transfer truck, taken under a hoisting frame and lowered into a pit, where the cores can be taken out of the cases for inspection and repairs. Fig. 37 is a general view of the transformers, switch frame and bus structures. The 2200-volt buses are made up of 1-in. copper pipe, supported on special porcelain insulators, each transformer being connected to the bus by means of outdoor-type disconnecting switches. The high-tension bus extends across the top of the transformers and is connected to them through disconnecting switches. The line connects to the bus through an outdoor double-break horn-type Bowie switch on the end of the steel structure. Only one break of the switch is installed at the present time; the other part will be put in when the voltage is raised.

#### Plant No. 3 Tie Line

The tie line from this plant leads directly to the control station, a distance of 4 miles down the creek. This line consists of No. 0 stranded copper supported on steel lattice poles by six 10-in. disk suspension-type insulators. A wishbone type of cross-arm is used which gives a separation of 10 ft. between wires. Fig. 38 is a view of this line. The weight of the pole is 1700 lb., and it is 58 ft. in length. The pole is set 8 ft. in the ground, and embedded in concrete. It will withstand a stress of 6000 lb. applied at the top. The poles are spaced twelve to the mile.

#### Hints on Avoidance of Accidents

The Utilities Mutual Insurance Company, formed by gas and electric companies of New York State to meet their requirements under the workmen's compensation law, will issue a monthly bulletin to give members information in regard to accidents that have happened and suggestions for means by which similar accidents could be prevented in the future. Among the accidents and suggestions mentioned in the first bulletin are the following:

"A number of minor accidents have occurred by men having their feet injured by nails in box covers. The importance of removing excelsior from packing boxes is important from an accident-prevention viewpoint, as well as from that of fire prevention.

"A great many minor accidents have been reported caused by material or tools dropping from overhead lines. A careful inspection should be made of the linemen's tools. In many cases the clamps are worn and loose and when pliers or wrenches are carried in belt they are easily dislodged and serious accidents have occurred.

"A number of accidents have been reported where blood poisoning has followed scratches received in handling material; the first-aid outfit will prevent this result.

"A flywheel on a belted engine burst; power house, generating apparatus and other apparatus was damaged, although fortunately no one was seriously injured. Your special attention is called to the importance of frequent examination of flywheels, also the governing apparatus on engine. Flywheels are subjected to severe strains due to short-circuiting or racing."

# Parallel Operation of Subway Transformers

**Difficulties experienced in congested business districts from the inadequacy of equipment that one manhole can contain, and how they may be overcome. By Richard C. Powell**

**I**N very congested business districts where the lighting load is carried exclusively by an alternating-current system it may happen that the load to be taken from a single manhole requires considerably more transformer equipment than the manhole is capable of containing on account of its failure to dissipate the heat arising from the losses.

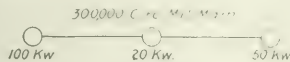


FIG. 1—THREE TRANSFORMERS IN PARALLEL AND ONE CARRYING PRACTICALLY NO LOAD

It may become necessary to supply the excess energy from an adjacent manhole, usually from 50 ft. to 150 ft. distant. Unless the transformers have the proper characteristics, there is grave and almost certain danger of overheating. Sometimes a transformer "banked" with others will refuse to carry even a small portion of the load supplied from its own manhole, but will throw most of it to other transformers situated perhaps several hundred feet distant.

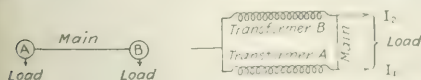
In a case which came to the writer's notice a 20-kw unit was banked with a 50-kw and a 100-kw unit, as shown in Fig. 1.

With 20-kw load supplied from the center manhole less than 3 kva passed through the 20-kw transformer, the 100-kw and the 50-kw units taking practically the entire load. The 20-kw unit was, therefore, almost entirely excess equipment, and hence was removed to a location better suited to its characteristics.

Considerable variation exists in the impedance volts, and in the ratio of resistance to reactance in subway transformers. This fact and the difficulties mentioned above make it highly desirable to predetermine the operation of subway transformers.

In what follows the numerical values for resistance and reactance stated are based on measurements made on individual transformers, and not on fictitious or average values. The loads are considered to be non-inductive and the voltage drop in the mains so small that the load currents may be considered as in time-phase with the voltage. The mains are assumed to have no reactance.

By neglecting the exciting currents and reducing all secondary resistances and currents to the equivalent



FIGS. 2 AND 3—INTERCONNECTION OF TWO TRANSFORMERS

primary values\* each transformer may be replaced by an impedance coil.

The simplest case is that of two transformers inter-

connected by a main and supplying load from each manhole, as in Fig. 2. The equivalent network is shown by Fig. 3.

Let  $i_1$ ,  $r_1$ ,  $x_1$  and  $z_1$  and  $i_2$ ,  $r_2$ ,  $x_2$  and  $z_2$  be the equivalent currents, resistances, reactances and impedances for transformers A and B respectively. The equivalent resistance of the main  $r_s$  is the resistance of the double

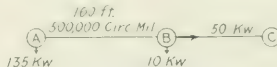


FIG. 4—TWO TRANSFORMERS OPERATED IN PARALLEL TO SHARE LOADS EQUALLY

distance multiplied by the square of the ratio of transformation. The load currents are  $I_1$  and  $I_2$  as shown in the figure, and the current in the main is  $i_s$ .

From Kirchhoff's law are obtained the vector equations:

$$\begin{aligned} i_1 + i_2 &= I_s \\ i_1 - i_2 &= I_s \\ i_1 z_1 - i_2 z_2 - i_s r_s &= 0, \end{aligned}$$

from which is readily obtained the vector equation

$$i_1 = \frac{(I_s + I_2) z_2 + I_s r_s}{z_1 + z_2 + r_s} \quad (1)$$

with similar equations for  $i_2$  and  $i_s$ .

Since  $I_1$  and  $I_2$  have been assumed to be in time-phase with each other, the algebraic equations are easily written. They are

$$i_1 = \frac{1}{z} \sqrt{(I_s r_s + I_2 r_s)^2 + (I_s x_s)^2} \quad (2)$$

$$i_2 = \frac{1}{z} \sqrt{(I_s r_s + I_1 r_s)^2 + (I_s x_s)^2} \quad (3)$$

$$i_s = \frac{1}{z} \sqrt{(I_1 r_1 - I_2 r_2)^2 + (I_1 x_1 - I_2 x_2)^2} \quad (4)$$

where

$$I = I_1 + I_2 \text{ and } z = \sqrt{(r_1 + r_2 + r_s)^2 + (x_1 + x_2)^2} \quad (5)$$

As an example assume that the loads are 50 kw and 75 kw from manholes A and B respectively—that is, 21 amp and 31.5 amp primary (240-volt secondary and 10:1 ratio)—and that neither manhole is of sufficient size to contain a 125-kw transformer without overheating. The problem is to determine how a 50-kw transformer in manhole A and a 75-kw transformer in manhole B connected by 125 ft. of 300,000-circ. mil cable will share the load.



FIGS. 5 AND 6—TWO TRANSFORMERS WITH LOAD BETWEEN

By substituting in the equations above

$$\begin{aligned} r_1 &= 1.50 \text{ ohms,} \\ x_1 &= 3.39 \text{ ohms,} \\ I_1 &= 21 \text{ amp,} \\ r_2 &= 0.96 \text{ ohm,} \\ x_2 &= 0.52 \text{ ohm,} \end{aligned}$$

\*Secondary resistances are multiplied by the square of the ratio of transformation, and secondary currents are divided by this ratio.

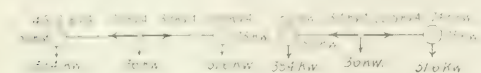


$$I_s = 31.5 \text{ amp,}$$

$$r_s = 0.90 \text{ ohm,}$$

it is found that the 50-kw transformer will carry 34.6 kva (14.4 amp), the 75-kw transformer 97 kva (40.3 amp), and the main 25.4 kva (106 amp secondary current).

In actual practice it is generally assumed that transformers divide the load according to their ratings. Hence the installation would, in general, be made as sup-



FIGS. 7 AND 8—DIVISION OF LOAD BETWEEN TWO TRANSFORMERS

posed in the example, and the 75-kw unit would later be exchanged for a 100-kw unit under the belief that the load from manhole B had been underestimated.

It is easily shown that the currents in an alternating-current network will divide according to the resistances—that is, the same as for direct current—if the ratio of resistance to reactance is the same for all branches. Hence if 1.65 ohms reactance is added to the 75-kw transformer, each transformer will carry its rated share of the load and there will be practically no interconnecting current in the lead, since the resistances and reactances of the two transformers are inversely proportional to their ratings.

In certain cases dissimilarity in characteristics may be an advantage. In one case 50 kw was being supplied from manhole C (Fig. 4) with little or no loads from manholes A and B, when, owing to the erection of large buildings, it became necessary to supply 135 kw from A and 10 kw from B. The A manhole was small and 100 kw in transformer rating was its limit. By installing a 100-kw transformer in each of the manholes A and B the transformer in C could be removed. It is evident that in this event the transformer in B must have the lower impedance, and the two must be connected by cable of sufficiently low resistance.

From the 100-kw transformers available, selection was made of two having the following measurements: For manhole A, resistance, 0.643 ohm; reactance, 0.895 ohm. For manhole B, resistance, 0.52 ohm; reactance, 0.68 ohm.

By substituting these values in the equations above and assuming 500,000-circ. mil for the interconnecting main, the reader may readily verify the result that the out-of-phase currents will be negligible and each transformer will carry approximately its rated share of the load.

An arrangement leading to somewhat more complicated equations is that of two transformers separated by a greater distance than in the preceding examples, where load is supplied not only from the two transformer manholes but also from a service hole between.

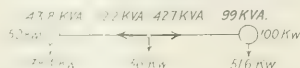


FIG. 9—DIVISION OF LOAD BETWEEN TWO TRANSFORMERS

This is shown in Fig. 5, with the equivalent network shown in Fig. 6.

By writing down Kirchhoff's equations (vector) and solving, as shown in the preceding case, the reader will have no difficulty in verifying the following results:

Assume the 50-kw and the 75-kw transformers in the first example installed in manholes A and B respectively. Let them be connected by 300 ft. of 250,000-circ. mil cable with 160 amp taken from A, 215 amp

from B, and 150 amp from the service manhole half way between.

The numerical results are shown in Fig. 7, in which the loads are shown in kw and kva. By adding 1.65 ohms reactance to the 75-kw transformer the loads will divide as in Fig. 8.

Assume as in the first example that the overloaded 75-kw transformer is exchanged for a 100-kw unit. This later would probably have 0.63 ohm resistance and 0.87 ohm reactance. After this change the results would be as shown in Fig. 9.

This would be satisfactory in so far as overload on the transformers is concerned. But to supply 126-kw load 150 kw in transformer equipment is required, and to supply 36 kw from the service manhole requires 55 kva in the mains.

The above shows that an alternating-current network is liable to produce excessive losses by reason of out-of-phase currents. If the losses for the cases shown in Figs. 8 and 9 are compared, it will be found that the arrangement of Fig. 9 produces 11 per cent more copper losses than that of Fig. 8. The case shown in Fig. 7 produces 27 per cent more copper losses than that of Fig. 8. By the mere addition of a reactor to the 75 kw transformer, the cost of which is very small, 25 kw in transformer equipment and 11 per cent in copper losses can be saved, as can also the difference in core loss of a 75-kw over a 100-kw transformer. The voltage regulation will also be somewhat improved.

## Status of Rural Electric-Service Customers in Indiana

In preparing a paper for the recent convention of the Indiana Electric Light Association, Mr. A. R. Holliday, of Indianapolis, addressed circular letters to utilities in the State inquiring whether or not they had demands for electric service from rural inhabitants. The

### DATA ON RURAL CUSTOMERS IN INDIANA

Company	Number of Customers	Number of Motors	Monthly Minimum	Maximum Rate per Kw-hr.
Citizens' Heat, Light & Power Company, Winchester	10	2	\$1.50	\$0.10
Fort Wayne & Northern Indiana Traction Company	82	15	0.50	0.08
Huntington Light & Fuel Company	12	..	1.00	0.10
Indiana General Service Company, Elwood	20	4	1.00	0.10
Indiana Railway & Light Company, Kokomo	106	7	1.00	0.12
Indianapolis Light & Heat Company	*761	132	1.00	0.10
Lafayette Gas & Electric Company	12	1	2.00	0.12
Liberty Light & Power Company	12	None	1.50	0.13
Muncie Electric Light Company	25	18	1.00	0.10
Noblesville Heat, Light & Power Company	214	34	.50	0.10
Putnam Electric Company	60	None	1.00	0.124
Terre Haute, Indianapolis & Eastern Traction Company	32	..	2.00	0.10
Union Traction Company	10	4	1.00	0.10

\*Includes Indianapolis suburbs and small towns.

majority of the companies answered in the affirmative, and the accompanying table was made to show the present status of rural service in the State.

Among the companies listed different practices obtain in regard to the matter of whether the customer shall pay for lines and transformers. In a few cases the customer is treated on the same basis as the city customer, the company assuming all expense, including service connection. In other cases the customer pays all line and transformer expense and gives the company the option of buying back the line.

# Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods and Current Practice Among Successful Utilities

## Centralizing Energy Production at Louisville, Ky.

Ever since the electric-service companies in Louisville, Ky., were consolidated into the Louisville Gas & Electric Company there has been a tendency to transfer the generation of energy from the old stations to the new Waterside station, which was described in the *Electrical World* for Oct. 25 and Nov. 1, 1913. This plant and the old Fourteenth Street plant have been connected by a tie-line which permits of distributing the energy generated in either station over the feeders radiating from the other. During the past twelve months the Waterside station has generated about half of the energy supplied by this company, while the remainder was developed at the Fourteenth Street plant. An extension to the Waterside station has been very nearly completed to accommodate generating equipment to carry the entire load of the system. Centralization of energy production at this plant has been considered preferable as condensing and boiler-feed water is obtained through tunnels extending into the Ohio River, while water for similar purposes at the Fourteenth Street station has to be pumped from deep wells. Other advantages of the plant on the Ohio River are that it is conveniently located for the reception of coal by rail or water, that it has facilities for handling cheap grades of coal, and that its equipment is of the most modern and efficient type.

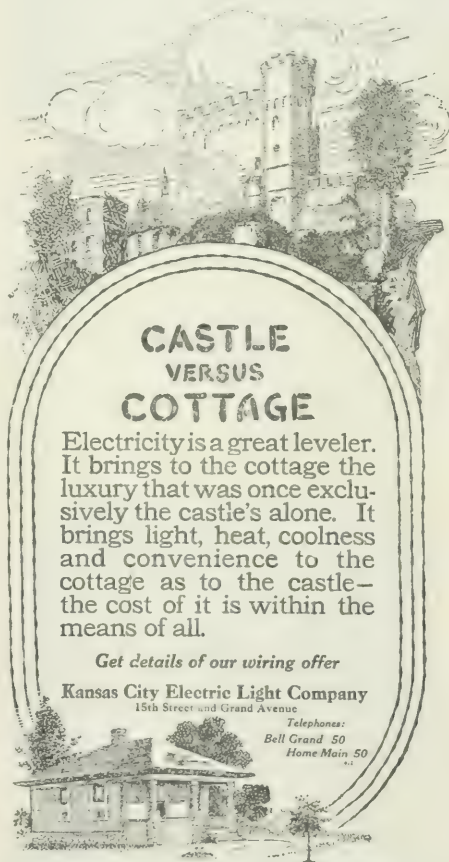
## Overhead Charges in Nashua, N. H.

Testimony on overhead charges and other factors which have a bearing on the value of the property are mentioned in the decision of the Public Service Commission of New Hampshire authorizing the Manchester Traction, Light & Power Company to purchase stock of the Nashua, Light, Heat & Power Company.

The property of the Nashua company, exclusive of land, was valued on the basis of cost of reproduction new and less depreciation, by Messrs. Sloan, Huddle, Feustel & Freeman, of Madison, Wis., on behalf of the commission, and by Mr. Hollis French, of Boston, on behalf of the petitioner. Mr. Feustel, of the firm which made the valuation for the commission, allowed 15 per cent for overhead charges, while Mr. French testified that, in his opinion, 21 per cent was a reasonable allowance. Mr. Feustel also depreciated his overhead charges, while Mr. French did not. The conclusion of the commission was that the allowance made by Mr. Feustel was ample and that overhead charges should be depreciated. As the plant, according to the commission, has always paid a fair return and has also earned enough to enable its owners to put back into the property a sum in excess of the total depreciation, no allowance was made for going-concern value considered as an item to be appraised separately. The commission adds in its decision: "Of course, what is being valued is a plant with business attached in full and profitable operation, and our valuation is made with that fact clearly in mind." Although the stock of the petitioning company was selling at 140, the commission had no hesitation in authorizing the new issue at par.

## Effective Advertising Campaign in Kansas City

The Kansas City (Mo.) Electric Light Company, which recently gave a very successful "fall festival electric," has made a great success in selling all sorts of appliances and devices in its Electric Shop and also in its campaign for wiring houses. The efforts of the company in the "festival electric" were confined to the



REPRODUCTION OF A PICTURESQUE ADVERTISEMENT OF KANSAS CITY COMPANY

display of household equipment, including everything from the parlor through the dining-room, sewing-room, kitchen and the basement laundry, and this centering of effect brought definite results. The accompanying illustration shows a rather striking advertisement which appeared in the Kansas City papers recently stating tersely the universal advantages of electricity.



### Steam-Power Versus Electricity for Filling Silos

Customers on the rural lines of the Noblesville (Ind.) Heat, Light & Power Company have been trying both steam and electric drive for filling silos and have found the latter method the less expensive. Individual

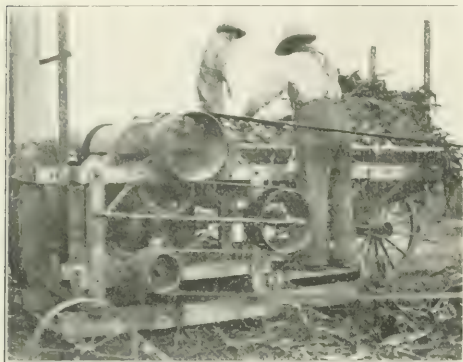


FIG. 1—FEEDING ENSILAGE TO THE CUTTER

farmers or groups of farmers have bought the shredders and blowers used for cutting and elevating ensilage, so that in considering the comparative costs this piece of machinery need not enter. For the use of a steam traction engine, though, the daily charge is \$5—not including the engineer's wage of \$3, the cost of coal at about \$3, or the water hauling at about \$1.50. Hence the actual total cost of steam-engine drive is about

ENERGY REQUIRED FOR FILLING SILOS

Test Number	Tonnage of Silo	Energy in Kw-hr.
1	50	52
2	75	60
3	125 (two silos)	152
4	50	88

\$12.50 a day, and it is found that time is generally lost in the morning in firing up the engine.

For the farmers who wish to use electricity, however,



FIG. 2—THE OLD WAY—STEAM-ENGINE DRIVE

the Noblesville company has bought and maintains a 15-hp motor and a bank of transformers mounted on a wagon truck. This outfit complete with starting equipment and wiring is rented to those who wish to use it for \$5 a day, the rental charge covering also the energy

consumption. In addition to filling silos this portable power plant has been used for hulling peas and shredding fodder, and it is expected that "farmers' rings" in different communities will purchase this outfit and other similar equipments for their own use in the future.

Records have been kept of the energy consumption



FIG. 3—MOTOR AND TRANSFORMERS ON TRUCK

for several of the silos filled, and some of the representative data are given in the table herewith. The average energy required per ton is 1.17 kw-hr.

### Cost of Operating Electrical Dairy

Among the 150 farm-owners in southwestern Ontario receiving electric service from the Hydro-Electric Power Commission are several dairymen. The accom-

UNIT COST DATA FOR DAIRY FARM

Operation	Detail	Percentage of Total Kw-hrs.	Cost	Unit Cost
Pumping water	Four hours a day	23.3	\$17.75	\$0.0011 per barrel
Milking	421 times—30 cows	23.7	14.98	0.0012 per cow per milking
Separating cream	316 times	8.2	5.20	0.011 per hour
Heating water	2,420 gal.	29.0	18.35	0.007 per gallon
Lighting		10.8	6.74	
Total		100.0	\$63.02	

panying data were collected from the records of one of these dairy customers for the period from March 16 to Oct. 18, 1913.

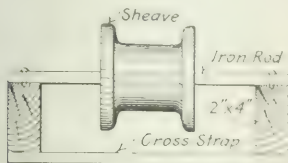
### Putting Personality in Advertisements

The Rockford Electric Company, Rockford, Ill., has been running a successful series of house-wiring advertisements a departure in which has been the use of half-tone portraits of its salesmen. The text of the advertisements usually relates specifically to work done by the particular salesman, including an introduction to new customers, a letter from a pleased customer or some other matter calculated to arouse the personal interest of the reader in the solicitor's personality—a psychological device that has long been taken advantage of by advertisers in other fields desiring a direct approach to the individual reader. An earlier advertisement includes pictures of a group of sales representatives. The company's indorsement declares that they "know the house-wiring business from A to Z."

## Illumination and Wiring

### Roller Guides to Facilitate Installing Armored Cable

If long runs of heavy armored cable are to be installed in an earth trench, the friction load of pulling the cable into place may be considerably reduced by supporting it on roller guides placed several feet apart. A



ROLLER GUIDE FOR CABLES

guide which is simple to construct may be made of a sheave supported on an iron rod resting on two short pieces of two-by-four timber held together by cross straps. The sheave should be given considerable end-play to allow for irregularities in the cable. The guides should be placed close enough together to prevent the sags in the cable dragging on the ground. In the accompanying drawing a guide suitable for this purpose is shown.

### Pulling Underground Cable

If the lead sheathing on a cable is gouged during installation, moisture may seep in and ultimately cause trouble locally and possibly for a distance on each side of the damaged spot. Should the cable be subjected to excessive bending, the paper insulation may be cracked, thereby lowering the dielectric strength and affording a path for a subsequent breakdown when the conductors are energized. Special care was taken to prevent these effects by the method of cable pulling employed at the Crucible Steel Company's plant at Midland, Pa., where the entire distribution system is underground.

The ducts were first "rodded" to remove obstructions and to thread the pull-in wires through the conduits. The rods were about 4 ft. long and were fastened together by cast-iron male and female hook joints. As the rods were pulled through one duct followed by an iron wire they were pushed into another duct line without unhooking. Hemp line was attached to the wire and pulled into the duct, leaving the rope for the final pulling of the cables. The men rodding the ducts were sent ahead of the cable-distributing gang, which consisted of six men who delivered the cable on trucks capable of carrying two reels. The reels were marked, showing the size of the cable, the number of the run, the terminal manholes and the amount of clearance to be left at each manhole.

For attaching the cable to the pull-in line a woven-wire grip was employed. This was slipped over the end of the cable and fastened to the hemp rope by a pair of "sister hooks." Before this was done, however, a brass casting shaped like the bell of a horn was inserted in the entrance to the conduit to prevent the lead sheath being damaged during pulling. To lead the line out of the duct a frame supporting sheaves was placed in the next manhole. This frame was made of two 15-ft. channels fastened back to back about 5 in. apart. At each end of the structure a set of eight 1-in. holes was drilled to receive spindles on which the sheaves turned. One sheave was placed opposite the outlet to the duct

that was being threaded, and another was placed 4 ft. above the ground, leading the rope to the pulling winch. The winch, which was operated by a 2.5-hp motor, was found amply strong to pull the longest cable installed, which was about 330 ft.

During the actual pulling men were stationed as follows: One in the manhole into which the cable was being drawn, another where the line emerged, a third at the cable reel to operate a brake in case the cable fed faster than it was being pulled, and a fourth at the pulling winch. As the cable was being fed into the duct it was liberally smeared with cup grease to reduce friction. At no time was the reel allowed to revolve fast enough to let the cable drag on the ground and become bruised. As the cable emerged from the duct the man at the winch was signaled to "ease off" the winch, allowing the cable to be pulled slowly. Rule in hand, the attendant in the manhole watched the emerging cable until the desired amount had appeared, when he ordered a full stop. With alert men it was possible to pull cable within 1 in. of the desired clearance.

### Lighting Equipment of U. S. Dredge "Buras"

In the accompanying illustration is shown a night view of the United States dredge *Buras*, which is used for levee building along the Mississippi River and its tributaries. The equipment for lighting the dredge was designed and installed by S. J. Stewart (Electric), New Orleans. The boom of the dredge is 125 ft. long and is provided with two oblong "illuminators" shown in the illustration.

The house, which is octagonal in shape, is equipped with two illuminator head-lamps and four three-lamp clusters of 60-watt lamps on the outside. As the machine turns there is light on all sides. The base is provided with one five-lamp cluster of 60-watt lamps in the front, another in the back and six 16-cp lamps distributed at other points. Energy is supplied to all of these lamps through a sliding contact. The inside of the house is lighted with one three-lamp cluster of 60-



NIGHT VIEW OF U. S. DREDGE "BURAS"

watt lamps and twelve separate 16-cp lamps. All wiring is laid in steel conduit, and all circuits are controlled from a central switchboard. Energy is supplied by a 7.5-kw, 125-volt, 1000-r.p.m. direct-current generator, manufactured by the Robbins & Myers Com-



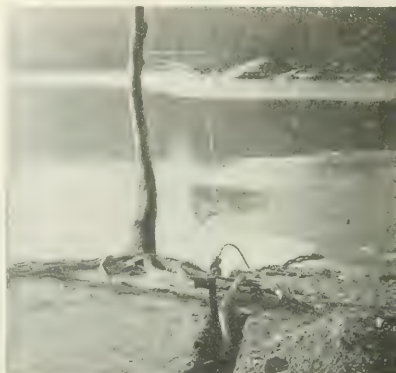
pany, Springfield, Ohio. The generator is belt-driven by a steam engine. The dredge was manufactured by the McMyler Interstate Company, Cleveland, Ohio.

### Underground Distribution in Central Park, New York

Central Park, New York City, which, as pointed out in these pages some time ago, is lighted with tungsten lamps fed from underground cables, has an unusually complicated distribution system. Electrically the park is divided into seventy-two circuits of from two to forty-five lamps each. As a general rule these are controlled from the first post on the circuit, but in some cases from city lamps conveniently placed. With this arrangement it is possible to turn the lamps on or off either at or near the park boundaries or at transverse roads, which arrangement has many operating advantages. Where convenient, opposite sides of a drive are lighted from separate circuits to increase the reliability of illumination. Double, steel-banded lead cables ranging in size from No. 00 triplex to No. 8 duplex are employed. Under and around the steel armor are wrappings of jute which protect the steel from moisture and the lead from contact with the steel. One of the chief advantages possessed by this cable is that it does not have to be buried more than 10 in. or 12 in. in the earth. It can also be submerged without additional protection.

The New York Edison Company's three-wire mains are tapped at convenient points on the outskirts of the park and cables, usually of No. 00 wire, are run to the control posts. Switches are generally placed in the main feeders, but in important sections of the park where fewer lamps are connected to each circuit branch circuit switches are employed. All of the switches are of the knife-blade type, one being installed in each posi-

two-bar connection block which carries the lamp fuse. The lower bar is always neutral and the upper one is either positive or negative, depending on conditions. Three-bar blocks are employed on triplex feeders at



CABLE EXTENDING UNDER WATER

heavily loaded branch points. As all connections are made inside the posts, no manholes or junction boxes are required. Wherever cables are installed under driveways which are liable to be torn up frequently they are inclosed in 2.5-in. pipe.

## Letter to the Editors

### Electrolytic Insulation of Aluminum

*To the Editors of the Electrical World:*

SIRS:—In both your interesting editorial in the Oct. 17 issue relating to the electrolytic insulation of aluminum and the paper quoted the possibilities of aluminum wire in large sizes for series-wound coils appear to have been overlooked.

In electrical machine design at the present day, and particularly in that section dealing with traction motors, there is a pronounced tendency to discard all insulating material of an organic or textile nature and to substitute substances as highly refractory as possible. In this connection, therefore, it is particularly interesting to note the progress made in Europe in the use of series-field coils of aluminum in which the adjacent turns are insulated only by the oxide formed on the surface of the wire. Such a coil would have excellent characteristics when operating under temperature conditions which would be fatal to ordinary insulating materials. Moreover, the process involved for forming the necessary coating of oxide is of the simplest nature. As a rule, the wire is passed through a warm alkaline solution and wound up while hot.

Some idea of the commercial practicabilities of aluminum coils can be gathered from the fact that they are in use on about fifty street railways in Europe, the city of Hamburg alone having adopted them exclusively some time since. As will be surmised, these coils have principally been used for rewinding motors of older types, but there has been found no insuperable difficulty to fitting them in machines of much more recent design, and in London several 125-hp motors equipped with aluminum coils are operating on one of the subways.

ERNEST V. PANNELL,

Electrical Department, British Aluminum Company, Ltd.  
Toronto, Can.



BASE OF LIGHTING UNIT CONNECTED TO CABLE

tive and negative circuit. Each lamp has its individual fuse in addition to those in the main line, but none is employed in the neutral circuit.

In every post on duplex branch lines is installed a

# Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems Notes on Practical Subjects Questions and Answers

## To Prevent Loosening of Socket Shells

In sockets of the bayonet-joint type, particularly when equipped with keys and installed on bracket fixtures, the outer shells frequently become loosened and drop down, giving an unsightly appearance and exposing the live parts. Tightening the screws affords only temporary relief, for with the handling incidental to turning the lamp on and off a few times the shell may be again twisted so that it will drop out through the open slot as before. The trouble can be permanently



NOTCH TO PREVENT LOOSENING OF SOCKET SHELL

remedied, however, by cutting a little notch in the top of the bayonet-joint slot as shown in the accompanying sketch. This allows the screw to seat itself firmly in the notch, where it is adequately supported without the need for pressure on the part of the screws. A socket prepared in this way will hold firmly even after the threads have been worn from the screws by previous fruitless efforts to tighten the shell in place. The notch can be conveniently cut in the shell with the small end of a rat-tail file.

## Case to Protect Knife Switches

By J. G. KOPPEL

In places where exposed knife switches are a menace to life it is advisable to employ some sort of a protecting cover. Illustrated herewith are cases for inclosing single-throw and double-throw knife switches and the fuses usually installed therewith. The cover is pro-

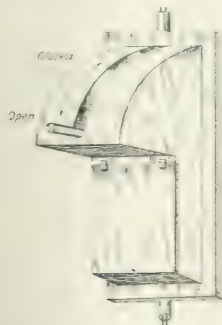


FIG. 1—PROTECTIVE COVER FOR SINGLE-THROW SWITCH AND FUSES

vided with a slot through which the switch handle is allowed to protrude. The base may be made of marble, slate or alberine fiber, the casing of the latter material,

and the slotted cover of vegetable fiber lined with asbestos. To permit access to the fuses without having to remove the entire cover, a hinged cover of alberine

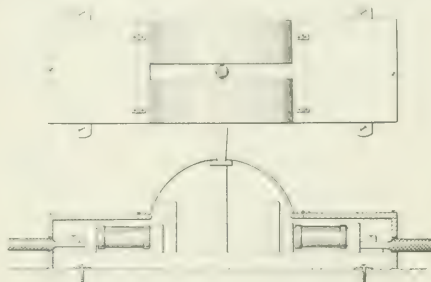
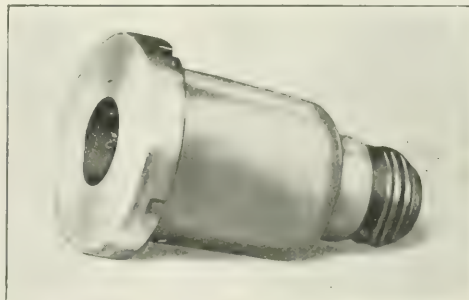


FIG. 2—PROTECTIVE COVER FOR DOUBLE-THROW SWITCH

fiber may be provided as indicated. Protective covers of this description are employed in several large industrial plants in Montreal, Quebec.

## Protecting Induction Motors from Overload

To protect induction motors from continued overloads, such as are caused by a single fuse blowing in a poly-phase circuit, a device can be used which operates on the principle of a fuse with a long time lag. As described before the Association of Edison Illuminating Companies at its recent convention, the device consists of a porcelain receptacle containing a heating coil surrounding a copper bar which projects from the coil and is used as a contact post. A spring contact set to spring away from the post when the heat, and consequently the overload, becomes excessive is fastened thereto by a fusible link. The terminals of the receptacle are fast-



TIME ELEMENT FUSE FOR PROTECTION OF INDUCTION MOTORS

ened to the stationary end of the spring and the copper post. The device is connected in series with the ordinary motor fuses, which need to be set only for short-



circuits. Owing to the long time lag of the heating unit, momentary heavy starting currents will not melt the link and open the circuit, but a continued overload will do so.

### Improved Control Circuit for Vehicle-Charging Motor-Generator Set

While charging a vehicle battery or group of batteries through a motor-generator set an interruption in the source of the alternating supply may cause the direct-current machine to become the motor, delivering alternating current back to the line. Likewise the interruption of service on a single phase of the three-phase service may overload the motor end of the set. However, when protected by a wiring scheme similar to that shown in the accompanying illustration neither of these troubles can occur.

The armatures of current relays in each phase of the

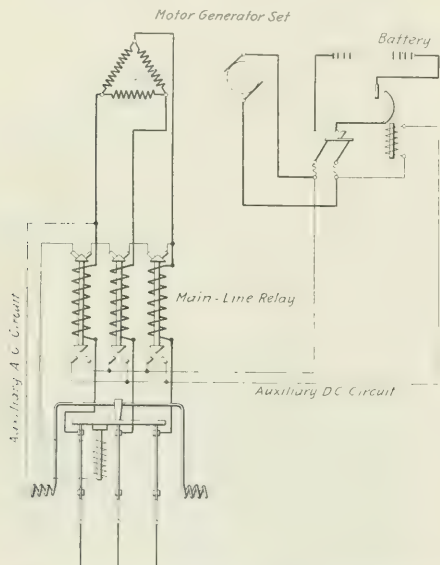


DIAGRAM OF WIRING FOR SECTION BATTERY-CHARGING SET

alternating-current service complete a local electrical circuit energizing a trip coil which holds the main-line switch closed. If any main-line relay becomes de-energized, the auxiliary relay circuit is immediately opened, thus releasing the spring-operated main-line switch.

More important, however, is the operation of the auxiliary direct-current circuit, which is completed by a main-line relay in the "down" position, that is, the position a relay would occupy when the phase in which it is connected is dead. Completion of this auxiliary direct-current circuit trips the single-pole circuit-breaker in the battery service and prevents direct current from the battery being used to drive the motor-generator set. Cases are on record wherein the alternating-current service failed during the night. Although an attendant was in the garage, he did not notice any trouble. However, when the drivers could not move their vehicles in the morning investigation showed that the batteries of the fleet had been deliver-

ing energy to the motor-generator during the greater part of the night instead of receiving it.

Patents on this wiring scheme have been taken out by Mr. Nels Joleen, of the Commonwealth Edison Company, Chicago.

### Wooden Nozzle for Compressed-Air Hose

For blowing out bus chambers with compressed air, as well as for cleaning all kinds of electrical machinery in its plants and substations, the Middle West Utilities Company, Chicago, is making use of wooden nozzles on its air-hose lines. These nozzles can be introduced with safety near charged conductors and avoid the possibility of fatal shock which is present with the usual metal nozzles.

Where some of its disconnecting switches are remote from the oil switches controlling the same circuits red and green signal lamps operated from the switchboard pilot-lamp circuits are placed near the disconnecting switches. With these lamps as safeguards the attendant can assure himself of the condition of the circuit before attempting to open or close the disconnecting switch.

### Burning of Commutator

We have a synchronous motor-generator set which recently became grounded at the motor collector rings, resulting in burning small holes in the generator commutator. The commutator is not grounded, but these holes collect dirt, which causes arcing between the brushes. How can this trouble be remedied?

G. T. M.

In order to restore this machine to satisfactory operation it will probably be necessary to turn down the commutator until a smooth surface is again reached. While several methods can be employed for filling such burned places with mica compounds, these are generally makeshifts, the filling usually being thrown out under the high centrifugal forces in the commutator. One plan is to cut a slot between the commutator bars for a short distance back on both sides of the burned places. Into the slot thus formed a piece of sheet mica is introduced and the remaining space at each side is filled with mica compound. With the aid of a chisel, copper from the body of the segments can be beaten over to wedge the filling, in some cases practically covering it. The presence of this insulating filling prevents the entrance of dirt which, by forming a short-circuit path between adjacent commutator bars, causes the sparking noted.

### Design of Electromagnets

I wish to design a powerful electromagnet to be used for the quick closing of a door. Two such magnets will be operated in series on a 275-volt circuit. Please state the formula for the design of such a magnet.

J. F. D.

The maximum uniform pull of an open-circuit plunger magnet, measured in pounds, is expressed by the formula:

$$\text{Pull} = CA \frac{I^2 N^2}{l}$$

where  $I$  is the current in amperes,  $N$  the number of turns,  $A$  the area of the core in square inches,  $l$  the length in inches, and  $C$  the pound pull per square inch per ampere-turn per inch. The last-named factor depends upon the proportions of the coil, the degree of saturation, the length, the physical character and the chemical purity of the plunger. Its numerical value as ascertained from practical magnet construction ranges from 0.009 lb. to 0.013 lb. per square inch per ampere-turn per inch.

# Digest of Current Electrical Literature

## Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

### Generators, Motors and Transformers

**Three-Phase Commutator Series-Motors.**—F. VON KLEIST.—A mathematical article illustrated by diagrams in which the author gives formulas for the calculation of three-phase series commutator motors. Formulas which have been found reliable and useful in practice are given both for motors with a single set of brushes and with a double set of brushes. Numerical examples are added.—*Elek. Zeit.*, Oct. 8, 1914.

**Large Induction Motors.**—G. MOORES.—A continuation of his illustrated serial on some features of mechanical design of large induction motors. In the present instalments the author deals with stator frames and with rotor construction.—*London Elec. Review*, Oct. 9 and 16, 1914.

**Railway Motor.**—C. W. STARKER.—An illustrated description of the universal pressed-steel railway motor of the Westinghouse Company.—*Elec. Journal*, October, 1914.

### Lamps and Lighting

**Flicker Photometer.**—HERBERT E. IVES AND EDWARD J. BRADY.—An illustrated article on a new design of flicker photometer for laboratory colored-light photometry. Three requirements should be fulfilled: First, the dividing line between the two fields which are alternated should be a line without breadth; second, the speed of alteration should be accurately adjustable, and, third, it should be possible to vary the relative brightness of the two fields quickly over a wide range with a minimum of physical effort. A flicker photometer head should be of the stationary and not of the movable type. The instrument is best described by reference to Fig. 1, which gives plan and sections. The photometer is

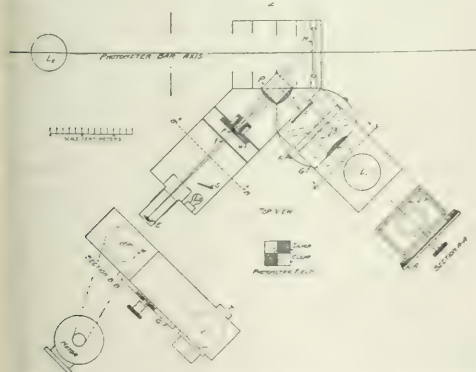


FIG. 1—PLAN AND SECTIONS OF FLICKER PHOTOMETER

planned to be used solely by the substitution method, so that while the test and standard light sources are carried successively at appropriate places on the photometer bar, the comparison lamp is held at a fixed position in the photometer body. Tracing the paths of the beams of light which ultimately reach the eye is the easiest way to understand the photometer's behavior. The light from the standard lamp  $L$ , falls upon the matte white

surface  $M$ , thence a portion is reflected through the cube  $P$  and the small prism  $P_1$  to the eye. The light from the comparison lamp  $L_c$  passes through the lens  $C$  and thence through the variable neutral-tint screen  $V$  to the flashed opal glass  $O$ . Part of the diffused light of the latter enters the cube  $P$  and is reflected through

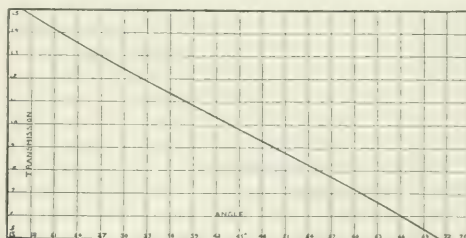


FIG. 2—CALIBRATION CURVE

the small prism  $P_1$  to the eyepiece and eye at  $E$ . The mechanism for producing the alternation of the two illuminations is comprised in the cube  $P$  and the prism  $P_1$ . The cube is a modified Lummer-Brodhun. One of the component prisms is left untouched; the other is silvered and the silvering is cut away in the manner shown in the separate sketch of the photometric field. The small prism  $P_1$ , having an angle of 10 deg., is mounted in a collar  $W$ , which is rotated by the motor to which it is connected by a belt. The plate  $F$ , perforated by a central round opening of 2 deg. diameter, as viewed from the eyepiece, limits the actual area of the prism used. When the motor is running the beam of light which reaches the eye is, as it were, whirled around the axis of the instrument, alternately passing over the clear and the silvered parts of the cube  $P$ . The successive appearance of the openings at  $F$  are readily seen from the separate sketch of the photometric field, where the small circle represents the section of the beam coming to the eye from  $F$ . The practically invisible dividing line between the silvered and the clear portion of the cube and the smooth continuous motion of the prism  $P_1$  insure the first condition considered above. The second condition above dwelt upon is secured by using a series-wound motor with a sliding resistor of variable resistance. The third condition—the easy variation of the relative illumination—is secured by the use of the variable neutral tint screen  $V$ . This consists of two opaque line gratings on glass slightly separated from each other. When rotated about an axis parallel to the lines the transmission varies with a rapidity determined by the separation of the glasses. This screen is rotated by a milled head which also carries the pointer  $A$ . The size of the milled head is such that it may be turned easily by the fingers. Small lamps to illuminate the scale are also provided but are not shown in the sketch, and the scale may be read either from the observer's side or else by an assistant viewing the other end of the pointer. The lens  $C$  is intended to help make the illumination on  $O$  uniform, and as a further refinement the cube  $P$  is furnished with a convex lens focused on



one spot of the opal glass *O*. A calibration curve of the screen in this particular instrument is shown in Fig. 2. It is practically a straight line over all the region which would be used. A novelty in this instrument is the means for illuminating the surroundings of the photometric field to nearly the same brightness, furnished by the small lamp *L*, which throws its light on the white walls of the compartment facing *F*. *S* is a small translucent screen for securing uniform illumination. This bright surrounding field materially contributes to the comfort of reading.—*Phys. Rev.*, September, 1914.

#### Generation, Transmission and Distribution

**Long Three-Phase Transmission Line.**—B. SOSCHINSKI.—The conclusion of his mathematical paper in which he shows that regulation for constant final voltage of high-tension feeder lines by means of synchronous motors at the end of the line is always economical. It is the more economical the greater the length of the transmission line and the power transmitted. Numerical examples are given.—*Elek. Zeit.*, Sept. 24, 1914.

#### Traction

**Electrification of Railroads.**—L. PONTECORVO.—An article on the electrification of the Italian Giovi line. This was brought about for the single reason that the capacity was insufficient and that by electric equipment it became possible to triple the capacity both by increase in speed and tractive effort. The three-phase system is used. Although the increase in capacity was the only decisive consideration, the results from an economic point of view have been far better than expected and have constituted for the Italian State Railway a very great success. A detailed examination made by the administration of the Italian State Railway has shown that the running expenses, including interest and depreciation on the investment, have been reduced 22.5 per cent, notwithstanding the fact that the electric energy is produced by a steam-electric plant and that the station capacity is not yet fully utilized. As regards the relative merits of the various systems, the Italian State Railways are sufficiently satisfied with the three-phase system to extend it to all their lines as conditions will require it. Having already in service 135 three-phase electric locomotives, of which 110 are of the Giovi type, with a total capacity of 2161,200 hp, they are considering the electrification of new lines not on theoretical considerations but from the results of actual experience. On account of the large increase in capacity of the lines through three-phase electrification, it will be unnecessary to double the track on single-track lines where the traffic is getting too heavy and where the expense of doubling the track would be very high; besides, on account of the elimination of smoke they will be able to improve greatly the service on lines with many tunnels as is the case on most Italian lines. To this will be added the advantage of a reduction in the running expenses and, by utilizing to a larger extent the hydraulic power not yet developed, they may reduce the importation of coal, which represents a heavy expenditure for the country. Again, it is not simply the large saving due to the characteristics of this system, such as the lightness of the locomotive and the regeneration of energy, but more especially the characteristic of maintaining high speeds on the up-grade with high efficiency, which determines the hauling capacity of the lines.—*Elec. Journal*, October, 1914.

#### Installations, Systems and Appliances

**Direct-Current Motors for Variable-Speed Drive.**—R. S. SAGE.—The first part of this article is devoted to a brief discussion of the elementary principles involved in producing variation of speed in direct-current motors and shows why the commutating pole is a requisite in

the design of motors to be used for wide speed ranges by the field-control method. After a short statement as to the general classes of industrial requirements, some space is given to a more detailed description of the three control systems and a discussion of their adaptability to the three general classes of requirements, the third method (field control) receiving special consideration. The concluding paragraphs deal with the subject of compound windings for motors of this class and close with the statement that the application of the commutating-pole adjustable-speed motor should prove of advantage in the majority of drives for variable-speed apparatus.—*Gen. Elec. Rev.*, October, 1914.

#### Wires, Wiring and Conduits

**Insulating Materials.**—A. SCHWAIGER.—An illustrated English translation of his German paper, noticed some time ago in the Digest, on a new method for testing the electrical properties of insulating materials and their ratings for quality by a series of characteristic curves.—*London Electrician*, Oct. 16, 1914.

#### Electrophysics and Magnetism

**Seat of Light Action in Selenium.**—F. C. BROWN and L. P. SIEG.—There has been some uncertainty in the past as to the seat of light action in selenium. The present authors have succeeded in producing several forms of large crystals of metallic selenium, which have enabled them to determine several interesting facts concerning the seat of light action in selenium. The authors describe various observations which have led to the following results: The change of resistance by light is a property of the crystal and not an action taking place at the contacts. Illumination of different points along the crystal produces approximately the same effect at all places. The crystal is changed in conductance by approximately the same amount whether the illumination is on the side of the contacts or on the opposite side. From these results the authors draw the general conclusion that the light acts throughout the crystal and that the conductivity is almost uniform throughout the crystal. They then refer to evidence deduced from the law of superposition of intensities. They used two lamps in certain combinations and found that the two lamps acting together produce almost identically the same effect whether they act on the same side or on opposite sides. Moreover, there is an apparent spreading of light action. The authors produce evidence to the effect that the action of light in crystal is transmitted to a distance. There seems to be a new "action at a distance." If the rate of transmission of the action through the crystal can be determined, certain information may be obtained as to the nature of the mechanism of transmission. The possible processes that are suggested are electronic transmission such as exists in the flow of the electric current, transmission by the elastic vibration of the medium, and possibly by the interaction of parts of the atoms moving with velocities approaching that of light.—*Philos. Mag.*, October, 1914.

**Time-Factor in Selenium Resistance.**—G. E. GRANTHAM.—It is well known that the electrical resistance of selenium does not reach an equilibrium value instantaneously after exposure to light, and the rate of change of resistance on exposure is much greater than the recovery rate. The problem suggested the use of a rotating disk from which sectors are cut to allow the light to fall upon the cell, the cell being in one arm of a Wheatstone bridge with some device for connecting a galvanometer in the bridge circuit at a known time interval after exposure. The author describes experiments made by this method. The relation between time and resistance for the preliminary experiment is shown

in curves. During the first hour the rate of change of resistance increases with the speed. During the remainder of the time the cell approaches the equilibrium resistance. This equilibrium resistance is the resistance of the cell at the time that the decrease on exposure is just equal to the increase in the dark. A discussion of the results is given on the assumption that selenium consists of three components.—*Phys. Rev.*, September, 1914.

#### Units, Measurements and Instruments

**Direct-Current Ampere-Hour Meters as a Substitute for Watt-Hour Meters.**—W. STRELOW.—An illustrated article in which the author gives an outline of the development of the designs of direct-current watt-hour meters and ampere-hour meters in the last twelve years. He then describes the construction of ampere-hour meters for two-wire and three-wire installations. They are provided with a friction compensation device making use of a small additional current of 3 or 4 milliamperes (corresponding to a consumption of 0.4 watt per 100 volts). The author emphasizes that it is quite possible to design an ampere-hour motor meter which will read correctly even at the smallest loads and that it should represent a suitable substitute for watt-hour meters.—*Elek. Zeit.*, Sept. 24, 1914.

**Testing Lubricating Oils.**—An illustrated description of an oil-testing machine of British make which determines and automatically records the correlation that should exist between the machinery to be lubricated and the lubricating medium it is proposed to employ for the purpose. The apparatus forms a complete self-contained oil-testing and grease-testing plant, the equipment including a small high-pressure steam boiler and superheater, and it is so arranged that all tests are carried out under conditions which are in every respect the exact mechanical counterparts of the actual work to be done by the lubricants. To accomplish this the speed of the machine can be varied as required to produce the equivalent of from 50 r.p.m. to 3000 r.p.m., corresponding to a speed of the frictional surfaces of about 5 in. to 25 ft. per second. The range of pressure is from 1 lb. to 750 lb. per square inch, and the temperature can be increased from that of the frictional surfaces when at rest to 500 deg. C., which surpasses the heat of dry steam produced under the highest pressure. The recording mechanism indicates automatically and upon the same sheet of paper the degree of friction and the temperature of the frictional surfaces at various speeds. The curves are such that they also indicate the proportional thickness of the layer of oil required to maintain efficient lubrication at the given temperature, together with the comparative values of the oils in relation to their capacities for withstanding various temperatures.—*London Electrician*, Sept. 18, 1914.

**Measuring Magnetic Flux.**—P. LUDEWIG.—A description of laboratory exercises on the determination of the magnetic flux and the coefficient of mutual induction in university laboratories. After an outline of the theoretical foundations the author describes in detail how to calibrate a ballistic galvanometer and how to determine the distribution of magnetism in a magnet rod, the flux in a long primary coil by means of a short secondary coil, the mutual inductance of two coils, one of which is placed so that it can be revolved within the other, and the effect of an iron core on the flux.—*Elek. u. Masch.* (Vienna), Sept. 13 and 20, 1914.

#### Miscellaneous

**Arc Welding.**—E. S. ZUCK.—An illustrated article on the equipment required for electric arc welding. The author discusses successively the generating equipment, the electrode holders, protective coverings, welding materials and filling materials and points out the saving

obtainable with electric weldings.—*Elec. Journal*, October, 1914.

**Italy.**—A review of the condition of the electrical industries in Italy in 1913. In various ways there have been decided improvements in conditions. Progress is being made in extending the sphere of electric traction on interurban and trunk railways.—*Elek. Zeit.*, Sept. 24, 1914.

**Italy.**—O. E. ALLO.—An article on trading in Italy, giving notes both on wholesale and retail trading in electrical machinery.—*London Elec. Review*, Oct. 16, 1914.

## Book Reviews

**SO THE PEOPLE MAY KNOW.** A series of advertisements for the Toledo Railways & Light Company, written by Henry L. Doherty. Toledo, Ohio: Blade Printing & Paper Company. 52 pages. Price, \$2.

This is a republication of statements published by Mr. Doherty in his campaign for a settlement of the franchise controversy between the city of Toledo and the Toledo Railways & Light Company, of which he is chairman of the board of directors. The spirit and characteristics of Mr. Doherty appear throughout the advertisements, which were effective agencies in so changing public sentiment in Toledo as to improve the position of the company materially.

**COMMISSION REGULATION OF PUBLIC UTILITIES.** A compilation and analysis of laws of forty-three states and of the federal government for the regulation by commissions of railroads and other public utilities. New York: National Civic Federation Distributors, Traffic Service Bureau, Chicago, Ill. 1284 pages. Price, \$8.50.

This volume represents part of the work of the department on regulation of interstate and municipal utilities of the National Civic Federation. The work was begun in February, 1912. The division of the data by subjects makes the volume exceedingly useful for reference purposes.

**TELEPHONE CONSTRUCTION, INSTALLATION, WIRING, OPERATION AND MAINTENANCE.** By W. H. Radcliffe and H. C. Cushing, Jr. New York: The Norman W. Henley Publishing Company. 224 pages, 132 illus. Price, \$1.

The 1914 edition of this book is intended, as was the first edition of 1908, to supply usable data to persons who may wish to install private telephone systems of various kinds. The first eighty-two pages are given over to the construction, operation and installation of telephone instruments, and beginning with the simplest magneto-phone and one-way microphone and battery circuits, lead the reader gradually into explanations of the more complicated series and bridging party-line layouts. Telephone line wiring, including pole setting, wire and cable stringing, conduit laying and the use of aluminum wire and concrete poles, is taken up in a section covering sixty pages. A short treatment of the simpler tests for continuity, crossed lines, grounds, etc., is followed by quite full descriptions of the wiring and operation of special telephone systems, including selective party lines and intercommunicating, automatic and manual exchange systems. The book is completed by an appendix containing definitions and wire tables and by a five-page index. It should prove very useful to the electrician who is unfamiliar with simple telephone practice and desires to find clearly expressed information compactly arranged.



# New Apparatus and Appliances

An Illustrated Descriptive Record of Recently Developed  
Manufactured Products of Interest to Electrical Readers

## Three-Heat Chafing Dish

With the chafing dish shown herewith it is possible to obtain three gradations of heat. This is very desirable as some foods have to be cooked more slowly than others. The device is equipped with a food pan and a water receptacle, either of which can be clamped directly to the heating plate. It is declared that clamping the pans to the hot-plate increases the rate of heating about

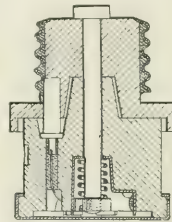


CHAFING DISH WITH RECEPTACLE CLAMPED TO HEATER

30 per cent above that ordinarily obtained with other designs. The chafing dish, which holds three pints, is furnished with a silk conductor cord and an attachment plug. It is manufactured by the Simplex Electric Heating Company, Cambridge, Mass.

## Six-in-One Fuse Plug

A fuse plug containing six fuse links which can be used in succession before the plug has to be refilled is shown in the accompanying illustration. When one link burns out it is only necessary to turn the head of the

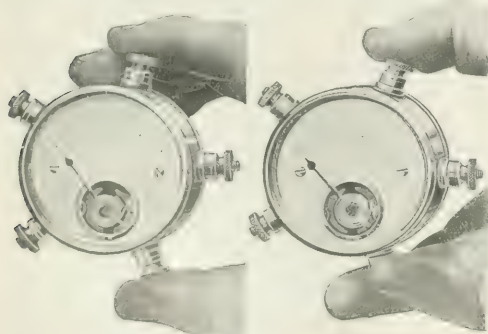


INTERNAL-COMBUSTION FUSE PLUG

plug through 60 deg. to connect a new fuse in circuit. Marks on the head of the plug show when a new fuse is connected and indicate how many are left for service. The plugs can be screwed into a standard lamp socket. They are manufactured by C. C. Balassa, 17 Battery Place, New York City.

## Pocket-Size Volt-Ammeter

A pocket-size instrument for indicating low values of voltage and current simultaneously is illustrated herewith. It consists of two complete instruments mounted back to back in a small cylindrical case, both faces of which are provided with a dial covered with plate glass. The device is only 2.25 in. in diameter and 1.25 in. thick. The pointers are operated by separate movable coil armatures pivoted on jewel bearings between the poles of permanent magnets. Voltages from 0 to 40 and cur-

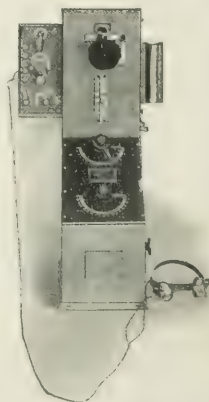


VOLT-AMMETER FOR THE POCKET

rents from 0 amp to 40 amp can be measured with this instrument simultaneously by connecting with the proper terminals, of which there are five. The instrument is manufactured by the Hoyt Electrical Instrument Works, Penacook, N. H.

## Radio-Telephone Set

One of the features of the wireless-telephone apparatus developed by the De Forest Radio Telephone & Telegraph Company, 101 Park Avenue, New York, is its simplicity of operation, and it is declared that any in-



WIRELESS-TELEPHONE WALL SET

telligent person after a few instructions can manipulate the set. The entire apparatus except the motor generator and transformer is mounted on the wall as shown in the accompanying illustration, the outside dimensions being 33 in. by 9 in.

The receiving apparatus is placed beneath the transmitter cabinet. The base of the cabinet containing the receiving apparatus projects 21 in. from the wall. The secondary condenser dials and primary inductance switch are mounted on a hard-rubber panel which is inclined at a convenient angle so that the speaker standing or seated can easily see and adjust the receiving circuits. The receiving tuner is designed to be sharply selective in order to minimize any danger of interference from outside stations. The slide switch on front of the transmitter cabinet is used for tuning a given antenna to the transmitter wave-length which is employed.

Ordinarily only one transmitter wave-length is necessary at a given point so that when the apparatus is once set for this wave-length no further adjustment is needed. The detector is shown on a little case on the left side of the transmitter cabinet. It is connected to the receiver tuner below. A small storage battery supplies energy for lighting a small lamp, the circuit of which is opened whenever the "listening key" is depressed for talking. Thus the detector automatically indicates the condition of the set whether switched in for talking or listening. Sets rated at 2 kw and 5 kw are being made.

### Permeability Testing Outfit

An outfit for obtaining magnetization and hysteresis curves of straight rods, sheet-metal strips, transformers and other working samples of magnetic material has been placed on the market recently by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. The complete equipment consists of a galvanometer, an adjustable mutual inductance, resistors, batteries, switches and sample-holding yokes.

The yokes for holding the straight rods are essentially the same as for sheet material, the only difference being the shape of the opening through the coils and the iron clamps at each end. The yoke shown in Fig. 1 consists of two separate solenoids mounted parallel to each other. The clamping yokes at the ends of the solenoids are arranged so that when clasped on the ends of the sample a closed magnetic circuit is obtained.

The variable mutual inductance illustrated in Fig. 2 consists of a stationary primary coil and a movable secondary coil whose relative positions can be varied by a long screw projecting through the top of the metal case. Attached to the head of the screw is an indicating pointer. The mutual inductance can be furnished calibrated in millihenries of magnetic linkage.

Seven adjustable resistors are required with the com-

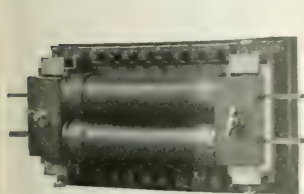


FIG. 1—SAMPLE-CLAMPING YOKES AND MAGNETIZING COILS

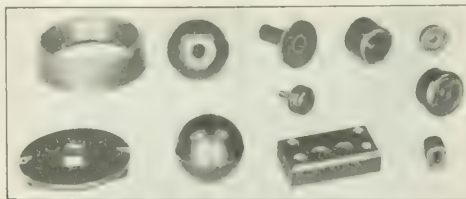


FIG. 2—VARIABLE INDUCTORIUM

plete outfit. Three of these are of the double-throw switch type, of which two have one sliding element to give finer adjustment. Two are of the potentiometer type, one of the sliding type and one adjustable by means of taps.

### Synthetic Gum Insulating Material

"Redmanol" is the name given to a synthetic gum manufactured by the Redmanol Chemical Products Company, 636 West Twenty-second Street, Chicago, which mixed with various fillers is being introduced as



PARTS MADE FROM SYNTHETIC GUM INSULATING MATERIAL

an insulating material for electrical apparatus. The pure material is of high dielectric strength and insulating qualities. It is practically non-combustible but softens when heated, although it does not melt. The material itself is made from phenol, cresol and hexamethylene tetramine and is furnished in powder, granular and sheet form. Mixed with an organic filler redmanol has a specific gravity of about 1.33; with inorganic mixtures its specific gravity is about 1.85. The pure synthetic gum displays a tensile strength of 7500 lb. per sq. in. It is unaffected by chemicals or acids and has the properties of rock amber, including that material's ease of electrification. Already redmanol has been applied to many uses as an electrical insulating material. A number of these applications are shown in the accompanying illustration. The material has also been employed for commutator rings, telephone instrument and switchboard parts, magneto generators, hand flash-lamps, etc. As manufactured into sheets and other forms, redmanol is furnished by the Formica Insulating Company, 3240 Spring Grove Avenue, Cincinnati, Ohio. The insulating material can, for example, be formed readily and accurately around copper conductors. Tubular cases for battery flash-lamps are made with wires scarcely less in diameter than the thickness of the case walls, perfectly embedded in the walls, but separated by thin layers of insulation from both the inner and outer surfaces.

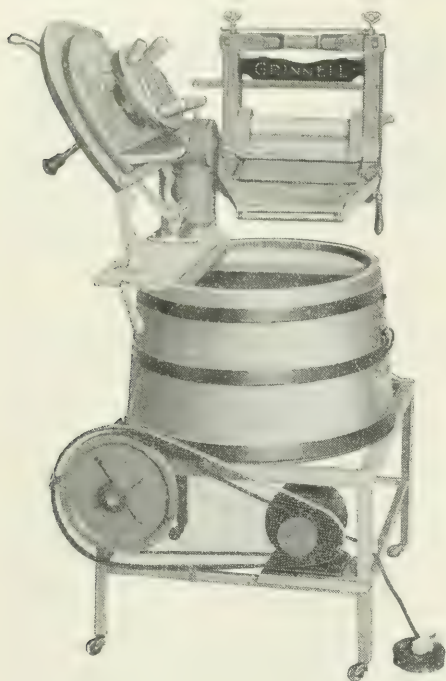
### Washing Machine with Swinging Wringer and Agitator

One of the latest and most improved washing machines made by the Grinnell Washing Machine Company, Grinnell, Ia., is shown in the accompanying illustration. Among its chief features are these: No part of the mechanism is rigidly attached to the tub, so that the agitator and wringing apparatus can be used with the bluing and rinsing tubs; when the tub cover is raised the agitator, or dolly, carried by it is automatically disconnected from the driving mechanism; a silent-running planetary gear connects the motor with the dolly and wringer, and emergency release levers are in easy reach. The tub support is a frame made of angle irons rigidly braced and resting on casters. Inside the frame and at one side is attached the driving motor, which is waterproof and dustproof and rated at 0.1 hp. If it were not for the starting current, the manufacturers declare, a 0.05-hp motor would be sufficiently strong to operate the washer. Connected with the motor by a belt drive inclosed in a woven-wire guard is a flywheel carrying the planetary gears, which



give a reduction in speed of five to one. The pinion is made of laminated steel and fiber, which prevents noise. A shaft connects the flywheel with a vertical shaft on the opposite corner of the frame, where the wringer and tub-top are supported. A wooden dolly is employed to

glass bowl which is softly illuminated by light passing through the bottom of the reflector. This opening is closed by an opal-glass diffuser. The outer bowl is supported from a single pendent chain by three arms at its lower end. These are attached by spring clips to the metal rim on the glass bowl. With this construction it is simple to clean the fixture as any dust that may work past the joint between the reflector and bowl may be removed by detaching one arm and allowing the bowl to swing downward from the other two as hinges. As the inside of the reflector is fire-glazed, dust collecting thereon may be removed easily with a dry cloth.

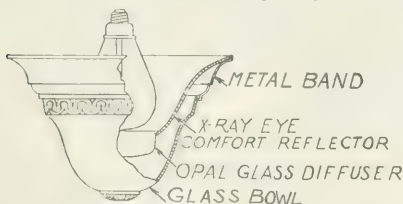


WASHER WITH PLANETARY GEAR DRIVE

agitate the clothes. It is attached to a telescoping post, which can be raised, without shutting off the power, in order to permit the agitator to take a new hold on the clothes. The wringer rolls are equipped to feed in either direction or be separated in an emergency. Either wooden or metal tubs are furnished. The wooden ones are made of Louisiana swamp cypress or Virginia white cedar finished in the natural color and coated with waterproof varnish. The tubs can be easily replaced without disturbing the rest of the washer.

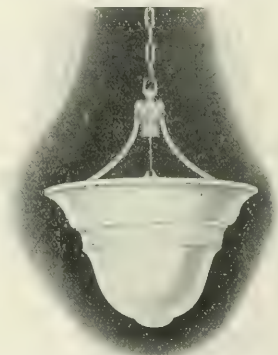
#### Fixture for Gas-Filled Lamps

A direct-indirect fixture designed to accommodate gas-filled lamps has been developed by the National



CUT SECTION OF INVERTED-BOWL FIXTURE

X-Ray Reflector Company, 235 West Jackson Boulevard, Chicago. It consists of a silvered-glass reflector fitting snugly in the mouth of an inverted bell-shaped



DIRECT-INDIRECT FIXTURE FOR GAS-FILLED LAMPS

The fixture is ordinarily furnished to accommodate 300-watt lamps, but it can be equipped with a mogul socket for 400-watt or 500-watt lamps.

#### Water Heater

An electric water heater which can be attached to any sink, wash-bowl or bath-tub faucet is illustrated herewith. By turning the faucet to the right cold water is obtained and by turning it to the left hot water flows from the spigot. Besides developing heat it is declared that electricity is made to sterilize the water. The device eliminates running special hot-water pipe

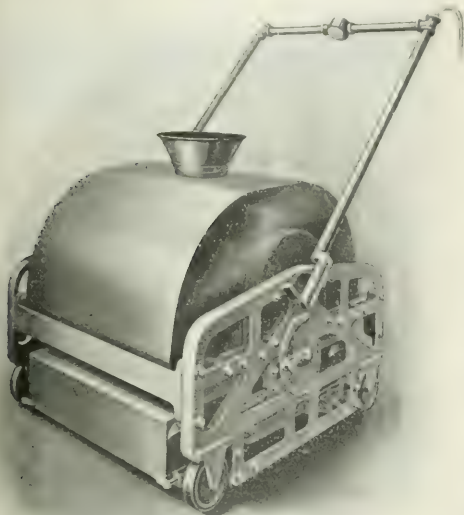


ELECTRIC WATER HEATER ATTACHED TO WASHBOWL

through a house. It is manufactured by the Geyser Electric Water Heater Company, 42 Hudson Street, New York City.

### Electric Floor-Scrubbing Machine

A motor-driven floor scrubber, which, it is declared, will do as much work as eight men and will effectively scrub from 6000 sq. ft. to 8000 sq. ft. of floor an hour, is being made by the Sanitary Scrubbing Company, 140 Liberty Street, New York. The scrubber is equipped



MOTOR-DRIVEN SCRUBBING MACHINE

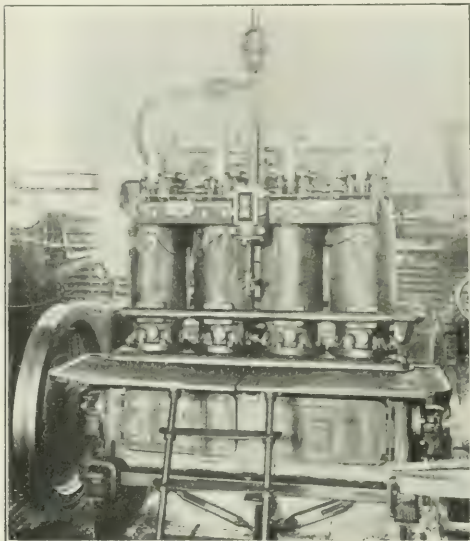
with a tank for clean water and tanks for receiving the dirty water which is swept up by a 16-in. horizontal brush revolving at a speed of about 600 r.p.m. The water supply is regulated by a valve on the handle and is fed through a pipe directly in front of the brush. The brush sweeps the water into a tank, leaving the floor very nearly dry after the machine has passed over it. Two types of scrubbing machines are being made, one for large unobstructed floor areas and the other for small spaces. The larger machine is equipped with a supply tank containing 15 gal. of water and two tanks for soiled water. This machine is operated by a 0.25-hp motor and may be moved either forward or backward. The smaller machine is equipped with an 8-gal. supply tank and only one tank for dirty water. This machine is also operated by a 0.25-hp motor, but can be moved in only one direction. A Crocker-Wheeler motor is used to drive these scrubbing machines.

### Steam as the By-Product of Gas Engine

When the water in the jackets of an internal-combustion engine of the water-cooled type is raised above a certain temperature (usually about 150 deg. Fahr.) bubbles tend to gather along the jacketed surfaces and greatly hinder the transfer of heat from the cylinder to the water. By increasing the velocity of the water flowing through the jackets the bubbles are removed before they become very large and not so much interference is offered to the conduction of heat through the cylinder walls.

A series of tests were recently made on the 150-hp four-cylinder vertical engine shown in the accompanying illustration by the Bruce-Macbeth Engine Com-

pany, Cleveland, Ohio, to determine the effect of increasing the velocity of the jacket water above that usually employed. A centrifugal pump was used to force the water through the cylinder jackets, from which it passed into an inclosed tank which was in turn connected to the suction side of the centrifugal pump. The velocity of the water was maintained at from five



GAS ENGINE FROM WHICH STEAM WAS OBTAINED

to ten times that ordinarily used. It was found that a pressure of 50 lb. per sq. in. was produced, which is equivalent to a temperature of 297 deg. Fahr. In connection with an exhaust-gas boiler much of the heat usually lost through the exhaust and the jacket water can be saved by such a system, and the steam generated can be used for heating purposes, steam jacketing and similar work.

A system similar to that described above is used in the Younglove Building, Cleveland, Ohio. The installation consists of three gas engines, which are connected to one centrifugal pump and one expansion tank. A steam coil leading from the latter is connected to another tank, from which the hot-water supply for the building is obtained.

### Drive and Pull Anchor

The guy anchor shown herewith consists of a  $\frac{7}{8}$ -in. square steel rod 5 ft. long, equipped with four steel barbs. The barbs are made of two pieces, the upper strips being held rigid by the lower. Both these strips and the rivets which connect them to the shaft are hot-galvanized. The upper end of the rod is formed into an eye 1 in. in diameter. The weight of the anchor complete is 20 lb. It is driven into the ground by means of a sledge hammer. On being pulled out the barbs spread, thus insuring a substantial resistance.

This drive and pull anchor is being manufactured by the Barbed Anchor Manufacturing Company, whose works are in Louisville, Kentucky.





# Jobber, Dealer and Contractor

## Thanksgiving Display Suggestions

By A. J. EDGELL\*

November is the month during which the dealer in electrical merchandise should pave the way for the big business that always comes with the Christmas shopping in December. November and December are the two best months for the merchants in nearly all lines; it is the time of the year when people are most likely to buy heavily. It is all very well for the dealer to look forward to the big business which is coming; it is also an excellent plan for him to force the buying a little by early activity, particularly in the matter of window displays. Whether he has been a trifle lax about this phase of publicity or whether he has taken advantage of the possibilities of the show window, a little extra effort at this time will bring surprisingly big results.

Displays are most effective when artificially lighted, as they stand out from their surroundings and the merchandise can be clearly seen. Displays at this time of the year are probably more effective than at any other period, one reason being that the lamps are turned on an hour or so before the close of the day's business and hence the desire created by the display can be fulfilled by an immediate purchase.

The devices themselves appear the same at all times, and it is by means of attractive arrangements or some decorative feature that the display can give them a different appearance. The decorative feature serves to arrest the attention and the attractive arrangement holds the attention and assists the display in making sales. This "setting," as it is sometimes called, although it may consist only of grouping some artificial flowers or leaves, should, of course, be seasonable. During early November artificial autumn leaves and drappings of bright colors serve very well.

The coming of Thanksgiving offers an opportunity for the display of cooking appliances with seasonable symbols as decorative accessories. While the turkey has been used very frequently for such purposes, there is no other feature which conveys the Thanksgiving idea quite as well. Therefore the suggestions show two ways of using the turkey as a background feature.



FIG. 1—THANKSGIVING WINDOW DISPLAY

These turkeys may be painted in colors or black and white. They can be obtained at small cost from a sign maker or may be cut from crêpe paper, such as comes with the turkey, painted in colors. In the latter case the cut-out should be mounted upon stiff cardboard.

In suggestion No. 1 artificial autumn leaves and chrysanthemums (these can probably be borrowed from a department store) are grouped in an attractive manner and fastened under the turkey. A large bow of crêpe paper or ribbon of brown or deep yellow, or both, is carried from the stems of the flowers and leaves to the floor. A center unit arrangement of devices is also

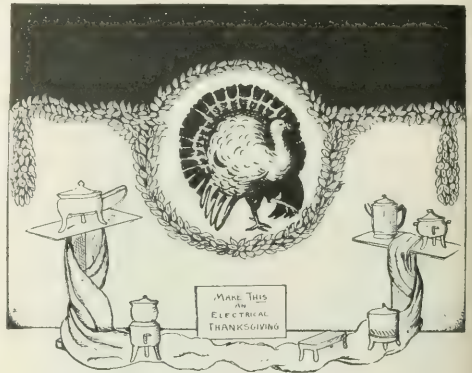


FIG. 2—ANOTHER SEASONABLE DEVICE

shown, and some of the devices are placed on a wooden or glass shelf supported by a pedestal. The showcard reads, "The Thanksgiving feast will taste better if cooked electrically."

The second suggestion shows the turkey mounted upon a large circle and surrounded by artificial foliage of autumn colors, with a fruit pendant hanging at either end. A different grouping of devices is shown. The pedestals and floor are draped with dark green velours, saten or other material. The showcard reads, "Make this an electrical Thanksgiving."

## "Leaks"—Some Lessons for the Electrical Dealer

Some of the "leaks" in a retail store which, though individually small, may amount to a good many dollars' loss in the aggregate are enumerated as follows by Mr. H. F. Frasse, purchasing agent of the Brooklyn Edison company, whose experience has included a number of years on both sides of the sales game:

"Being out of standard goods.

"Allowing customers to ask to be served.

"Saying 'Well?' to a customer instead of greeting him cordially.

"Continuing to talk to clerks instead of ascertaining customers' wants.

"Talking politics and ventilating one's own opinions regardless of those of customers.

"Making promises to have goods on a specified date and failing to do so.

"Keeping antiquated stock on shelves, instead of placing it on a special-offer counter.

"Trying to force a fly-specked or deteriorated stock on customers instead of sending it to auction.

"Burning gas when electricity is a better servant and does not vitiate the air.

"Operating machines by hand or foot when an electric motor does quicker work and gives time to occupy oneself elsewhere.

"Using too much string and wrapping paper.

"Employing cheap help.

"Neglecting to keep constant inventory.

"Failing to advertise."

\*Society for Electrical Development, Inc.

# Industrial and Financial News

## Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

**Large Electric Sign for Pittsburgh.**—The A. & W. Electric Sign Company, Cleveland, Ohio, recently completed the erection of a large electric sign for the Miles Theater, Pittsburgh, Pa. The sign is about 50 ft. by 20 ft. and is of steel construction. It is lighted by 650 lamps. The sign weighs about 1000 lb. and is placed directly over the entrance of the theater.

**Orders for Insulated Wire.**—The Habirshaw Wire Company, New York, recently secured an order for supplying the insulated wire to be used in the Parkway Central Office Building, Philadelphia, the electrical contractor being the L. K. Comstock Company, New York, and also that in the Grand Central Telephone Building, Pittsburgh, for which the electrical contractor is the Thompson-Starrett Company, of New York.

**Exide Battery Used Exclusively by Detroit Automobile Manufacturer.**—The Electric Storage Battery Company, Philadelphia, reports that the Saxon Motor Company, Detroit, Mich., has adopted the Exide battery as a standard for electric starting, lighting and ignition. The type adopted measures 9.25 in. long by 7 13/32 in. wide by 9.125 in. high, weighs about 46 lb., and is capable of delivering 93 amp for a period of twenty minutes.

**Electric Time-Recording Outfit.**—The Gisholt Machine Company, Madison, Wis., has developed a time-recording set which consists of a clock, switching apparatus and one or more registering machines. The "Periodograph," as it is called, operates on either direct current or alternating current. The outfit was first designed for use in the company's erecting department. The apparatus has been on general sale for about a year, and in that time forty-five concerns have installed the system.

**New Wireless Station for Oregon.**—The Marconi Wireless Telegraph Company has started preliminary work on the erection of a new wireless station on the south side of Young's Bay near Astoria, Ore. The new plant is to be the most powerful on the coast north of Bolinas Bay and is to have a 25-kw equipment capable of sending a distance of 3500 miles at night. Four self-supporting steel towers are to be erected, each 10 ft. by 10 ft. in plan at the base and 300 ft. high. The towers will be placed at the corners of a 300-ft. by 600-ft. rectangle, which is to be the size of the aerial. The completed station is to cost from \$70,000 to \$80,000 and will have a working force of four men, a chief and three operators.

**Build Electrical Power Plant for Gas Works.**—The Laclede Gas Light Company, St. Louis, Mo., has completed plans for building a 1000-kva electric station to supply energy for new fifty-six-oven gas works. Two Westinghouse 500-kva, 4150-volt, three-phase, sixty-cycle turbo-generators will compose the prime mover equipment, and the steam end of the station will consist of three 500-hp Edge Moor boilers with their auxiliaries. Lines throughout the plant will be laid in underground ducts. Most of the motors will operate on alternating current at 440 volts, but the gas-oven-charging machines will be driven by 250-volt direct-current motors receiving energy from a motor-generator set. It is expected that the plant will be placed in operation some time in July, 1915.

**Metal Company Taking Cotton in Payment for Its Products.**—The Frictionless Metal Company, Chattanooga, Tenn., is sending a form letter to more than 3000 merchants in the cotton states who sell farm implements, hardware, etc., proposing to sell its "frictionless" metal in lots of 300 lb. or more and accept cotton in full payment. The cotton is to be taken at a rate of 10 cents per lb. and is to be insured and stored free for a period not more than six months, invoice and warehouse receipt showing insurance to accom-

pany orders for the product. This offer, it is claimed, should cover at least 500 bales of cotton, which, added to 100 bales which the above company has already purchased, will help the dealers who by necessity will have to take cotton instead of cash in payment for their goods.

**Kansas Small Towns to Receive Electric Service.**—Mr. W. W. Finney, Emporia, Kan., has signed a wholesale energy contract with the Emporia Railway & Light Company and will distribute purchased electricity to Hartford and Neosho Rapids, Kan. This project will require the construction of 17 miles of 6600-volt transmission line, which, it has been decided, will be built on 25-ft. and 30-ft. poles bearing standard electric-light cross-arms and 15,000-volt insulators. The initial connected load will consist of 100 residence customers in Hartford, thirty in Neosho Rapids, and street lighting in both places. Later an effort will be made to serve prosperous farm communities through which the line passes. Mr. Finney has been supplying telephone service in Emporia, Hartford and Neosho Rapids for several years.

**Electric Desk Calculating Machine.**—Office appliances operated by electricity are constantly increasing as the result of the demands of modern business for speed, accuracy and efficiency in the handling of office work. One of these appliances, an electric desk machine for adding, multiplying, subtracting and dividing, was exhibited at the recent Business and Efficiency Show in Chicago and attracted considerable attention. It is made of steel and aluminum, weighs approximately 40 lb. and occupies a space 13.5 in. by 17 in. A 1/12-hp Holtzer-Cabot motor is used to operate the machine. When not in use the circuit is automatically opened. This machine is similar in operation and design to an electric calculating machine attached to a tubular-steel stand equipped with castors, which was described and illustrated in the *Electrical World* of Nov. 29, 1913.

**Motor Manufacturers' Sales Convention.**—The annual convention of the branch house managers of the Robbins & Myers Company was held at Springfield, Ohio, Oct. 19-24. In addition to the managers, one or two salesmen of each branch house were in attendance. The time which was not devoted to the general assembly was set aside for personal conferences by the different branch managers with the various departments of the factory organization. A schedule was prepared showing the branch managers the time assigned them for consultation with each department. In this way a great deal of time was saved in arranging dates and every manager had an uninterrupted session with each department. The general conference was opened Wednesday morning by a discussion on fans. Thursday morning was devoted to a discussion on motors. Thursday afternoon Mr. Kettering, of the Dayton Engineering Laboratories Company, addressed the assembly. Friday morning was given to talks on credits and advertising. Motion pictures of the company's factory in operation were also shown.

**New Boston Edison Contracts.**—The Edison Electric Illuminating Company of Boston, Mass., has obtained contracts from the New York, New Haven & Hartford Railroad to replace isolated plants with central-station service at the Back Bay Station and at the South Boston freight terminal. About 200 hp in connected load is involved in the former case and an equal amount in the latter, which includes battery-charging facilities for electric trucks used in the handling of freight at the terminal, motor load and lighting. Electric lighting will also supersede gas in the company's repair shops on Camden Street, Roxbury. The cost of operation in these plants will be cut about 40 per



cent by central-station energy. To the Edison company has also been awarded the contract for electric service to the extent of 325 kw in the new 500-ft. Custom House tower which has been erected on the Boston waterfront. Other recent contracts include 800 hp in motors, with other electric service, at the new Allston plant of the Carnegie Steel Company, 300 kw connected load at the new factory of the United States Oxygen Corporation in East Boston, 200 kw for the Milford & Uxbridge Street Railway, and the discontinuance of isolated plants in a number of office buildings.

**Washington-Philadelphia Electric-Vehicle Tour.**—An effective demonstration of the touring capabilities of modern electric vehicles was afforded by a trip from the Capital City and back again of several Washington delegates of the Electric Vehicle Association of America to the recent convention in Philadelphia. Driving two Baker electric victorias, Mr. F. T. Kalas, Washington representative of the Electric Storage Battery Company, and Mr. C. M. Marsh, secretary of the Washington Section of the association, accompanied by Mr. J. J. Bartram, Mr. H. B. Hart and Mr. E. S. Marlow, of the Potomac Electric Power Company, left Washington at 7 o'clock Saturday morning to make the 160-mile trip to Philadelphia in two days. Luncheon was eaten at Baltimore, where the vehicles received a short "boosting" charge, and in the afternoon the journey was continued via Towson, Md., to Havre de Grace, where the machines were put on charge for the night. Early Sunday morning the tourists continued via Perryville and Elkton to Wilmington, where batteries were again charged. From Wilmington via Chester to Philadelphia was an easy run, Philadelphia being reached at 4.30 p.m. The trip was noteworthy both for its length, which is unusual for electric vehicles, and for the fact that the machines were purely stock models equipped with 28-cell Mv-9 "Ironclad-Exide" batteries. After attending the three-day session of the E. V. A. convention, the tourists returned over the same route.

**Exhibits at the Boston Electric-Vehicle Salon.**—Seventeen electric passenger cars were exhibited at the electric-vehicle salon in the ballroom of the Copley Plaza Hotel, Boston, Mass., this week, in addition to battery accessories. Special interest was aroused by a five-passenger coupé shown by the Buffalo Electric Vehicle Company, Buffalo, N. Y., which was described in the *Electrical World* of Sept. 26, 1914. This car was exhibited for the first time at the Boston salon. S. R. Bailey & Company, Boston, showed a Model F roadster. The Waverley Company, Indianapolis, Ind., showed several 1915 models, including a four-chair brougham with sloping-front battery box of graceful design, a front-and-rear-drive brougham and a "silent" limousine. The Ohio Electric Car Company, Toledo, Ohio, showed a five-passenger brougham, 1915 pattern, with stream lines in the body design, hand-hammered aluminum roof, panels and mudguards, worm-gear shaft drive and mechanical window lifts. The Anderson Electric Car Company, Detroit, Mich., featured a new three-passenger cabriolet. This car is designed so that the top may be raised in inclement weather, offering the pleasures of an open roadster at other times. It has a speed range of from 5 miles to 20 miles per hour and is provided with three sets of brakes, aluminum panels and battery hoods, a 100-in. wheelbase, locking operating levers and Lanchester worm gears. The company also showed a worm-gear-driven brougham with optional wire wheels and a Jacquard broadcloth interior finish and three other standard cars. In all the latest designs the chassis is the same, and all the rigging and control are carried on the chassis. A refinement recently applied to the Model 51 brougham is a narrow rain-drip over the doorway. The Rauch & Lang Carriage Company, Cleveland, Ohio, showed five cars of the roadster, coach and brougham types. Recent features incorporated in these are electric horns, metal mudguards and optional wire wheels. The exhibits of the battery manufacturers included the latest standard equipment. The Edison Storage Battery Company, Orange, N. J., showed a new button suspension for cells, the button being spot-welded on the side of the cell and affording increased reliability of service. The Electric Storage Battery Company and the Philadelphia Storage Battery Company, both of Philadelphia, displayed cells in section and assembled.

## Corporate and Financial

**Notes Retired in Advance.**—According to an announcement made by H. M. Byllesby & Company, the Standard Gas & Electric Company has already paid off \$250,000 out of a total of \$500,000 in collateral-trust 6 per cent notes maturing June 1, 1915.

**Investors Seeking Public Utility Stocks and Bonds.**—Messrs. Williams, Dunbar & Coleman, of New York, in their weekly review state: "The earnings reported by the Pacific Gas & Electric Company for September show an increase in gross and a large increase in net, and since the first of the year the gains have been most impressive. The reports this last week also from the Cities Service Company, the Byllesby properties and other public service corporations show increases and prove conclusively the stability and underlying earning power of this class of quasi-municipal corporations. The better feeling produced by these earnings statements has been revealed in a renewed inquiry for public utility stocks and bonds by investors."

**Public Utility Bonds for Savings Banks.**—At the recent American Bankers' Association convention Mr. A. M. Harris, of Harris, Forbes & Company, New York, presented a paper on "Savings Bank Bonds in the Light of Recent Developments," in which he said: "To my mind one of the most significant developments in savings-bank bond requirements is the recognition of public service corporation bonds. While telephone and street railway are undoubtedly excellent additions, there is warrant for the assertion that they do not comprise exclusively the best in the public utility field. The principal other classes of public service corporations are gas, electric light and power companies, including the increasingly important hydroelectric developments. The best representatives of these public utilities furnish a most stable basis of security. Practically unaffected by industrial depression and practically free from the ill effects of competition by the fact of their being natural monopolies, the leading public utilities of this country have grown rapidly in favor with conservative investors during the last ten years. Banks other than savings institutions, as well as private investors, are now among the largest purchasers of the bonds of such companies. Their admission into the savings bank eligibility class is, therefore, a natural step."

**Advantages of Present Bond Market.**—Lee, Higginson & Company, of Boston, Mass., in a review of the bond market say: "The fact is that after every period of acute financial strain the financial centers have always worked back to normal monetary conditions. If the volume of the world's business is too large compared with the world's available capital, then the two must be readjusted. High money rates are a spur to saving and tend to increase the world's capital. High money rates and the accompanying credit disturbance cause rapid business contraction, and thus the volume of business becomes adjusted to the supply of capital. Undoubtedly there will be some foreign selling, but we think the average foreign investor will be strongly inclined to retain his investments in this country as promising perhaps a higher degree of safety and possibly also less subject to war assessments. It is estimated that in normal times England invests in foreign countries about \$1,000,000,000 a year. No doubt the amount of English money seeking investment in foreign countries will fall off this year, but the percentage of this investment fund coming to this country we think is more likely to be increased than diminished. We think the English purchases of American bonds will exceed the sales. We might add that so far our London house has transmitted to us substantially more orders to buy than orders to sell. We shall be prepared to take back a reasonable number of our securities at less than original cost and ought to reap a reasonable profit by so doing. In our opinion, the effects of the European war will long be felt in this country, but the investor who is in the habit of buying interest-bearing obligations should not permit the pessimistic talk by the manufacturer or merchant about his lessened business and diminished profits to prevent him from placing his money at interest. The experience of all hard times shows that it is the idle money resulting from diminished business which enhances the value of safe, interest-bearing securities. In our opinion the investment fund seeking good interest-bearing obliga-

tions is not less than normal but more. The supply of good, interest-bearing investment securities is not more than normal but less. We expect, accordingly, to see prices for good investment securities rise during the next few months. We strongly advise the purchase of sound interest-bearing securities now."

**Annual Report of Baltimore Company.**—The annual report of the Consolidated Gas, Electric Light & Power Company, of Baltimore, Md., for the year ended June 30, 1914, shows the operations of the company to be as follows: Gross income, \$6,400,896; operating expenses and taxes, \$3,333,822; net earnings, \$3,067,074; fixed charges, \$1,567,689; net income, \$1,499,385; dividends paid and payable, \$891,562; surplus, \$607,823; reserves for depreciation and special reserves, \$585,000; net surplus, \$22,823. Compared with the previous fiscal year, the gross income shows an increase of \$285,923, or 4.7 per cent, and the net earnings a decrease of \$84,718, or 2.7 per cent. This latter condition was due to a rise in cost of gas, oil, large increases in taxes, and a reduction in rates starting July 1, 1913. The electric division showed a gain of 9.7 per cent in income from energy sales, a gain of 30.5 per cent in output, and a gain of 14.7 per cent in customers. Since May 1, 1913, \$3,987,323 par value debenture shares have been sold, against which has been deposited \$4,636,000 par value collateral. During the year \$1,416,000 par value common shares were sold. The shareholders of the company increased during the year 37.5 per cent.

**The Investment Situation.**—N. W. Halsey & Company, of New York, in a bond circular expressed the following opinion regarding the investment situation produced by the war: "Many phases of the existing situation point to the conclusion that the present period of low prices for high-grade bonds will not be of long duration. In the first place, it must be remembered that we have experienced a tremendous dislocation of the credit machinery of the United States. Payment of existing loans has not to any appreciable extent been insisted upon by the banks, but new borrowing, except in cases of absolute necessity, has to the furthest possible degree been discouraged. The inevitable result of the great shock which has affected the credit structure will be a material contraction in commercial and industrial activity. Business will go slow until it catches its breath. It will require time to recover from the abnormal situation now existing. This slowing down will result in a great diminution of the demand for credit. There are already indications that the money markets of the country are beginning to experience easier tendencies. There are other influences which will operate to reduce the demands on the money markets. We refer to economies which undoubtedly will be put into effect by practically all corporations, both public and private. This eventually is of particular interest to the investor, because, inasmuch as almost all large expenditures by both public and private corporations are financed by bond issues, a general reduction in such expenditures will mean that the supply of new securities to be issued during the next six months or a year will be much below normal. If we at this time were to open our exchanges and at the same time were to establish a free market for gold, we have no doubt there would be an attempt on the part of Europe, so extremely exigent are the financial needs of the warring nations, to convert into gold through our markets, a very great volume of securities. Prices would be accepted which would have little regard for intrinsic values. That we cannot open our markets to Europe at this time is obvious. We can hardly spare sufficient gold to cancel our present indebtedness to France and England. It is true that in settling our foreign indebtedness we export commodities as well as gold, but we cannot conceive of a sufficient increase in our agricultural and other exports to offset our present indebtedness abroad and take care of the additional amount we should owe were we voluntarily to accept all the securities Europe should care to sell back to us. Our first duty is to ourselves. We can hardly be expected to open our markets to Europe if, as a result, the prices of our securities are to be slaughtered without regard to value or if our gold supply is to be seriously depleted. Nor can we keep our markets closed indefinitely. The problem is one of the greatest difficulty, but no doubt a way will be found to meet the situation."

## GROWTH MAINTAINED IN THE WEST

Comparative Figures for August from Utilities in the Pacific and Mountain States Do Not Indicate Serious Loss Owing to War—Small Companies Pick Up

The accompanying tables tell a story of slackening growth and, reflecting as they do activities during the first month of the war, will at a first glance be considered as another proof of the depression due to the European conflict. However, although the depression caused by the war

TABLE I—COMPARATIVE RETURNS FOR JUNE, JULY AND AUGUST FROM COMPANIES IN SIX LARGE CITIES IN CALIFORNIA, WASHINGTON, OREGON, UTAH AND COLORADO, REPRESENTING OVER 60 PER CENT OF THE ELECTRIC UTILITY INDUSTRY OF PACIFIC AND MOUNTAIN STATES

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
June	\$1,639,297	\$1,559,596	5.1	140,494,562	129,504,858	8.5
July	1,645,688	1,531,493	9.6	144,776,151	131,387,994	10.4
August	1,642,096	1,595,891	3.0	145,646,901	140,920,218	3.4

has had its influence, when a careful analysis is made of the underlying industrial, domestic and political conditions in the West the war depression begins to fall into the background.

Owing to lack of raw materials and an unfavorable labor market the industries of the Far West are few and by no means sufficient to supply the needs of that section. The peoples of the Rockies and Pacific for the most part still depend on the East for their manufactured products. Washington and Oregon do a large fishery and lumber business. California raises fruit. Montana, Nevada, Utah and other Mountain States have their gold, silver and copper mining and their fruit and cattle ranches. However, the great

TABLE II—COMPARATIVE RETURNS FOR MAY, JUNE, JULY AND AUGUST FROM COMPANIES IN SIX SMALL CITIES IN NEW MEXICO, ARIZONA, WASHINGTON, WYOMING AND IDAHO, REPRESENTING LESS THAN 1 PER CENT OF THE INDUSTRY OF THE PACIFIC AND MOUNTAIN STATES

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
May	\$35,828	\$34,163	3.3	1,613,341	1,770,549	*8.8
June	54,753	55,596	*1.5	1,262,268	1,645,528	*23.3
July	58,250	56,436	3.5	1,488,635	1,596,973	*15.2
August	59,361	54,718	8.3	1,649,420	1,747,405	*5.5

\* Decrease

manufacturing industries which are characteristic of the East, employ thousands of people and are chief economic factors are lacking. Hence the war could have little if any effect on this class of industrial motor load.

Copper production was curtailed in August owing to the failure of the export market. But, as was noticed in a recent report by the Montana Power Company, which operates in the great copper districts of Butte, Helena, Anaconda, Great Falls, etc., other factors had stepped in to overcome the mining depression. In fact, a glance at Table II will show that six small companies in the copper-mining region did better in August than at any other time in the previous three months. Slackening growth in other sections can be accounted for in many ways. Probably the most significant of these was the condition of the irrigation load. The present year has been a poor year for irrigation



in comparison with last year. The long and severe droughts of 1913 caused the irrigation load to rise enormously.

In all of the Pacific Coast States, in addition, the question of state-wide prohibition came up at this election, and to the owners of the vast tracts of vineyards and hop-yards impending prohibition suggested curtailment of expendi-

TABLE III—COMPARATIVE RETURNS FOR JUNE, JULY AND AUGUST FROM OVER 60 PER CENT OF THE CENTRAL-STATION INDUSTRY OF THE PACIFIC STATES OF CALIFORNIA, WASHINGTON AND OREGON

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
June	\$1,329,041	\$1,251,956	6.2	110,466,824	102,761,425	7.6
July	1,323,118	1,245,135	6.2	114,993,629	106,422,888	8.0
August	1,331,820	1,290,976	3.2	119,418,013	114,083,423	4.8

tures for expansion. Acreage was not increased, and irrigation, while necessary in many cases, did not increase to the extent that it might have done had the minds of the grape and hop growers been at ease and had not bountiful rains fallen last winter.

There is still another reason for a smaller growth being

TABLE IV—COMPARATIVE RETURNS FOR JUNE, JULY AND AUGUST FROM OVER 80 PER CENT OF THE CENTRAL-STATION INDUSTRY OF THE MOUNTAIN STATES OF COLORADO, NEW MEXICO, UTAH, ARIZONA, WYOMING, NEVADA AND IDAHO

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
June	\$565,846	\$539,962	4.8	44,859,631	39,074,902	14.8
July	586,453	528,292	11.0	44,686,495	37,832,222	18.0
August	604,612	582,021	3.8	47,038,849	44,714,822	5.2

registered. Real-estate booms have not only collapsed but a reaction has set in. This has been felt particularly in the Northwest during the past year and has been attended with an exodus of people.

With the exception of the six small companies for which the figures are shown in Table II., the entire Far Western

TABLE V—RETURNS RECEIVED BY THE ELECTRICAL WORLD FOR MAY JUNE, JULY AND AUGUST FROM THE CENTRAL-STATION INDUSTRY OF THE PACIFIC AND MOUNTAIN STATES

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
May (60 per cent of industry)	\$1,825,720	\$1,426,855	7.0	144,839,552	129,357,915	11.9
June (70 per cent of industry)	1,894,887	1,791,915	5.8	155,326,455	141,836,377	9.6
July (75 per cent of industry)	2,212,827	2,068,249	6.8	183,160,015	169,718,357	7.9
August (78 per cent of industry)	2,386,677	2,282,061	4.6	193,216,699	185,330,705	4.2

section of the United States has gone ahead at about the same rate. This rate, while not up to the percentage of growth for July compares very favorably, under the circumstances, with the figures for some of the previous months, June especially.

## Business Notes

D. J. Martins, dealer in materials for electrical installations at Sao Paulo, Brazil, is finding difficulty in obtaining goods from European countries and is desirous of getting catalogs and other information from electrical concerns in the United States.

The Electric Service Supplies Company, Philadelphia, has recently taken the agency for selling the "never-creep" anchors made by the Chance Manufacturing Company, Centralia, Mo. This anchor was described in the *Electrical World* of June 20, 1914.

The Sprague Electric Works of the General Electric Company.—F. W. Hall, formerly manager of apparatus sales for the Sprague Electric Works, New York, has been appointed sales manager. Mr. Hall has been associated with the Sprague Electric Works for nineteen years.

The Day Electric Vehicle Syndicate, 45 Broadway, New York, has recently been formed and purposes to place on the market a new electric automobile at a moderate price. The development of this car, it is expected, will be completed the first of the year. Max E. Schmidt is chairman of the syndicate, H. W. Hillman is treasurer, H. E. Day is resident engineer, and Dr. C. P. Steinmetz is consulting engineer.

## New Industrial Companies

The Colonial Electric & Manufacturing Company, of Boston, Mass., has been incorporated with a capital stock of \$35,000 by E. G. Carter, of Somerville, Mass., and J. F. Russell, of Cambridge, Mass.

The Metropolitan Electrical Products Company, of Brooklyn, N. Y., has been chartered with a capital stock of \$10,000 to do a general contracting and engineering business, and to deal in electrical supplies, etc. The incorporators are E. A. S. Timothy, D. C. Choate and T. J. Crafton, 197 Powers Street, Brooklyn, N. Y.

## Trade Publications

Metal Cut-out Boxes.—Prices of metal cut-out boxes are given in a folder which is being distributed by the Union Electric Company, Pittsburgh, Pa.

Flame-Arc Lamps.—"Type W Flame-Arc Lamps for Series and Multiple Circuits" is the subject of Bulletin No. 43,320 of the General Electric Company.

Composition Receptacles.—A flush plug-type receptacle made of composition is described and illustrated in a leaflet sent out by the Chelton Electric Company, Philadelphia.

Steam Engines.—Catalog No. 17 recently issued by the Reeves-Cubberley Engine Company, Trenton, N. J., describes and illustrates several types of steam engines.

Porcelain Insulators.—A catalog describing various insulating articles made by the wet and dry process has been issued by the firm of J. H. Parker & Son, Chelsea, Mass.

Washing Machines.—The Meadows Manufacturing Company, Pontiac, Mich., has recently issued a bulletin describing and illustrating its "safety power" electric washer.

Rotary Converters.—Synchronous booster rotary converters are the subject of Leaflet No. 3749, sent out by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Reflectors.—V-shaped fluted reflectors and indirect fixture bowls are illustrated in a folder which is being distributed by the Friedley-Voshardt Company, 733 South Halsted Street, Chicago.

Electric Trucks.—In an attractively illustrated thirty-two-page catalog issued by the General Vehicle Company, Long Island City, New York, various types of electric vehicles for commercial uses are described.

Electrical Devices.—Catalog No. 7, entitled "Electrical Specialties," describes and illustrates switches, receptacles, etc., manufactured by the Machen & Mayer Electrical Manufacturing Company, Philadelphia, Pa.

## Personal Mention

**Mr. Frederick Sargent**, of Sargent & Lundy, of Chicago, sailed from New York on Nov. 4 for England.

**Mr. D. C. Wilson** has succeeded **Mr. A. J. Collett** as electrical engineer for the Union Pacific Railroad, with headquarters at Omaha, Neb.

**Prof. R. M. Parks**, formerly of the faculty of the Manual Training High School, has been appointed city gas and electrical inspector of Louisville, Ky.

**Mr. J. P. H. de Windt**, vice-president and general manager of the Birmingham (Ala.) Railway, Light & Power Company, has been elected president of the Alabama Light & Traction Association.

**Mr. A. J. Collett**, who was formerly electrical engineer for the Union Pacific Railroad, with headquarters at Omaha, Neb., has removed to Santo Domingo, in the West Indies, where he is supervisor of public improvements at Santo Domingo City.

**Mr. J. M. Moncrieff** has been appointed manager of the La Crosse (Wis.) Gas & Electric Company, succeeding **Mr. A. W. Higgins**, who has been transferred to Indianapolis. **Mr. Moncrieff** was formerly manager of the electric-lighting plant at Bloomington, Ind.

**Mr. Arthur Atwater Kent**, of Rosemont, Pa., has, on the recommendation of the Franklin Institute, been awarded by the city of Philadelphia the John Scott legacy medal and premium for his "unisparker." The "unisparker" is an essential element of the Atwater Kent ignition system for automobiles and consists of a contact-breaker, governor and distributor arranged in one structure.

**Mr. A. W. Higgins**, formerly manager of the La Crosse Gas & Electric Company, La Crosse, Wis., has been appointed general manager of the Merchants' Heat & Light Company, of Indianapolis, Ind., a subsidiary of the American Public Utilities Company. **Mr. Hugh H. Harrison**, of Indianapolis, continues as president of the Merchants' company, which operates the largest central-heating plant in the world.

**Mr. W. H. McGrath**, who has been assistant to **Mr. A. W. Leonard**, vice-president and general manager of the Puget Sound Traction, Light & Power Company, Seattle, Wash., has been appointed manager of the company. **Mr. McGrath** was born in Massachusetts and has been identified with Stone and Webster since 1901. He entered the employ of the firm at the home office in Boston following his graduation from Harvard University.

**Mr. Charles R. Underhill**, chief engineer of the Acme Wire Company, New Haven, Conn., lectured before the A. I. E. E. branch of Purdue University on Oct. 27 and before the A. I. E. E. branch of the Ohio State University on Oct. 30. This year **Mr. Underhill** is exhibiting the results of numerous tests with the oscillograph in connection with both alternating-current and direct-current electromagnets having various lengths of air-gaps and with the plunger or armature in motion.

**Mr. A. J. Farrelly**, electrical engineer of the Chicago & Northwestern Railway, Chicago, and organizer and first president of the present Association of Railway Electrical Engineers, has been confined to his room by illness following a sprain received at his country place in Michigan. **Mr. Farrelly** was unable to attend the convention of the railway electrical engineers held at Chicago during the week of Oct. 26, but the association sent to his bedside a handsome floral tribute accompanied by a note of regret at his absence from its sessions.

**Mr. W. W. Freeman**, in addition to his election as president of the Union Gas & Electric Company and of the South Covington & Cincinnati Street Railway Company, as published last week, has been elected president of the following companies operating in the States of West Virginia, Ohio and Kentucky: The Union Light, Heat & Power Company (Kentucky), the Suburban Electric Company, the Kentucky Electric Company, the Municipal Light Company, the Covington Electric Company, the Cincinnati, Newport & Covington Railway Company, the Cincinnati, West Cov-

ington & Ludlow Street Railway Company, the Newport Electric Street Railway Company, the Cincinnati, Covington & Rosedale Railway Company, the Covington & Latonia Railroad Company, the Cincinnati, Covington & Erlanger Railway Company and the Licking River Bridge Company. The above companies are controlled by the Columbia Gas & Electric Company.

**Mr. Frederick S. Pratt**, of Stone & Webster, has been elected chairman of the board of directors of the Puget Sound Traction, Light & Power Company, Seattle, Wash. **Mr. Pratt** is forty-two years of age. He was graduated from Harvard and has been identified with the Stone & Webster interests for nearly twenty years. His first position was in the engineering department in the Boston offices. Soon after the Seattle fire in 1889, when the late **Jacob Furth** began the work of reorganizing and reconstructing the various electric railways in Seattle under one management, **Mr. Pratt** took the active management of the properties for a year, subsequently returning to Boston. During his identification with Stone & Webster **Mr. Pratt's** work has been largely with the company's interests on Puget Sound, although his headquarters have been in the East. He will remain in Boston. **Mr. Pratt** was formerly vice-president of the Puget Sound Traction, Light & Power Company.

**Mr. Elmer Ambrose Sperry**, of New York City, has been awarded the John Scott legacy medal and premium by the city of Philadelphia, acting on the recommendation of the Franklin Institute, for his gyro-compass. **Mr. Sperry** was also recently awarded the first prize of 50,000 francs in the aerial security contest held at Bezons, France, this summer, following the successful test of his aeroplane-stabilizing device. For some years **Mr. Sperry** has devoted practically his whole time to overcoming the numerous physical difficulties involved in the adaptation of a gyroscope to a ship's compass in the place of a magnetic needle. He has been able to make an instrument which automatically corrects for the speed and direction of the vessel and which is unaffected by the rolling of the ship in a heavy sea, is entirely non-magnetic and is unaffected by the proximity of iron. **Mr. Sperry** was born Oct. 12, 1860, at Cortland, N. Y., and received his technical training at Cornell University. He is at present president and engineer of the Sperry Gyroscopic Company of Brooklyn, N. Y.

**Mr. A. W. Leonard**, for the last two years vice-president and general manager of the Puget Sound Traction, Light & Power Company, with headquarters in Seattle, Wash., has been elected president of the company and member of the board of directors to succeed **Jacob Furth**, deceased. **Mr. Leonard** was born in Monmouth, Maine, forty-one years ago. Nineteen years ago he entered the employ of Stone & Webster as a bookkeeper and was promoted to be general manager and superintendent of the Edison Electric Illuminating Company of Brockton, Mass., twelve years ago. He was transferred to Houghton, Mich., as superintendent of the Houghton County Electric Light Company, and was subsequently manager of that property and the Houghton County Traction Company for four years. He then went to Minneapolis as manager of the Minneapolis General Electric Company. In this position he had practical supervision over all the Stone & Webster properties and plants in the Middle West. On Oct. 12, 1912, he was appointed vice-president and general manager of the various Puget Sound companies.

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## Obituary

**Johannes de La Motte**, manager of the American Telegraph Company during the régime of the late **Jay Gould** and General **Eckert**, and prominent in the Western Union Telegraph Company, died at his home in Brooklyn, N. Y., Oct. 27, in his seventy-sixth year. **Mr. de La Motte** came to this country from Germany, where he was a government official in the railway and telegraph service, in 1869. He became general manager of the now defunct Atlantic & Pacific Telegraph Company, and when **Gould** and **Eckert** began to war on the Western Union Company he joined them and became manager of the competing company. He retired in 1902.



## New England

ELK RAPIDS, MICH.—The Elk El. C of Elk Rapids, has erected within the last three months a transmission line to W

hamsburg, a distance of 16 miles. The town is secretly and treacherously plotting to purchase electrical apparatus, including heating and cooking apparatus, vacuum cleaners, washing machines, etc., amounting to approximately \$1,000. John Roemer is superintendent.

**GLADSTONE, MICH.**—Within the next three months the Electric Light Commission expects to purchase material, including three poles, for a 6,000-volt, three-phase transmission line to Rapid River (6 miles long); also material for local distribution system in Rapid River. G. W. Roemer is superintendent.

**HOWELL, MICH.**—A 20-ft. extension has recently been erected at the power house of the municipal electric light and power plant, and a 250-kva alternating-current (single-phase) generator and one 20-in. by 20-in. side crank Corliss valve engine are now being installed. The commissioners expect within the next few months to purchase a carload of poles.

**MONROE, MICH.**—Arrangements are being made by the Commissioner of Public Utilities to change the municipal electric light plant from single-phase, 110 volts, to three-phase, 2300 volts. Contracts have already been made for the necessary equipment, which includes a complete switchboard and new coils for the Western electric generator; also three General Electric switchboard regulators with complete switchboards for the three circuits; also new transformers and meters. Two 150-hp return-tubular boilers are now being installed. The entire city will be required for use of the new system. The old arc-lamp street-lighting system has been replaced with the new incandescent lamps.

**PORTHURVILLE, MICH.**—The town of Porthurville expects to purchase within the next two months a new carload of poles for the municipal electric-lighting system. S. Wilkinson is superintendent.

**ONAWAY, MICH.**—The Onaway El. Lt. & Pwr. Co. expects to purchase within the next 12 months a few small lighting and power transformers, primary and secondary wire, meters, etc.; also within the next six months that the new washers and a few washing machines. J. Isbister is superintendent.

**OSHTONAUT, MICH.**—Plans are being considered for rebuilding the municipal electric light plant to cost about \$35,000. The matter, it is understood, will be held in abeyance until spring. S. W. McHaffey is director of public service.

**GALION, OHIO.**—The City Council has authorized the city director of service to purchase material for the installation of a cluster-lamp lighting system in the business district of the city.

**HILLSBORO, OHIO.**—The Hillsboro El. Lt. & Pwr. Co. is preparing for submission to the voters a proposition providing for the installation of 16 254-watt nitrogen-filled lamps and 140 70-watt nitrogen-filled lamps, at a cost of \$5,160 per year.

**MOUNT VERNON, OHIO.**—Work has been on the erection of the transmission line from Mount Vernon to Fredericktown by the Ohio El. Lt. & Pwr. Co. This is part of the line that will eventually extend from Bowling, W. Va., to Tiffin, Ohio.

**EMERYVILLE, OHIO.**—The village of Emeryville has purchased the local electric distribution system, consisting of 2300-volt, direct current. This system will be changed to 2300 volts, single-phase, 60 cycles. Energy will be purchased from the Toledo, Lorain & Findlay El. Co. at 2300 volts. Material for distribution line has been purchased. Eight transformers, total capacity 75 kw, 2300/110/220-volt, about 125 lbs. each, 12 25-candle-power lamps (110 volts, 25 cycles, single-phase) will be purchased; also material for the lighting system, consisting of about 2000 ft. of wire, 12 25-candle-power lamps. Fred H. Froehlich, Second National Bank Building, Toledo, is engineer.

**ST. HENRY, OHIO.**—The Council has passed an ordinance authorizing an issue of bonds for the installation of a municipal electric-light plant. It is understood that in connection with the water-works system. Contract for the construction of the proposed plant, it is understood, will be awarded Nov. 10.

**SANDUSKY, OHIO.**—Bids will be received by John J. Molter, director of public service, until Nov. 30 for furnishing and operating a complete electric-lighting and lighting street-lanes, parks and public places of the city.

**WEST LAFAYETTE, OHIO.**—The Lafayette El. & Pwr. Co., of Coshocton, has been granted a franchise to supply electricity for lighting, commercial and manu-

facturing purposes in the village of West Lafayette for a period of 25 years.

**CADIZ, KY.**—Arrangements are being made by A. P. and Stanley White for the installation of an electric-lighting system in Cadiz, material for which, it is understood, has already been purchased. Power for operating the system will be obtained from the dam on Little River. An 80-hp oil engine will drive the plant during the low-water periods.

**FRANKLIN, KY.**—The Franklin El. Lt. & Ice Co. is reported, it is contemplating the installation of a transmission line to Portland, a distance of 25 miles.

**IRVINE, KY.**—The electric-light franchise recently offered for sale by the town was purchased by C. R. Flynn, of Irvine. It is understood that an electric plant will be installed in the near future.

**LOUISVILLE, KY.**—The new factory which the J. F. Kurtes Paint Co. proposes to build in Louisville next spring, it is reported, will be equipped with electrically driven machinery.

**LOUISVILLE, KY.**—Plans are being considered by the Louisville Chemical Co. 1455 South Seventh Street, Louisville, to equip its proposed new plant with electrically operated machinery.

**STITHSTON, KY.**—Plans are being considered for the installation of an electric-lighting plant in Stithston, to cost about \$2,500. George Greenup and L. J. Metcalfe are reported interested in the project.

**VINE GROVE, KY.**—Within the next two months the Citizens' El. Co., of Vine Grove, expects to purchase an engine. Miss Pearl Stander is secretary and treasurer.

**FERDINAND, IND.**—The Water Works Co., recently organized, is constructing a water-works system and later will take over the local electric-light system. The company is now building a dam for water-works and will ask for bids on the following: (1) one 60-hp boiler and stack, 100 ft. in height; (2) one 120-hp boiler (pressure), to elevate water to tank on a 50-ft. steel tower, tank to have a capacity of 75,000 gal., and the pump to pump water into the tank in case of high water; (3) one 60-hp oil engine, pump same as above, to be connected by clutch and air-compressor starting device; (4) alternating-current motor connected to triplex pump. The company would like to receive estimates on the three systems. Address bids and catalogs to William R. Sauer, vice-president, Ferdinand. E. Pickhardt is construction engineer.

**HUNTINGBURG, IND.**—At an election held recently the proposal to take over the electric-light plant of the Huntingburg El. Lt. Co. was carried. The State Public Service Commission has asked for an appraisal of the property. It is proposed to make improvements to the plant and equip the water-works pumping station for electrical operation.

**HUNTINGTON, IND.**—Bids will be received by the city of Huntington until Nov. 23 for furnishing and installing steam, exhaust and power plant piping in the municipal light and water plant. Charles Froessman, consulting engineer, 1616 Broadway, Bank Building, Indianapolis, has charge of the work.

**PLYMOUTH, IND.**—The County Commission has granted the Plymouth El. Lt. & Pwr. Co. permission to erect transmission lines through Liberty Township.

**ATWOOD, ILL.**—The Council has engaged Ralph Blackwell to take charge of the engineering work for the proposed electric-light plant, for which bonds were recently authorized.

**HARTSBURG, ILL.**—The Orvill El. Lt. & Pwr. Co., recently organized, is planning to install an electric-lighting system in Hartsburg, a distance of 12 miles from the city. Material for the distributing system, about 50 meters will be used to begin with. D. A. Roberts, of Springfield, is engineer in charge. D. Van Gerpen is secretary of the company.

**HAVANA, ILL.**—The contract for installing the cluster lamps in the business section has been awarded to the Caldwell El. Co. Campaign, at \$3,075.

**NOKOMIS, ILL.**—A temporary injunction restraining the city of Nokomis from purchasing electrical equipment or from selling bonds for the municipal electric-light plant has been secured by the Central Illinois El. Co. in the Circuit Court at Litchfield. The company has a contract with the city of Nokomis to furnish electricity for lamps and motors, and claims that the bonds voted for the municipal electric-light plant on Oct. 15 are illegal.

**PEPPIA, ILL.**—Steps have been taken by the Rotary Club for the installation of an ornamental street-lighting system in the business district.

**PARKERSBURG, ILL.**—A franchise has been

granted by the Village Board to Mr. Crump to install and operate an electric-light plant in Hankin.

**ROBINSON, ILL.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Dec. 4 for construction, including mechanical equipment, lighting fixtures and approaches, of the United States post office at Robinson. Drawings and specifications will be obtained at the architect's office or the custodian of the site at Robinson. O. Wenderoth is supervising architect.

**GLIDDEN, WIS.**—The property of the Glidden Mfg. Co., together with electric-light plant, will be sold by public sale by fire.

**MERRILL, WIS.**—Preparations are being made for the installation of an ornamental street-lighting system in Merrill.

**ORFORDVILLE, WIS.**—The Orfordville El. & Pwr. Co., recently organized to supply electricity in Orfordville, is making preparations to install an electric-lighting plant. The equipment will include one 30-kva, three-phase, 60-cycle, 2400-volt Westinghouse generator, one 40-hp gas engine, Mary's gas engine, switchboard equipment, lighting fixtures, and power transformers from 1/2 kw to 15 kw; 163 poles, about 4 miles of wire, and 60 Sanamo meters. Series 6.6-amp street lamps will be used. It is understood that the company will do its own work. A. E. Tomlin will have charge of the engineering work.

**SPARTA, WIS.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Nov. 30 for construction complete, including mechanical equipment, lighting fixtures and approaches, of the United States post office at Sparta. Drawings and specifications may be obtained at the above office or from the custodian of site at Sparta. O. Wenderoth is supervising architect.

**BEHMDJI, MINN.**—Plans are being considered by the Warfield El. Co., of Bemidji, to extend its transmission lines to Lavinia, at the head of the lake, next spring.

**HUTCHINSON, MINN.**—The Hutchinson El. & Mfg. Co. expects to install within the next three weeks a 225-hp Bosch-Sulzer Diesel oil engine and a 200-kva, 2300-volt generator.

**LITTLE FALLS, MINN.**—The Little Falls El. & Pwr. Co., has recently completed a concrete dam to replace the old wooden structure and expects to build an extension to its power house next year. T. C. Gordon is secretary and general manager.

**MONTEVIDEO, MINN.**—The Montevideo El. Lt. & Pwr. Co. has nearly completed the erection of 12 miles of 23,000-volt transmission line and is installing a condenser transformer for the same. The company is also installing a distribution system at Clara City, with substation, which will soon be put into operation. E. A. Aspinen is engineer and general manager.

**REDWOOD FALLS, MINN.**—Within the next ten days the Redwood Falls El. Co., of Redwood Falls, expects to purchase five 5-kw, 2200/220/110-volt transformers and a series street-lighting system, consisting of 15 60-watt and 15 25-watt lamps. R. F. Werhland is secretary and manager.

**ROCHESTER, MINN.**—The City Council has authorized the utility board to secure a new site for the municipal electric-light plant and to prepare preliminary plans for a new plant to cost from \$100,000 to \$125,000. It is proposed to move the plant from its present location, which is in the heart of the city.

**STILLWATER, MINN.**—The Consumers' Pwr. Co., of Stillwater, has closed a contract with the village of St. Elmo to furnish electricity for lamps and motors. A short extension of the transmission line will be erected from South Stillwater, to make the connection.

**WALNUT GROVE, MINN.**—Preparations are being made by Messrs. Nordgren & Lighner for the installation of an electric-light plant in Walnut Grove. The plant will be driven by a gas engine. Contracts for equipment, it is understood, have been placed.

**ELDORA, IA.**—Within the next eight months the Iowa River Co., of Eldora, expects to erect 12 miles of transmission line. J. C. Lundy is manager.

**LAKE CITY, IA.**—The Central El. & Pwr. Co., of Boone, is reported to have purchased the local electric-light plant, owned by C. E. Brownell.

**LARCHWOOD, IA.**—The Council has engaged Earl D. Jackson, Capital Bank Building, St. Paul, Minn., to take charge of the engineering work for the electric-light plant, proposed municipal electric-light plant, to cost about \$10,000.

**LEON, IA.**—The Leon El. Co. is installing a 15-kw series street-lighting system. Contract has already been placed for a



Fort Wayne regulator for Leon. J. F. Smith is president.

**MARENGO, IA.**—The Iowa Ry. & L. Co. has been granted permission to reconstruct its electric-light plant and system in Marengo.

**ROCK RAPIDS, IA.**—Improvements and extensions have been made to the municipal street-lighting system, including the installation of 51 ornamental lamp standards, at a cost of \$6,500. W. F. Gingrich is manager.

**SANBORN, IA.**—The Sanborn El. Co. expects to purchase within the next six months one 16-ft. by 60-in. horizontal tubular boiler (150 lb. pressure) and 45-kw., 6000/2300-volt step-down transformer and one 50-kw., 2300/6600-volt step-up transformer. The company has recently erected a 2300-volt transmission line from Sanborn to Primghar (7 miles long) and distributing lines in Primghar. George A. Healey is president and manager.

**THOR, IA.**—Plans are being considered for organization of a company to install an electric-light plant in Thor. G. E. Nurbly is reported interested in the project.

**WILLIAMS, IA.**—Within the next few months the F. R. Payne Co., owner of the local electric-light plant, expects to purchase an elevator for handling coal. F. R. Payne is manager.

**BLUE SPRINGS, MO.**—Work has begun on the installation of the machinery and equipment for the new electric-light plant in Blue Springs.

**CASSVILLE, MO.**—The Ingalls Stone Co., it is understood, contemplates the construction of a power house to develop from 250 up to 350 hp.

**JOPLIN, MO.**—The city of Joplin has made a contract with the Home Tel. Co. for the installation of a police-alarm system to be maintained by the company.

**ST. LOUIS, MO.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Dec. 2, for vacuum cleaning apparatus in the United States post office in St. Louis, Mo. For details see proposal columns.

**WEBSTER GROVES, MO.**—The El. Co. of Missouri, a subsidiary of the North American Co. has secured a contract to furnish electric energy to the amount of 4000 hp to the Continental Portland Cement Co. at Continental. Electricity will be supplied from the Kekuk plant.

**OSHKOSH, NEB.**—The Council has granted James M. Weldon, of Woodriver, a franchise to install an electric-lighting system in Oshkosh.

**ALMA, NEB.**—At an election held recently bonds to the amount of \$9,000 were voted for the installation of a municipal electric-light plant.

**MCPHERSON, KAN.**—Within the next three months the city of McPherson expects to purchase a vacuum pump for exhaust-steam-heating system, 8-in. Venturi tube with complete recorders, pipe covering for entire steam lines, coal-handling system, and probably material for railroad spur; also within the next six months pole-line material, including wire, etc. (for new lines and for repairs to present system), lighting arresters, meters and portable standard meter tester. It is proposed to establish within the next two months a cooking rate and place a number of ranges through local contractors. Arthur Groesbeck is superintendent.

## Southern States

**DURHAM, N. C.**—The Southern Pwr. Co. has purchased a tract of land between Durham and University Station on which it proposes to erect an auxiliary power plant. The new plant will have an output of 10,000 kw. and will cost about \$500,000. Work, it is understood, will begin at once on the proposed plant.

**ADEL, GA.**—Within the next four months the town of Adel expects to erect 3000 ft. of transmission line for series street lamps and six series street lamps. T. R. Sutton is superintendent.

**ALBANY, GA.**—The Albany Pwr. & Mfg. Co. is installing a 1250-kw General Curtis turbine complete, with all auxiliaries, material for which has been purchased.

**SAVANNAH, GA.**—Bids will be received by the H. S. Jaudon Engineering Co., P. O. Box 582, Savannah, Ga., until Nov. 18 for construction of electric plant and water-works system as follows: Electric generating and distributing system, electric generating and pumping plant equipped with two 100-hp boilers, feed-water pump and heater, condenser engine, current generator, switchboard and accessories as per plans and specifications.

**DRESDEN, TENN.**—At an election to

be held Nov. 21 the proposal to issue \$27,000 in bonds to construct an electric-lighting plant and water-works system will be submitted to the voters.

**JACKSON, MISS.**—Two sets of plans, it is reported, have been prepared by M. L. Culley, city engineer, for a municipal electric-light and power plant. The first provides for locating the plant in the city, to cost about \$165,000; the other to locate a power house at the pumping station of the water-works system, at a cost of about \$155,000. Both plans provide for placing mines in underground conduits in the business section, at an estimated cost of \$29,000.

**LESLIE, ARK.**—The Leslie Ice, Ltg. & Pwr. Co. and the Lenker Hub Co. have consolidated under the name of the Leslie Ice, Ltg. & Pwr. Co. The new company is capitalized at \$48,000. E. Mays is manager.

**BUNKIE, LA.**—Preparations are being made by the Bunkie Ice Co. to take over the franchise now owned by W. D. Haas. The company proposes to install an entire new plant and furnish a 24-hour service. W. L. Thompson, of Boyce, has been engaged as supervising engineer.

**MINDEN, LA.**—Within the next three months the Minden El. Ltg. & Pwr. Co. expects to overhaul its lines and to purchase new poles and cross-arms. J. S. Maxwell is superintendent.

**CHICKASAW, OKLA.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Dec. 1, for the installation of an electric passenger elevator in the United States post office at Chickasaw. For details see proposal columns.

**CLEBURNE, TEX.**—Contracts, it is reported, have been awarded for a power house for the proposed electric-light plant and for a substation to cost about \$5,000.

**McKINNEY, TEX.**—The City Commission has awarded a contract for a new power station for the city water and lighting plant, to cost about \$5,000.

## Pacific States

**EDISON, WASH.**—A subsidiary company of the Stone & Webster Corporation, with main office in Seattle, is planning to erect a substation in Edison to supply electricity in Edison, Blanchard and also to farm-to-town transmission lines. The line will also be extended through the Skagit Valley to furnish electricity for lamps and motors to ranches along the line.

**PARKLAND, WASH.**—A proposal to install an electric distribution system in Parkland is to be connected with the transmission lines of the Tacoma municipal electric plant, at a cost of \$9,000, has been submitted to the co-operative stockholders of the Parkland Ltg. & Pwr. Co. committee has been appointed by the company to raise funds for financing the project.

**SEATTLE, WASH.**—Bids will be received by A. L. Valentine, chairman of board of public works, until Nov. 13 for furnishing the city lighting department with one year's supply of distribution transformers, in accordance with specifications on file with the Board of Public Works.

**SEATTLE, WASH.**—A. L. Valentine, chairman of board of public works, it is understood, will ask for bids for furnishing material and installing a cluster-lamp lighting system on Columbia, Marion and Madison Streets, from First to Railroad Avenue. The cost of the work is estimated at \$5,000, to be paid by property owners.

**SPOKANE, WASH.**—The contract for installing the electric lighting system on First Avenue has been awarded to the William E. Chase Engineering Co., at \$66,429. The company has announced that it will purchase energy to maintain the system from the Washington Wtr. & Pwr. Co.

**PORTLAND, ORE.**—The City Commission has authorized Municipal Purchasing Agent Wood to advertise for bids for the installation of an electric-light system in the city. The contract is for remodeling the lighting system in Peninsula.

**PORTLAND, ORE.**—Special appropriations have been made by the City Commissioners for installing lighting system in the city parks as follows: For Holladay Park, \$11,400; for Kenworthy Park, \$1,500; for Laurelhurst Park, \$8,000. Bids for this work, it is understood, will be asked before the first of the year.

**BAKERSFIELD, CAL.**—The County Board of Supervisors of Kern County has awarded the contract for the erection of a 10-mile transmission line to supply energy to operate the new county rock-crushing plant, the Power Equipment Co., Rialto Building, San Francisco. The transmission

line as well as the telephone line will be of ¼-in. Siemens-Martin steel cable, supported on suspension cables.

**ESCONDIDO, CAL.**—The Escondido Mutual Water Co. has applied to the Board of Supervisors for a franchise to erect a transmission line from its reservoir on the San Luis River to Escondido and to install a distributing system in this city. The company proposes to generate electricity at the dam site and deliver the same to its customers here.

**HOLTVILLE, CAL.**—The State Railroad Commission has granted the Holton Pwr. Co., of Holtville, permission to issue \$200,000 in bonds (to be sold at not less than 80), the proceeds to be used for extensions and improvements to its system, including the construction of a substation at El Centro to cost \$45,000, the erection of a transmission line from El Centro to Seely and Dixieland, at a cost of \$12,078.

**SAN FRANCISCO, CAL.**—Plans are being prepared by the Mission Street Merchants' Association for installing an ornamental street-lighting system on Mission Street between Sixteenth Street and Twenty-fourth Street. J. J. Chick is chairman of lighting committee.

**SAN FRANCISCO, CAL.**—The State Railroad Commission has authorized the Northern California Pwr. Co., of San Francisco, to issue 5000 shares of capital stock, to be sold at not less than \$50 per share, the proceeds to be used for the purpose of reimbursing capital account and \$175,000 for additions and improvements to its properties.

**PLACERVILLE, IDAHO.**—The National Mining & Development Co., of Placerville, is equipping its mine with electrically operated machinery. A complete electric-lighting system will also be installed. The Golden Age Mining Co., is also preparing to equip its mine with electrically operated machinery.

**THOMPSON FALLS, MONT.**—The Thompson Falls Pwr. Co. has applied for right-of-way for the Cœur d'Alene transmission lines through certain sections in this vicinity.

## Canada

**NEW DENVER, B. C.**—Plans are being considered, it is reported, by the New Denver Pwr. Co. for rebuilding its power plant, which was destroyed by fire last summer. The company also contemplates extension of its transmission lines into outlying sections.

**TORONTO, ONT.**—The advisory industrial committee has appropriated \$45,000 for the purchase of engines, generators and other machinery in connection with the equipment of the new technical school.

## Miscellaneous

**WRANGELL, ALASKA.**—The Wrangell El. Ltg. & Pwr. Co. is now changing its system from direct to alternating current and is installing two 25-hp Fairbanks-Morse type Y oil engines with a 75-kva, three-phase, 60-cy. 2200-volt Fairbanks-Morse generator. O. C. Palmer is owner and manager.

**TATUHY, SAO PAULO, BRAZIL.**—Maeo Guedes, owner of a central station with an output of 1140 kw, is in the market for a water wheel and alternator having an output of 750 kw. For further information address Manoel Guedes, care of Octavio Moraes, Tatuhy, Sao Paulo, Brazil.

## New Incorporations

**PHOENIX, ARIZ.**—The Falls Pwr. & El. Co. has been incorporated by C. M. Etter, John Munson, C. Bailey, W. S. Perry and T. T. Powers, all of Phoenix. The company is capitalized at \$100,000 and proposes to construct and operate gas and electric plant and telephone and telegraph systems.

**FREEMONT, TEX.**—The Freemont Ltg. Wtr. & Ice Co. has been incorporated with a capital stock of \$5,000 by C. A. Jones and others.

**LOGAN, W. VA.**—The Logan Ltg. & Pwr. Co. has been incorporated with a capital stock of \$1,500,000 by George W. Stevens, Jr., E. S. Aleshire and R. P. Aleshire, of Huntington; Curtis McComas, of Barboursville; and John C. McComas, of Logan. The company proposes to build a large power plant at Logan from which it will distribute electricity to the various mining corporations in Logan County and through the Guyandotte Valley.

# Directory of Electrical Associations

ALABAMA LIGHT AND TRACTION ASSOCIATION. Secretary-treasurer, H. O. Hanson, Mobile Gas Co., Mobile, Ala.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. Petrololol Society, L. O. Howard, Smithsonian Institution, Washington, D. C. Annual meeting, Philadelphia, Dec. 28, 1914, to Jan. 2, 1915.

AMERICAN ELECTRIC RAILWAY ASSOCIANTS' ASSOCIATION. Secretary-treasurer, E. B. Burritt, 29 West 39th St., New York.

AMERICAN ELECTRIC RAILWAY ASSOCIATION. Secretary, E. B. Burritt, 29 West 39th St., New York.

AMERICAN ELECTRIC RAILWAY ENGINEERING ASSOCIATION. Secretary, E. B. Burritt, 29 West 39th St., New York.

AMERICAN ELECTROCHEMICAL SOCIETY. Secretary, Prof. J. W. Richards, Lehigh University, South Bethlehem, Pa.

AMERICAN ELECTRO-THERAPEUTIC ASSOCIATION. Secretary, Dr. J. Willard Truvel, 27 East 11th St., New York.

AMERICAN INSTITUTE OF CONSULTING ENGINEERS. Secretary, Eugene W. Stern, 101 Park Ave., New York City.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Secretary, F. L. Hutchinson, 33 West 39th St., New York. Board of directors meets monthly. Sections and branches in the principal electrical centers throughout the country.

AMERICAN PHYSICAL SOCIETY. Secretary, Prof. A. D. Cole, Ohio State University, Columbus, Ohio.

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS. Secretary, William H. Ross, 154 Nassau St., New York City. Annual meeting, New York, Nov. 30-Dec. 1.

AMERICAN SOCIETY FOR TESTING MATERIALS. Secretary-treasurer, Edgar Marburg, University of Pennsylvania, Philadelphia.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS. Secretary, Edwin A. Scott, 29 West 39th St., New York.

AMERICAN WATER WORKS ASSOCIATION. Secretary, J. M. Diven, 47 State St., Troy, N. Y.

ARKANSAS ASSOCIATION OF PUBLIC UTILITY OPERATORS. Secretary, W. J. Tharp, Little Rock, Ark.

ASSOCIATION OF EDISON ILLUMINATING COMPANIES. Assistant secretary, Walter Neumuller, Irving Place and 15th St., New York.

ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS. Secretary, W. T. Snyder, McKeesport, Pa.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS. Secretary-treasurer, Jos. A. Andreucetti, Chicago & Northwestern Railway, Chicago.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS. Secretary, F. W. Drew, 112 West Adams St., Chicago.

CALIFORNIA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, W. S. Hanbridge, 1408 Merchants' National Bank Building, Los Angeles, Cal.

CANADIAN ELECTRICAL ASSOCIATION. Affiliated with N. E. L. A. Secretary-treasurer, Alan Sullivan, 610 Confederation Life Bldg., Toronto, Can.

COLORADO ELECTRIC CLUB. Secretary, C. F. Gehlmann, Meets every Thursday at Albany Hotel, Denver, Col.

COLORADO ELECTRIC LIGHT, POWER AND RAILWAY ASSOCIATION. Secretary-treasurer, T. F. Kennedy, 900 15th St., Denver, Col.

COMMERCIAL SECTION, N. E. L. A. Secretary, J. F. Becker, 1170 Broadway, N. Y.

EASTERN NEW YORK SECTION, N. E. L. A. Secretary, C. S. Van Dyck, Schenectady, N. Y.

ELECTRIC CLUB OF CHICAGO. Secretary, Howard Ehrlich, 608 South Dearborn St., Chicago. Meets every Thursday noon at Hotel Sherman.

ELECTRICAL CONTRACTORS' ASSOCIATION OF TREASURY. Secretary, R. S. Hale, 39 Boylston St., Boston.

ELECTRICAL CONTRACTORS' ASSOCIATION OF MASSACHUSETTS. Secretary, H. D. Temple, 10 Foster St., Worcester, Mass.

ELECTRICAL CONTRACTORS' ASSOCIATION OF NEW YORK STATE. Secretary, Geo. W. Russell, Jr., 25 West 42d St., New York.

ELECTRICAL CONTRACTORS' ASSOCIATION OF THE CITY OF CHICAGO. Secretary, M. N. Sumenthal, 179 West Washington St. Meets at noon on the second and fourth Wednesday of each month at 424 South Wabash Ave.

ELECTRICAL CONTRACTORS' ASSOCIATION OF STATE OF MISSOURI. Secretary, A. J. Burns, 318 West Tenth St., Kansas City, Mo.

ELECTRICAL CONTRACTORS' ASSOCIATION OF WISCONSIN. Secretary, Albert Petermann, 626 Lloyd St., Milwaukee, Wis.

ELECTRICAL CREDIT ASSOCIATION OF CHICAGO. Secretary, Frederic P. Vose, 1343 Marquette Building, Chicago.

ELECTRICAL CREDIT ASSOCIATION OF PHILADELPHIA. Secretary, John W. Crum, 1324 Land Title Building, Philadelphia, Pa.

ELECTRICAL SALESMEN'S ASSOCIATION. Secretary, Francis Raymond, 125 Michigan Ave., Chicago, Ill.

ELECTRICAL SUPPLY JOBBERS ASSOCIATION. General secretary, Franklin Overbach, 411 South Clinton St., Chicago, Ill. Next meeting, Birmingham, Ala., Dec. 8-10.

ELECTRICAL TRADES ASSOCIATION OF CANADA. Secretary, William R. Stavelly, Royal Insurance Building, Montreal, Can.

ELECTRICAL TRADES ASSOCIATION OF THE PACIFIC COAST. Secretary, Albert H. Elliott, Harding Building, 34 Ellis St., San Francisco, Cal. Meeting, San Francisco, second Thursday of each month.

ELECTRIC VEHICLE ASSOCIATION OF AMERICA. Executive secretary, A. Jackson Marshall, 29 West 39th St., New York. Sections in New York, New England, Chicago, Philadelphia, Washington and Los Angeles.

EMPIRE STATE GAS AND ELECTRIC ASSOCIATION. Secretary, Charles H. B. Chapin, 29 West 39th St., New York.

FARADAY ELECTRICAL ASSOCIATION. Secretary, W. J. Collins, 1129 Masonic Temple, Chicago. Meets at noon on the first and third Wednesday of each month at Planters' Hotel.

FRANKLIN INSTITUTE. Secretary, Dr. R. B. Owens, Philadelphia, Pa.

GAS, ELECTRIC AND STREET RAILWAY ASSOCIATION OF OKLAHOMA. Secretary-treasurer, Prof. H. V. Bozell, Norman, Okla.

GEORGIA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, J. M. Clayton, Atlanta, Ga.

ILLINOIS STATE ELECTRICAL ASSOCIATION. Secretary, H. E. Chubbuck, Peoria, Ill.

ILLUMINATING ENGINEERING SOCIETY. General secretary, C. A. Littlefield, 29 West 39th St., New York.

INDEPENDENT ELECTRICAL CONTRACTORS' ASSOCIATION OF GREATER NEW YORK. Secretary, H. N. Burger, 1153 Myrtle Ave., Brooklyn, N. Y.

INDEPENDENT TELEPHONE ASSOCIATION OF AMERICA. Secretary, W. S. Vivian, Grand Rapids, Mich.

INDIANA ELECTRIC LIGHT ASSOCIATION. Secretary, Thomas Donahue, Lafayette, Ind.

INDIANA STATE ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, George Skilman, Indianapolis, Ind.

INSTITUTE OF OPERATING ENGINEERS. Secretary, L. Houmiller, 29 West 39th St., New York.

INSTITUTE OF RADIO ENGINEERS. Secretary, E. J. Simon, 71 Broadway, New York.

INTERNAL COMBUSTION ENGINEERS' ASSOCIATION. President, Charles Kratsch, 416 West Madison St., Chicago. Meeting second Friday of each month at Lewis Institute.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS. Secretary, C. R. George, Houston, Tex.

INTERNATIONAL ENGINEERING CONGRESS. Secretary-treasurer, W. A. Cattell, Foxcroft Building, San Francisco, Cal. Congress, San Francisco, September, 1915.

INTERNATIONAL ELECTROTECHNICAL COMMISSION. (International body representing various national electrical engineering societies contributing to its support.) General secretary, H. E. Maistre, 28 Victoria St., Westminster, London, S. W., England. Meeting at San Francisco, Sept. 9-11, 1915.

IOWA ELECTRICAL ASSOCIATION. Affiliated with N. E. L. A. Secretary, W. H. Thomson, Des Moines, Ia.

IOWA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, M. T. Humphrey, Waterloo, Ia.

IOWA STREET AND INTERURBAN RAILWAY ASSOCIATION. Secretary, H. E. Weeks, Davenport, Ia.

JOVIAN ORDER. Jupiter (president), Homer Nierz, Chicago, Ill.; Mercury (secretary), E. C. Bennett, Syndicate Trust Building, St. Louis, Mo.

KANSAS GAS, WATER, ELECTRIC LIGHT AND STREET RAILWAY ASSOCIATION. Secretary-treasurer, Ivor Thomas, 237 South Main St., Wichita, Kan.

LOUISIANA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, J. Ziegler, 227 Bourbon St. Meeting every Wednesday, Audubon Building, New Orleans.

MAINE ELECTRIC ASSOCIATION. Secretary-treasurer, Walter S. Wyman, Waterville, Maine.

MINNESOTA ELECTRIC ASSOCIATION. Affiliated with N. E. L. A. Secretary, Herby Silvester, 18 Washington Boulevard, Detroit, Mich.

MINNESOTA ELECTRIC ASSOCIATION. Secretary-treasurer, F. A. Otto, St. Paul Gas Light Company, St. Paul, Minn.

MISSISSIPPI ELECTRIC ASSOCIATION. Affiliated with the National Electric Light Association. Secretary-treasurer, H. F. Wheeler, Hattiesburg, Miss. Next annual meeting, Hattiesburg, April 12-14, 1915.

MISSOURI ELECTRIC GAS, STREET RAILWAY AND WATER WORKS ASSOCIATION. Secretary-treasurer, F. D. Beardsley, Union Electric Light & Power Co., St. Louis.

NATIONAL ARM, PIN AND BRACKET ASSOCIATION. Secretary, J. B. Magers, Madison, Ind.

NATIONAL ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary-treasurer, Wm. L. Smith, Concord, Mass.

NATIONAL DISTRICT HEATING ASSOCIATION. Secretary, D. L. Gaskill, Greenville, Ohio.

NATIONAL ELECTRIC LIGHT ASSOCIATION. Executive secretary, T. C. Martin, Engineering Societies Building, 33 West 39th St., New York.

NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION OF THE UNITED STATES. Secretary, George H. Duffield, 41 Martin Building, Utica, N. Y.

NATIONAL ELECTRICAL CREDIT ASSOCIATION. Secretary, Frederic P. Vose, 1343 Marquette Building, Chicago.

NATIONAL FIRE PROTECTION ASSOCIATION. Secretary of electrical committee, Ralph Sweetland, 141 Milk St., Boston, Mass. Open meeting, New York, March, 1915.

NATIONAL INDEPENDENT TELEPHONE ASSOCIATION. Secretary-treasurer, J. B. Earle, Waco, Tex.

NEBRASKA SECTION, N. E. L. A. Secretary-treasurer, S. J. Bell, David City, Neb.

NEW ENGLAND ELECTRICAL CREDIT ASSOCIATION. Secretary, Alton F. Tupper, 60 State St., Boston, Mass.

NEW ENGLAND SECTION, ELECTRIC VEHICLE ASSOCIATION OF AMERICA. Secretary, L. L. Edgar, 39 Boylston St., Boston, Mass.

NEW ENGLAND STREET RAILWAY CLUB. Secretary, H. A. Faulkner, 12 Pearl St., Boston, Mass. Meets last Thursday of each month.

NEW ENGLAND SECTION, N. E. L. A. Secretary, Miss O. E. Bursiel, 149 Tremont St., Boston, Mass.

NEW ORLEANS ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, S. J. Stewart, 312 Carondelet St., New Orleans, La. Meetings second and fourth Tuesday of each month.

NEW YORK ELECTRIC RAILWAY ASSOCIATION. Secretary, Charles C. Dietz, 365 East 21st St., Brooklyn, N. Y.

NEW YORK ELECTRICAL CREDIT ASSOCIATION. Affiliated with the National Electrical Credit Association. Secretary, Franz Neilson, 80 Wall St., New York.

NEW YORK ELECTRICAL SOCIETY. Secretary, G. H. Guy, 33 West 39th St., New York.

NORTHWEST SECTION, N. E. L. A. Secretary, N. W. Brackett, Pioneer Building, Seattle, Wash.

NORTHERN WHITE CEDAR ASSOCIATION. Secretary, R. N. Boucher, 743 Lumber Exchange, Minneapolis, Minn.

OHIO ELECTRIC LIGHT ASSOCIATION. Secretary, D. L. Gaskill, Greenville, Ohio.

OHIO SOCIETY OF MECHANICAL ELECTRICAL AND STEAM ENGINEERS. Secretary, Prof. F. E. Sanborn, Ohio State University, Columbus, Ohio.

OREGON ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, F. C. Green, 291 East Morrison St., Portland, Ore.

PENNSYLVANIA ELECTRICAL ASSOCIATION (State Section N. E. L. A.). Secretary-treasurer, H. N. Miller, Pittsburgh, Pa.



RAILWAY SIGNAL ASSOCIATION. Secretary-treasurer, C. E. Rosenberg, Times Building, Bethlehem, Pa.

SOCIETY FOR ELECTRICAL DEVELOPMENT, Inc. General manager, J. M. Wakeman, 29 West 39th St., New York.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION. Secretary, Dean F. L. Reberg, University of Pittsburgh, Pittsburgh, Pa.

burgh, Pa., Annual meeting, Ames, Ia., June 22-25, 1915.

SOUTHEASTERN SECTION, N. E. L. A. Secretary-treasurer, Geo. H. Wygant, Tampa, Fla.

SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Secretary, H. S. Cooper, 405 Slaughter Building, Dallas, Tex.

VERMONT ELECTRICAL ASSOCIATION. Secretary-treasurer, C. H. West, Rutland, Vt.

WESTERN ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary, W. S. Boyd, 76 West Monroe St., Chicago, Ill. Annual meeting, Minneapolis, Minn., Jan. 28-29, 1915.

WESTERN SECTION OF ENGINEERS' ELECTRICAL SECTION. Secretary, J. H. Warder, 1737 Monadnock Block, Chicago.

WISCONSIN ELECTRICAL ASSOCIATION. Secretary, George Allison, 1410 First National Bank Building, Milwaukee, Wis.

## Weekly Record of Electrical Patents

### UNITED STATES PATENTS ISSUED OCT 27, 1914.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York, N. Y.]

- 1,114,719. TERMINAL CONNECTOR; C. W. Beck, Rockville Center, N. Y. App. filed Oct. 18, 1911. Claims connector for spark plugs.
- 1,114,725. MEANS FOR DETERMINING TIME INTERVALS IN TELEPHONE SYSTEMS; W. G. Blauvelt, New York, N. Y. App. filed May 4, 1911. Especially for automatic selecting switches.
- 1,114,727. ELECTRIC MOTOR AND PUMP CONNECTED THERE TO; J. F. Breeze, Hammersmith, England. App. filed July 28, 1911. Centrifugal pump exhausts the cooling water from the motor.
- 1,114,733. ELECTRIC FURNACE; W. N. Crafts, Oberlin, Ohio. App. filed Nov. 28, 1911. High-capacity induction furnace with an unrestricted bath.
- 1,114,759. WINDMILL-POWER PLANT; A. H. Heyroth, Great Falls, Mont. App. filed Dec. 17, 1912. Special automatic regulation.
- 1,114,760. SYSTEM OF ELECTRICAL SUPPLY; A. H. Heyroth, Great Falls, Mont. App. filed Jan. 3, 1913. Control of generator in respect to storage battery.
- 1,114,766. INHERENT-POWER-RETURN SIGNAL MECHANISM; W. K. Howe, Rochester, N. Y. App. filed Feb. 16, 1911. Alternating-current system employing a phase-splitting device.
- 1,114,788. AUTOMATIC DRAFT REGULATOR; R. P. Mercer, Burlington, Ia. App. filed March 14, 1914. For furnaces; operated by electric motor.
- 1,114,802. STORAGE BATTERY; W. E. Poole, Chicago, Ill. App. filed Feb. 20, 1914. Has improved venting arrangement.
- 1,114,805. ELECTRICAL PRESSING IRON; A. E. Reimers, New York, N. Y. App. filed Nov. 2, 1911. Resistance unit constructed to permit a graduated control of the heat.
- 1,114,813. SAFETY SWITCH; H. B. Shreve, Chicago, Ill. App. filed Jan. 11, 1913. For elevator doors.
- 1,114,816. ROTARY HYDROCARBON ENGINE; S. G. Stapp, Philadelphia, Pa. App. filed Jan. 19, 1911. Special ignition system.
- 1,114,823. ELECTRO-PNEUMATIC CONTROL VALVE; W. V. Turner, Edgewood, Pa. App. filed May 3, 1911. Electric control does not interfere with the pneumatic control.
- 1,114,831. ELECTRIC SWITCH; C. G. White, Detroit, Mich. App. filed Feb. 2, 1914. Permutation type.
- 1,114,840. WIRELESS TELEGRAPHY; W. C. Woodland, Warren, Ohio. App. filed Oct. 19, 1912. Increases the pitch of the tone heard at the receiving station.
- 1,114,842. ATTACHMENT FOR TELEPHONE STANDS; L. E. Wright Fairgrave, Ill. App. filed Dec. 19, 1913. For supporting the receiver at the ear.
- 1,114,845. ELECTRIC RELAY; H. De F. Arnold, East Orange, N. J. App. filed May 16, 1914. For use in connection with an audion.
- 1,114,872. ELECTRICAL SYSTEM OF DISTRIBUTION; S. H. Everett, Jr., Brooklyn, N. Y. App. filed July 9, 1909. Storage-battery system.
- 1,114,902. TELEPHONE RECEIVING INSTRUMENT; T. B. Miller, Seattle, Wash. App. filed Sept. 25, 1912. Especially sensitive for wireless work.
- 1,114,904. PRINTER FOR PRINTING-TELEGRAPH SYSTEMS; D. Murray, London, England. App. filed April 16, 1913. Typewriter class.
- 1,114,905. PRINTING TELEGRAPH SYSTEM; D. Murray, London, England. App. filed April 16, 1913. Two reproducers, a printer and a perforator at the receiving station.
- 1,114,939. SELECTIVE SIGNAL SYSTEM; W. R. Tomlin, Fort Collins, Colo. App. filed Feb. 27, 1914. For selectively ringing bells on a party line.
- 1,114,953. ARC-LIGHT ELECTRODE; A. V. Wilker, Brea, Ohio. App. filed Jan. 22, 1912. Contains cerium silicide.
- 1,114,982. WORKING SUBMARINE CABLES; J. Gott, Brighton, England. App. filed March 18, 1912. Every unit of each letter is formed by a reversed current.
- 1,114,984. ELECTRIC SWITCH; B. D. Horton, Detroit, Mich. App. filed April 5, 1913. "Armor-clad" type operated by crank inserted through casing.
- 1,115,018. STORAGE BATTERY; W. E. Poole, Chicago, Ill. App. filed May 23, 1914. Small portable tilting of battery without spilling electrode.
- 1,115,022. DEFLATED-TIRE DETECTOR; H. C. Quick, Oakland, Cal. App. filed March 21, 1914. Instrument on dashboard indicates deflation of a tire.
- 1,115,027. ELECTRODE; R. L. Seabury, Lakewood, Ohio. App. filed Aug. 2, 1911. Method of joining electrodes for electric furnaces.
- 1,115,053. TELEPHONE RECEIVER; W. H. Cotton, Chicago, Ill. App. filed Oct. 25, 1912. Prevents excessive vibration of the diaphragm.
- 1,115,075. ELECTRIC COOKER; M. L. Keagy, Canton, Ohio. App. filed April 11, 1912. Small portable type.
- 1,115,084. TROLLEY-WHEEL MOUNT; B. Milewski, Kent, Ohio. App. filed May 14, 1914. Has self-lubricating features.
- 1,115,091. PROTECTIVE SWITCH BOX; T. E. Murray, New York, N. Y. App. filed Oct. 21, 1913. Opening of the cover breaks the circuit.
- 1,115,092. ELECTRIC LOCK SWITCH; W. C. Neahr, Denver, Col. App. filed June 4, 1913. Operated by an inserted key, which, when turned, is held in the switch.
- 1,115,114. CONNECTOR FOR ELECTRIC CONDUCTORS; H. H. Russell, Chicago, Ill. App. filed March 21, 1913. Quick detachable plug-and-socket type.
- 1,115,130. PERMUTATION SWITCH LOCK; E. E. Theis, Dayton, Ohio. App. filed Feb. 9, 1914. For automobile ignition circuits.
- 1,115,131. ELECTRIC TERMINAL CONNECTOR; F. Wagner, Natrona, Pa. App. filed Jan. 2, 1913. Clamp for taking current from overhead trolley wire.
- 1,115,154. ELECTRICAL DISTRIBUTION SYSTEM FOR AUTOMOBILE CONTROL; V. G. Apple, Dayton, Ohio. App. filed Oct. 12, 1911. Motor-generator system.
- 1,115,158. LOCOMOTIVE TRUCK; A. F. Ratcliff, Glenville, N. Y. App. filed July 24, 1914. Has the same rolling effect as a steam locomotive.
- 1,115,174. COHERER DISCHARGE INDICATOR; E. E. F. Creighton, Schenectady, N. Y. App. filed May 11, 1912. Operates on both great and small charges.
- 1,115,195. WELDING MACHINE; E. T. Hendee, Chicago, Ill. App. filed May 4, 1914. For boiler flues, electric heat.
- 1,115,220. ROTARY FIELD MAGNET WITH TWO POLES; F. Ljungström, Finspang, Sweden. App. filed Jan. 24, 1914. U-shaped winding has dovetailed engagement with magnet core.
- 1,115,249. MEANS FOR THE PRODUCTION OF LONG CONTINUOUS ELECTRIC ARCS; O. Schonherr, Christiania, and J. Hessberger, Christiansand, Norway. App. filed May 18, 1913. Gas passed through arc tube in different directions.
- 1,115,251. METHOD OF OPERATING ELECTROMAGNETIC STRIKING TOOLS BY MEANS OF ALTERNATING CURRENT; L. Schüller, Berlin-Lichterfelde, West Germany. App. filed Aug. 30, 1912. Uses synchronous interrupts.
- 1,115,264. OIL SWITCH; E. B. Wedmore, Rusby, England. App. filed July 11, 1908. Special features of manual control, contacts and tank.
- 1,115,278. SHIN'S ENGINE-ROOM SIGNAL; O. K. Bohstrand, New York, N. Y. App. filed May 2, 1913. Telltale indicates operation of machinery in response to signals.
- 1,115,283. ELECTRIC CLOCK; L. Corf, New York, N. Y. App. filed March 17, 1914. Driving power is the solenoid connected with a local electric battery.
- 1,115,286. ELECTRO-PNEUMATIC AIR-BRAKE SYSTEM; J. P. Costello, Medicine Hat, Alberta, Canada. App. filed Jan. 1, 1914. Applicable to standard brake systems.
- 1,115,289. ALTERNATING-CURRENT DYNAMO-ELECTRIC MACHINE; L. Dreyfus and F. Hillebrand, Niederschönhausen, Germany. App. filed Sept. 4, 1912. Polyphase type.
- 1,115,314. EXHAUSTING ELECTRODES FOR ELECTRIC WELDING OR SOLDERING; O. Kjellberg, Gothenburg, Sweden. App. filed Jan. 29, 1912. Iron rod covered with special paste.
- 1,115,324. TELEPHONE RELEASE-INSURANCE MEANS; T. C. Martin, Chicago, Ill. App. filed July 6, 1908. For use in systems where a manual switchboard operator is given control of automatic trunk selectors.
- 1,115,351. PROCESS OF SEPARATING METALS FROM ORES; J. A. Wagner, East Orange, N. J. App. filed Jan. 27, 1914. Recovery of copper, zinc, etc., from sulphide and similar ores by electrolysis.
- 1,115,352. DYNAMO-ELECTRIC MACHINE; M. Walker, Old Trafford, England. App. filed Dec. 19, 1907. High-speed commutator machine.
- 1,115,359. ELECTRIC BURGLAR-ALARM SYSTEM; J. P. Williams, New York, N. Y. App. filed April 27, 1910. For protection of a vault or safe.
- 1,115,364. AUTOMATIC TRAIN CONTROL FOR CAR SIGNALS; E. F. Wooding, Denver, Col. App. filed July 15, 1912. Operation depends on normally closed train circuit.
- 1,115,396. ALARM ATTACHMENT FOR LOCKS; H. C. Harrison, Monmouth, Ill. App. filed June 14, 1911. Rotation of the hand closes circuit and rings bell.
- 1,115,406. DYNAMO-ELECTRIC MACHINE; J. Le C. Davis, Pittsburgh, Pa. App. filed June 14, 1912. Has special air-circulating cooling system.
- 1,115,440. DYNAMO-ELECTRIC MACHINE; F. R. Kunkel, Edgewood Park, Pa. App. filed July 6, 1908. Air currents are circulated through the core.
- 1,115,446. CIRCUIT-CONTROLLING DEVICE; O. M. Leich, Genoa, Ill. App. filed Feb. 20, 1913. Transmits a prolonged impulse when the receiver hook is moved up or down.
- 1,115,447. POT-HEAD OR END BELL; H. P. Liverage, Philadelphia, Pa. App. filed April 6, 1910. Clamping pot-head which avoids the injurious effects of electrostatic discharge.
- 1,115,448. CIRCUIT-BREAKER; A. J. Loguin, West Allis, Wis. App. filed March 12, 1910. Makes a contact with an oblique slicing action.
- 1,115,452. VARIABLE-SPEED DIRECT-CURRENT GENERATOR; A. Richter, Chicago, Ill. App. filed Oct. 22, 1913. Regulation of speed of generators such as are used on motorcycles.
- 1,115,455. ELECTRICAL DISTRIBUTION SYSTEM; P. H. Thomas, Pittsburgh, Pa. App. filed March 5, 1903. Using vapor converter.
- 1,115,456. ELECTRICAL DISTRIBUTION SYSTEM; P. H. Thomas, Pittsburgh, Pa. App. filed March 5, 1903. Vapor converter and regulating magnets.
- 1,115,458. DRY CELL; W. G. Walt, Fremont, Ohio. App. filed March 24, 1913. Fills can with oil to wet the surface, empties and then adds the powdery material to the wetted surface.
- 1,115,461. ELECTRIC WELDING MACHINE; W. E. Andrews, Bellvue, Ohio. App. filed July 6, 1914. For welding seams of tubular metal articles.
- 1,115,463. ELECTRODE ELEMENT; T. A. Edison, Llewellyn Park, West Orange, N. J. App. filed June 17, 1910. Automatic use and stamping of active material into small perforated tubes.

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## Civic Federation Utility Bill

The National Civic Federation draft bill for the regulation of public utilities makes its late appearance

when all but three states have regulative commissions. The question of what influence it will have on regulative legislation, therefore, is at least partly answered by the fact that the states generally have passed their laws on this subject. It is not impossible that amendments will be made to existing laws, but in law-making of an epochal character, such as this is, only slow changes are likely. In great legislative acts there is a tendency to avoid changes that hamper the administration of the law until a fair time has been given for actual demonstration of the weaknesses or flaws in the original statute. Although the bill is now formally promulgated by the National Civic Federation, a reading of the documents which were issued with it shows where the real responsibility for it rests and where it does not rest. As the work on the bill proceeded it was found to be "impossible to secure a unanimous approval" of any measure of this kind by the department on regulation of interstate and municipal utilities. The responsibility therefore was narrowed to the executive council of the department, composed of ten members. One of these, Secretary of the Interior Lane, retired on account of his official duties before the drafting of the bill began. Three of the others, although believing that the bill "is an advance in many respects on existing legislation," joined in a dissenting report on certain points. If there had been a larger number of persons on the executive council and most of these had concurred, or if it had been feasible to secure the unanimous approval of a large body of members of the department for a fair bill, the influence of the work would have been much greater. In actual money expenditure and in the time of prominent men freely given the work represents a vast outlay. It is unfortunate that those who contributed to it were not able to agree wholly upon principles and details of a bill to be an accepted guide to both public and corporations in the successful development of the policies of regulation to which the country as a whole is committed.

## Conserving Financial Resources

Letters have been sent by the municipal bond committee of the Investment Bankers' Association to

municipalities, towns and counties, asking for information as to the probable amount of financing and urging that new issues be kept at a minimum. This movement, of course, is designed in part to protect the market on outstanding municipal bonds, but at the

same time it is a needed word of caution which calls attention to the wisdom of preventing wasteful use of our national financial resources. It is a foregone conclusion that money will be in great demand from European as well as domestic borrowers. The world-wide need of capital will mean a bidding for available supplies that will cause rates to advance, probably sharply. European loans will be required in connection with the long, expensive process of sorrowful reconstruction which will follow the war; and our domestic needs will have accumulated during a period when new capital is obtainable only at abnormal figures or in relatively small amounts. Domestic needs will be further accentuated by the fact that until shortly before the war started they had been somewhat restricted by the absence of a satisfactory bond market. Future money market conditions will develop slowly, and until the European situation reaches a final stage it is not easy to predict the exact effect of the attitude of investors in countries now at war. It is interesting to consider the suggestion made by Mr. S. R. Bertron in last week's issue of the *Electrical World*, that Europeans who desire to place their funds in a country that is not liable to be at war may invest here in sufficient volume largely to offset forced sales. If that condition should come about, it will do much to protect prices of our securities. It is, however, only a possible means whereby the actual after-effects of the war on money markets may be made less severe for this country. The now restricted demand from borrowers of all classes, municipal and private, will be felt in force as rapidly as conditions permit, and the effort to show that the supply will not be unlimited will help to keep interest rates from mounting to too high a level.

## Theoretical Bill and Arguments

Among the sections in the National Civic Federation draft bill which are bones of contention are those

that deal with security issues, competing municipal plants and penalties. The European war makes the protection of our own financial resources a more vital issue than ever before. It is not practicable to write all public policy into laws, but it is possible to make laws that shall give leeway under which wise commissions may shape their decisions according to the financial vicissitudes of the times. The draft bill is too rigorous in this respect. It does not leave that trading margin which a borrower sometimes has to surrender before he can induce the lender to part with capital. The failure of the draft bill to make municipal utilities subject to the same kind and degree of regulation as private



utilities is open to decided criticism. We cannot see any fair reason why one class should be liable and the other immune. The practices of municipal plants in Wisconsin have been found to be full of discrimination. If the discriminatory practices of private plants must be abandoned, why should the discriminatory practices of municipal plants be allowed, even encouraged by lack of hindrance, to flourish? It is true that under the act no municipality shall hereafter enter upon the "original construction" of a utility plant where an existing plant is in operation without first obtaining from the commission a certificate of convenience and necessity. This, however, does not bring existing municipal competitive plants under the commission and, under a broad interpretation of "original construction," such as might possibly be permitted by the courts, it could open the way to unlimited attacks upon a sound private property rendering fair service. Such attacks are not economically justifiable. The proper avenue of redress of the municipality for the wrongs that it feels it suffers is the state commission. A measure of control of municipal operations would result from the section which provides for commission supervision of municipal as well as private plant accounting, but that is an inadequate remedy. The other clauses which we mentioned, those dealing with penalties, appear to be too rigorous. Although, after all, these are theoretical arguments regarding a theoretical bill, the issues involved are acute, and because they exist as problems demanding solution in many communities, they cannot well be ignored.

### Special Lighting Contracts

It has long been realized by central-station managers that to do a successful house-lighting business with the smaller consumer it is necessary to work out a scheme of wiring to be paid for on the instalment plan. Thus the owner is relieved from the sometimes rather heavy expense of the initial installation and has less hesitancy in turning to electric lighting, since the costs are arranged so that they can be easily borne. The same difficulty of initial cost was encountered in a campaign for factory lighting described by Messrs. O. R. Hogue and A. O. Dicker at the Cleveland convention of the Illuminating Engineering Society, and it was met in the same way. The cost of installation, complete with wiring and standard fixtures, is distributed as a rental charge over a period of two years, at the end of which time the whole becomes the property of the customer. Second, there is a special contract for suitable cleaning and renewals by the company which relates to a feature common in factory lighting, the degeneration of lighting units under the conditions of their use. The remaining charge is the ordinary one for energy. The ratings of the lamps employed were 100, 150 and 250 watts, and the data given show that ordinarily less than half a watt per square foot is required for satisfactory lighting, while the total cost per square foot to the customer, including all the charges, runs in ordinary cases from a quarter to half a cent, very rarely exceeding the latter figure. The experience acquired with this system of installation

has been to show that it is a thoroughly practical one and that the customer can receive a very definite estimate as to the cost of good illumination. The wiring contract and the maintenance contract are important features of the scheme, and the application of these to customers as large as are furnished by factories indicates a line of progress in central-station practice which is likely to be followed freely in other places.

### Resistivity of Metals at Low Temperatures

It is well known that the metals, when comparatively pure, have definite resistivities at 0 deg. C., and that these resistivities increase with temperature. The increase follows a straight-line law, within the range of temperatures ordinarily encountered outside of furnaces. Thus, in the case of good commercial copper, the resistivity between 0 deg. and 100 deg. C. is taken as a straight line such that at  $-234.5$  deg. C. the resistivity would vanish. Nevertheless, if a wire of nearly pure copper is cooled to that temperature, it is found to retain a small but definite resistivity, which is another way of saying that the straight-line law is departed from at very low temperatures.

Since the practice of obtaining liquid oxygen at  $-253$  deg. C. was discovered and developed for laboratory purposes, the electrical-resistivity behavior of metals within 20 deg. of the inferred absolute zero has become fairly well known. In all the cases investigated the resistivity of pure metals falls to a low but appreciable value at 20 deg. absolute. In recent years, however, the Dutch physicist Kamerlingh-Onnes has greatly extended our knowledge in this direction by developing a process for making and bottling liquid helium. This substance when liquefied is stated to attain a temperature of  $-272$  deg. C., or comes within almost 1 deg. of the absolute zero, than which nothing can theoretically be colder. The liquefied helium is poured into a Dewar flask or thermos bottle, and so long as it remains unevaporated its mass is supposed to retain that temperature. A coil of wire immersed in this liquid must nearly enjoy the Nirvana of absolute zero. The work of Onnes recently won the Nobel prize for physical research. An article on some of Onnes' observations has recently been published by Mr. L. Schüler in the *Elektrotechnische Zeitschrift*, as reviewed in this week's Digest.

It seems that the resistivity of gold, platinum and aluminum, when cooled below, say, 50 deg. absolute, departs from a straight-line law and tends to reach a finite constant value. The purer the metal, the lower the absolute-zero resistivity appears to be. Perhaps if the metal could be secured in absolute purity its absolute zero resistivity would fall to zero. In fact, Onnes was able to obtain, by redistillation, a sample of mercury so nearly pure that the residual impurity could not be detected. In cooling this mercury down to 4.2 deg. absolute the resistivity decreased nearly along a straight line. At the critical temperature of 4.2 deg. absolute the appreciable residual resistivity suddenly collapse

to zero, and it remained at zero to within 1.2 deg. absolute, the lowest attainable temperature. Consequently, according to Onnes' observations, a pure mercury conductor at 2 deg. absolute would develop no heat when carrying a current, or would carry electricity with an indefinitely small potential gradient.

In seeking to produce an intense magnetic field within a small coil immersed in liquid helium, utilizing the above principle of negligible heating at 2 deg. absolute, Onnes found that a coil of very fine lead wire suddenly burned out, or lost its "ultra-conductivity." On tracing this loss of conductivity to its source, he found that such a wire, at 2 deg. absolute, had indeed substantially zero resistivity, but when exposed to a magnetic field of about 1 kilogauss its resistivity at the same temperature suddenly jumped to a very appreciable value. Consequently, such a coil could not maintain its ultra-conductivity when developing a powerful magnetic flux within it. Near the absolute zero of temperature, therefore, the resistivity of this metal is powerfully affected by an impressed magnetic field.

### The Gas-Filled Lamp in Photography

In a brief article in this issue Mr. M. Luckiesh points out the advantages and some of the faults in the use of the modern gas-filled lamps in photographic studios, together with a very ingenious means of remedying the difficulties which arise. The convenience, steadiness and good color of the gas-filled lamp fit it admirably for photographic work provided that the actinic intensity be raised to an adequate point. Brief experience showed that, while much superior to the ordinary tungsten lamp in this particular, it was only a third or a quarter as effective as daylight or light from the mercury-vapor arc for the same apparent illumination. This means that to use it successfully, particularly for short studio exposures, extremely brilliant sources would have to be employed, which, while producing satisfactory results, might be rather unpleasant to the sitter. Mr. Luckiesh proposes to remedy this difficulty in a very simple manner by so screening the lamp as to cut off a considerable amount of the luminous radiation without much diminishing the rays that are effective upon the photographic plate, thus producing a light capable of working with short exposures while yet not unpleasantly brilliant.

According to his curves, Mr. Luckiesh has apparently succeeded in producing a screen of the requisite qualities. Its use results in a light apparently nearer daylight than the unscreened lamp and readily adaptable to the uses of a photographic studio. It is really a modification of the daylight-glass idea arranged to suit the actinic requirements of the case. Apparently the only objection to it will arise in the use of rather strongly orthochromatic plates, on which the very rays cut off should be available in order to take advantage of the most valuable properties of the plate. As such plates are coming into considerable use among photographers who make a specialty of fine portraiture, we are

inclined to think that the use of the screen glass in the bulb of the lamp itself might be less desirable than providing the lamp with exterior screens suited to the use of either ordinary or orthochromatic plates. At all events, the proposed plan is a highly ingenious one which is likely to prove of considerable practical utility.

### Actinic Value of Arc Lamps

The article by Mr. V. A. Clarke in this issue gives far more information regarding the exact performance of arc lamps in photographic work than has hitherto been available. The experiments tried were of a thoroughly practical character. They were based upon the actual density of the photographic image produced under fixed conditions of distance and time by the light from the arc lamps under the various conditions tested. The point to be determined was the relative efficiency of the various types of arc available for photographic work, including the cost per hour of obtaining from each of them a light of given photographic effectiveness. Of course, everybody understands that on ordinary photographic plates or paper the photographic power of a light source bears no relation to its photometric power, inasmuch as the maximum sensitiveness of the plates is in the blue and violet. It is the light of short wavelength which is important, as is well shown in Mr. Luckiesh's article in this issue dealing with the abolition of the non-actinic light. The testing medium in Mr. Clarke's experiments was an ordinary solio printing paper, which is fairly representative of common photographic plates.

The lamps tested were of the alternating-current and direct-current inclosed carbon types, and of the flame-arc types operated at various currents. A very beautiful experiment with the ordinary direct-current inclosed arc shows the difference between the luminous and actinic radiation given off. The space distribution of the output both photometrically and actinically was taken, the former showing the typical lobed distribution of the direct-current arc with the maximum intensity at about 40 deg. below horizontal. In the case of the latter the space distribution was like that of the long inclosed arc, showing that the photographic power is chiefly derived from the arc stream itself, which gives a discontinuous spectrum very rich in the violet, as in case of the inclosed arc. The tests showed that the highest actinic efficiency was attained by the 220-volt inclosed arc, which, considered as an illuminant, is known to be poor. In the second place came the alternating-current and direct-current 110-volt flame arcs with electrodes designed particularly for photographic working, the former being the more economical. In fact, the alternating-current flame arc comes so near to the best that can be done by the 220-volt inclosed arc as to be more generally applicable although not quite so cheap in operation. It would be very interesting to see precisely the same experimental method applied to the investigation of Mr. Luckiesh's screened nitrogen lamps and to the mercury arc in both glass and quartz tubes.



# The News of the Week

## Activities and Events in the Electrical Field— Reports of Meetings—Commission Findings, Etc.

### Bond Issue for Dayton Municipal Plant Defeated

The proposed ordinance initiated by the socialistic party of Dayton, Ohio, to provide a bond issue amounting to \$500,000 to establish a municipal electric-light plant in Dayton was defeated at the polls Nov. 3 by over 4000 votes. The total vote on the municipal power-plant issue was not so great as the vote on two other bond issues for municipal improvements, which were also defeated, indicating that the proposal to erect a municipal plant was not taken very seriously by the voters. A strenuous campaign against the proposition was carried on by the Dayton Power & Light Company, of which Mr. Frank M. Tait is president, and the result may be taken as indicative of the public sentiment toward the company and appreciation of its efforts in furnishing reliable electric service in that city.

### Meeting of N. E. L. A. Public Policy Committee

A meeting of the public policy committee of the National Electric Light Association was held at the headquarters, Engineering Societies Building, New York City, on Nov. 5. The following were present: Messrs. W. W. Freeman, chairman; Everett W. Burdett, Charles L. Edgar, George H. Harries, Samuel Insull, Joseph B. McCall, T. E. Murray, Samuel Scovill, Charles A. Stone, Arthur Williams, Holton H. Scott, T. C. Martin and R. S. Hale. Among the questions considered were those of co-operation with other electrical organization for parallel conventions during the week of the 1915 convention, which is to be held in San Francisco; a proposition to compile in available form the rulings and decisions of all the public service commissions in the country in co-operation with other public utility organizations; the question of co-operation with the United States Bureau of Standards in its present efforts to devise uniform methods in connection with electrical operating conditions, and also the proposed new boiler code of the American Society of Mechanical Engineers, which has invited the co-operation of similar organizations.

### Activities of the Society for Electrical Development, Inc.

The November report to members issued by the Society for Electrical Development, Inc., recounts the work of the various sections of the society during the month and shows to what extent the association has co-operated with other bodies in furthering the installation of things electrical. The society has ready for distribution two booklets, entitled respectively "Electricity in the Home" and "Household Electricity," the former being a thirty-six-page pamphlet with over fifty illustrations of electrically equipped rooms and electrical devices, and the latter being a sixty-page pamphlet of less pretentious get-up. Posters calling attention to the new membership employee button have been distributed, and a special combination post card has been prepared

relating solely to electric fixtures. Samples of a specially designed calendar for 1915 have been mailed to all members. These can be furnished imprinted with name and address at a very low figure. A three-column illustration showing Santa Claus as the chauffeur of an electric truck piled high with boxes and packages suitable for holiday gifts has been prepared for the use of members for local newspaper holiday advertising.

### Annual Meeting of Electrical Manufacturers' Club

The annual meeting of the Electrical Manufacturers' Club was held at the Homestead, Hot Springs, Va., from Nov. 4 to 7. The attendance was the largest the club has ever had, about seventy people being present. Two addresses of public interest were made. Mr. Joseph E. Davies, commissioner of corporations, Department of Commerce, discussed the new regulative laws passed by the last Congress—the Federal Trade Commission and the Clayton laws. Mr. W. S. Kies, manager of the foreign trade department of the National City Bank, New York, read a paper on export opportunities before manufacturers of this country. Following the usual practice of the club, these addresses will be published in pamphlet form and distributed later. The chairman of the committee which has charge of the publication of such addresses is Mr. A. B. Houghton, Corning, N. Y.

The election of officers resulted as follows: Messrs. Water Cary, Westinghouse Lamp Company, New York, president; A. W. Berresford, Cutler-Hammer Manufacturing Company, Milwaukee, vice-president; A. D. Page, General Electric Company, New York, secretary; Herbert Sinclair, Star Porcelain Company, Trenton, N. J., treasurer; C. I. Hills, Franklin Electric Manufacturing Company, New York, commissary. The following new directors were elected: Messrs. A. W. Burchard, General Electric Company; J. Allen Smith, president United States Light & Heating Company, Niagara Falls, N. Y., and H. B. Crouse, Crouse-Hinds Company, Syracuse, N. Y.

Upon the recommendation of the retiring president, Mr. S. O. Richardson, Jr., Libbey Glass Company, Toledo, Ohio, a committee was appointed to investigate and report to the members on foreign trade and the prospects thereof, and also a committee on legislation in Congress and in the several states, so that the members could keep in touch with all laws that were being enacted.

### Pennsylvania Industrial Welfare Conference

Matters pertaining to sanitary measures and to the safety, welfare and efficiency of employees will be discussed by engineers and leaders of industry and labor at a conference to be held in the House of Representatives, Harrisburg, Pa., Nov. 17 to 19. A manufacturers' exhibit of appliances and equipment will be held in connection therewith from Nov. 16 to 20. The conference will be conducted under the auspices of the Department of Labor of the State of Pennsylvania, headed by Com-

missioner John Price Jackson. The exhibit will be under the management of the Engineers' Society of Pennsylvania, of which Professor Jackson is the president.

### London Central Supply of Energy

The special electricity committee of the London County Council has received permission from the Council to take necessary steps to present definite proposals with a view to the promotion of a parliamentary bill. It was the original intention to have the report considered at the meeting of the Council on July 28, but action was deferred on account of other business matters. As stated in these columns on Aug. 15, the committee believes that effect should be given gradually to the technical conclusions contained in the report of Messrs. Merz and McLellan, providing for a more central supply of energy for London.

### Electrolysis Case in Los Angeles

Testimony was heard by the Railroad Commission of California at Los Angeles on Oct. 29 and 30 in the case arising from the attempted adjustments of the electrolysis difficulty between the Union Hollywood Water Company and the Los Angeles Railway and Pacific Electric Railway. The water company has asked that the railway company be required to take definite steps to correct the difficulty. The railway company objected to the action of the commission on the ground of jurisdiction. A letter was read by Commissioner Edgerton, signed by Dr. E. B. Rosa, of the Bureau of Standards, inclosing a general summary of the report made by the bureau after an investigation in the field of the questions involved in this case and saying that the bureau, because of the bearing it will have on electrolysis conditions generally throughout the country, would appreciate it if no final decision which might be adverse to the recommendations of the bureau was rendered until it had an opportunity to present further argument. Mr. W. G. Middleton, Robert W. Hunt & Company, who has been employed by the water company upon electrolysis investigation since February, 1913, testified.

### New General and Standing Committees of N. E. L. A.

President H. H. Scott has made appointments to the general and standing committees of the National Electric Light Association. In view of the fact that the committee work and committee reports will have to be presented at least one month sooner than they were this year, many of the committees are already actively at work. The chairmen of the various committees are as follows: Public policy committee, Mr. W. W. Freeman, Union Gas & Electric Company, Cincinnati, Ohio; exhibition committee, Mr. J. I. Ayer, Simplex Electric Heating Company, Cambridge, Mass.; finance committee, Mr. J. B. McCall, Philadelphia Electric Company; committee on company sections, Mr. F. J. Arnold, Commonwealth Edison Company, Chicago; educational committee, Mr. J. F. Gilchrist, Commonwealth Edison Company, Chicago; library committee, Mr. Arthur Williams, New York Edison Company; progress committee, Mr. T. C. Martin, National Electric Light Association, New York; Commercial Section committee, Mr. E. L. Callahan, H. M. Bylesby & Company, Chicago; committee on constitution and by-laws, Mr. R. S. Orr, Duquesne Light Company, Pittsburgh, Pa.; "Question Box" committee,

Mr. S. A. Sewall, National Electric Light Association, New York; transportation committee, Mr. G. W. Elliott, New York; accounting committee, Mr. H. M. Edwards, New York Edison Company; committee on prime movers, Mr. I. E. Moulthrop, Edison Electric Illuminating Company of Boston; committee on lamps, Mr. Frank W. Smith, United Electric Light & Power Company, New York; committee on meters, Mr. C. G. Durfee, Rochester Railway & Light Company; committee on accident prevention, Mr. M. G. Insull, Middle West Utilities Company, Chicago; committee on electrical measurements and values, Dr. A. E. Kennelly, Harvard University, Cambridge, Mass.; committee on overhead line construction, Mr. W. T. Oviatt, Narragansett Electric Lighting Company, Providence, R. I.; committee on electrical apparatus, Mr. L. L. Elden, Edison Electric Illuminating Company of Boston; committee on terminology, Dr. A. S. McAllister, *Electrical World*, New York; committee on underground construction, Mr. Philip Torchio, New York Edison Company; committee on street lighting, Mr. J. W. Lieb, New York Edison Company; committee on grounding secondaries, Mr. Paul Spencer, United Gas Improvement Company, Philadelphia.

### The Informal Settlement of Complaint Cases by the Illinois Commission

Sixty per cent of the work carried on by the Illinois Utilities Commission is in response to informal complaints, said Mr. Robert M. Feustel, chief engineer for the commission, in an address before the Western Society of Engineers, Chicago, Oct. 19. Many of these complaints can be settled through the simple expedient of getting the complainant and the utility operator together, with the commission's inspector present as a disinterested arbitrator. In most cases explanations follow, giving reasons why the rules and regulations in question are necessary, and a better understanding is at once assured. "And this," said Mr. Feustel, "is the real business of a utilities commission—promoting a better understanding between the utility and the consumer."

If as many as 90 per cent of the complaints could be settled informally, the ideal condition of commission regulation would be reached, declared the speaker. Many public-service companies have "complaint" departments, but the measure of their real service to the consumer is found in the degree of unrest obtaining in the community. In some territories, for example, the confidence of the customers in the company appears to be almost perfect, and the complaints are negligible. In others the differences that arise are almost continuous. The character of the community and the extent to which utility problems are made political issues also have considerable bearing on this unrest. However, the quality of service rendered is usually the deciding element in winning the favor of the utility company's patrons.

The duty of the regulating body, declared Mr. Feustel, is to investigate carefully the real relation between the public and the utility companies, bring about a better understanding as to the co-ordinate interests which exist, look first to human safety, and then see that the best service commensurate with the rate being charged is rendered and that the operator is paid fairly for the money and effort invested in his business.

In the discussion Mr. Feustel expressed himself as personally opposed to allowing full value for the cost of paving above mains, although such terms might be demanded on a pure cost-of-reproduction theory. He also declared himself personally in favor of indeterminate permits and the regulation of municipal plants under



the same terms as privately owned utilities. Others who took part in the discussion were Messrs. W. D. Pence, W. H. Finley, Peter Junkersfeld and Douglas Graham.

### New York Edison Company Rate Case

A brief in the New York Edison Company rate case pending before the New York Public Service Commission, First District, has been filed by Messrs. Beardsley, Hemmens & Taylor, attorneys for the company. On account of the recent change in conditions the commission granted the company's request for a rehearing.

The brief declares that rate-making cannot be attempted safely or legally in this proceeding as the commission did not call for many of the facts upon which rates are fixed and without which a rate cannot be fixed legally. The sole issue discussed by the presiding commissioner after the close of the complainants' cases seems, the attorneys argue, to be discrimination between classes of consumers. Therefore the argument of the brief is confined to the issue raised in the complaints and amplified by the testimony. The rates must be based upon the investment of the company in its business as that word has been defined by the courts. The schedules or clauses as set forth in the riders and different contracts of the company are the outgrowth of experience based upon the operation of the company for many years past.

Testimony was introduced into the evidence based on the report of the legislative investigating committee of 1905 known as the Hughes committee. This is the only testimony in the case, the brief says, relating to the investment of the company in the electric business. It is not accurate or complete or such as could be of use in rate-making. Rate-making by state legislatures is not conducted upon the same basis as rate-making by public service commissions. The legislature generally acts under political pressure. The public service commission is supposed to act upon facts irrespective of political pressure and to arrive at its conclusions in a manner somewhat similar to that adopted by courts in deciding cases. The 1905 reports were prepared hastily and carelessly under political pressure. Subsequent facts have fully justified the opinion held by the executives and counsel for the New York Edison Company that the investigation was a farce. The finding of the joint committee of 1905 in respect to the value of the property of all of the companies investigated has been utterly discredited.

The committee placed the value of the Consolidated Gas Company property and franchises at not to exceed \$30,000,000. In the 80-cent gas case, which was pending during 1906, the value of the property and franchises of this company were established by the court to be \$67,612,435. It cannot be assumed that the findings of the committee in respect to the New York Edison Company were any more nearly correct. The committee valued the New York Edison Company property as of Dec. 31, 1904, at \$34,359,906. On the basis of the valuation fixed by the court in the Consolidated Gas Company case the committee on Dec. 31, 1904, should have found that the valuation of the New York Edison Company property was at least \$78,345,083. The valuation fixed by the court in the Consolidated Gas case was exclusive of going value, which, since the decision in that case, has been recognized by courts and commissions generally as an asset of substantial value in addition to physical property. The brief submitted by the company to the commission in July, 1912, in connection with the earlier proceedings in the case was re-submitted with parts of the argument re-written so that the company's arguments might be considered together.

### GETTING HOUSES WIRED

N. E. L. A.'s Committee on Wiring Existing Buildings Energetically at Work—Data on Unit Wiring Prices Being Collected—Revisions in Code Suggested

The National Electric Light Association's committee on wiring of existing buildings, of which Mr. R. S. Hale, of the Boston Edison company, is chairman, is energetically at work, devising ways and means of reducing the number of buildings throughout the country that are not wired for electric service. In this work the committee has the active co-operation of the National Electrical Contractors' Association and of the Society for Electrical Development and many manufacturers. The program mapped out for the year is as follows: Continuation of the work on standardizing plugs and receptacles on which this committee has been engaged for the last two years. Definite results have not as yet been accomplished, because of the patent situation and of the difficulty in getting the Underwriters to take any action. The aim of the committee is to classify plugs and receptacles for all small devices that are commonly used on lighting circuits as a step toward their final standardization.

The committee is now collecting data from a large number of companies on unit prices for wiring and purposes to present these in the form of a compilation and comparison so that other companies which are not now using unit prices may adopt them, while those that are using unit prices may revise them. The data are being tabulated by Mr. H. E. Eisenmenger, Nela Park, Cleveland, Ohio. The committee has also undertaken the task of devising means for reducing the cost of wiring. Its purpose is not to promote or advocate any cheap or dangerous method, but it goes into this campaign believing that there are many cases in the National Electrical Code where the factor of safety is a thousand and other cases where the factor of safety may be only four or five. The committee desires to see a system of wiring similar to that used in Europe and described in an article on "Handling the Small Consumer in Europe" (*Electrical World*, May 23, 1914), available for use in this country, and it has requested a manufacturer of concentric wire to bring the matter before the Underwriters. The committee will also request the Underwriters to take action in regard to the use of a solid neutral and suggests the omission of all fuses, cutouts, etc., on the neutral of a grounded system between the generator and the lamps.

Feeling that there are a number of opportunities for reducing the cost of wiring without any reduction in safety by making various changes in the National Electrical Code, the committee has sent broadcast a request to central stations, electrical contractors and manufacturers for suggestions which would include cases where a change in the wiring rules would reduce the cost in a part of the work without introducing any hazard, the saving thus effected to be applied to increasing safety elsewhere. Manufacturers are asked to apply suggestions to types of apparatus rather than to patented articles, although the committee will not decline to consider improved cheaper designs of fittings, wiring, etc., merely because they are patented. It offers its services for consultation in cases where local inspectors are insisting on rules not in the code and where their interpretation increases the cost of wiring more than is warranted by the increased safety. In this work the committee feels that modification of rules can be presented more forcibly through the committee than by individuals. Its purpose is not to interfere in any way with the powers and rights that exist under the present rules, but to help improve these rules.

# National Civic Federation Commission Bill

## Draft of Measure Issued with Explanatory Statements on Behalf of Executive Council and Dissenting Members—Municipal Plants, Holding Companies, Capitalization and Penalties

The bill for the regulation of public utilities has been made public by the National Civic Federation. There have also been made public accompanying papers which explain the origin of the bill and point out and discuss some of the points on which differences have arisen. An introductory statement and memorandum by Messrs. Seth Low and William R. Willcox, the report of the department on regulation of interstate and municipal utilities, signed by order of the executive council by Mr. Emerson McMillin, and a dissenting report from Messrs. E. M. Bassett, John H. Gray and Milo R. Maltbie precede the text of the act. An appendix prepared by Mr. William D. Kerr is a résumé of the arguments on objections to and criticisms of the bill submitted by the executive council of the department on regulation of interstate and municipal utilities. Another appendix includes a reprint of the conclusions of the report of the commission of the National Civic Federation on public ownership and operation, with the letter in which Messrs. Charles L. Edgar and W. J. Clark dissented as to particulars and the minority report of Mr. Walton Clark. The drafting of the bill is regarded by the National Civic Federation as the logical sequence of the 1907 report, which held that in this country, under the conditions of municipal politics, private operation would be preferable to public operation, provided that there were adequate regulation to protect the people from extortionate rates and improper service.

### Memorandum by Messrs. Low and Willcox

The memorandum is presented by Messrs. Low and Willcox as a special committee of the executive council of the National Civic Federation, to which were referred for consideration all questions in relation to the draft bill for the regulation of public utilities. The opening paragraph refers to the fact that in 1907 the National Civic Federation appointed a commission on public ownership and operation to investigate in this country and abroad the history of such movements up to that date and to the report of this commission that public utilities from their nature tend to become and ought to be monopolies and that unregulated monopoly in so important a field is impossible. It was in view of this conclusion that the National Civic Federation in 1911 called another conference as a result of which it was determined to create a department to prepare a draft bill for the public regulation of interstate and municipal utilities. Inquiry revealed the fact that, except Delaware, Wyoming and Utah, every state in the Union now has a regulative commission of some sort.

Of the draft bill, which contains 399 sections, 60 sections have been criticised. It is evident, therefore, the memorandum says, that the draft bill as a whole embodies a form of legislation which meets with wide approval except as to such sections as deal with matters upon which differences of opinion are inevitable.

As the preparation of the draft bill proceeded it became apparent that it would be impossible to secure a unanimous approval by the department of this bill or of any other dealing with this subject. The draft bill, therefore, is published upon the authority of the executive council of the department subject to reservations submitted in a memorandum of dissent by three

members. The members of the executive council were Messrs. Edward M. Bassett, Franklin Q. Brown, Halford Erickson, John H. Gray, William D. Kerr, Franklin K. Lane, who retired on account of his official duties before the drafting of the bill began; Blewett Lee, Emerson McMillin, Milo R. Maltbie and Arthur Williams. A dissenting report was filed by Messrs. Bassett, Gray and Maltbie. The draft bill and the dissenting report were laid before the executive council of the National Civic Federation at a special meeting in January, 1914, without having been submitted, for the reason given, to the department as a whole. At this meeting Messrs. Low and Willcox were appointed a special committee to recommend what action should be taken by the National Civic Federation in view of this circumstance. The special committee recommends that the names of those composing the department on the regulation of public utilities be omitted from the document, "as it is evidently unfair to hold the members of a department in any way responsible for a measure upon which they have not had an adequate opportunity to pass," and that the draft bill as agreed upon by the executive council of the department be printed as reported together with the report and the memorandum of dissent.

The differences in regard to the bill, Messrs. Low and Willcox add, reflect the difference in the points of view of those who make them. The radicals are inclined to press regulation to the limit, even if it makes it impossible to secure private capital for the construction and conduct of public utilities. In the minds of many of them public ownership and operation loom up as not objectionable alternatives. Those who have to do with the procuring of private capital for public utilities believe that too much regulation will easily make private capital unavailable. These, therefore, lean toward limiting regulation as much as possible. In this conservative element there are again great differences of opinion. Some believe in public regulation and wish to make it practicable and successful. Others accept it reluctantly and are fearful of any limitation which may interfere with established practices. The National Civic Federation cannot pretend to pass judgment on the issue thus raised, though it is probable that the wise course to be followed lies between the two extremes.

An additional memorandum by Messrs. Low and Willcox discusses some of the questions involved. Some of their discussion follows:

### Regulation Must Not Be Strangulation

If public regulation of privately owned and operated public utilities is to remain a practicable policy, it must not be carried so far as to result in strangulation of private enterprise. The problem to be worked out, therefore, in connection with the public regulation of such utilities is to give power enough to the regulating commission to enable it to prevent the abuses to which uncontrolled private management has been shown to be subject without making exactions so severe as to make it impossible to secure the private capital that is necessary to maintain existing facilities in a high state of efficiency and to develop new enterprises when such are necessary. Such excessive restrictions may be embodied in the law itself, or they may flow from the bad



judgment of the commission charged with the administration of the law. If any such law is to work well, the men administering it must be men of high character and good judgment. Any public service commission must have large discretionary powers, and it is probably better to make this discretion large, despite the possibilities of abuse, than by making the law too rigid to make it impossible for the commission to deal equitably with exceptional conditions.

The draft bill leaves to the representatives of the public the determination of values against which stock or bonds are to be issued, upon the theory that if regulation means anything it means this; so that both investors and the public who are to be served by the utility may be protected against fraudulent practices and exaggerated values. The draft bill is drawn upon the theory that the only appeal to the courts from the action of the commission shall be on questions of law and that there shall be no appeal as to its findings upon questions of fact, such as value. Some of those who are engaged in establishing new public utilities hold the view that upon questions of value, if upon no other question of fact, there should be an appeal to the courts.

If the public assumes responsibility for the values against which stocks and bonds may be issued, it is held by some that the public becomes morally responsible for the existence of such values. There is also at least the possibility that in time the public will be asked to guarantee the values which it stands sponsor for. Should the time come when the public is willing to do this, it can undoubtedly secure private funds for such enterprises at much lower rates of interest than can be had at the present time, for private money for such enterprises can be had only at a price commensurate with the risk. If the risk is large, private capital will require large returns. If the risk is small, private capital can be had cheaper because of the absence of risk. On the other hand, because the fixing of values by the public perhaps tends in this direction, there are those who maintain that public relation should not attempt to determine values but should call for the most complete publicity. Under such a system private investors would have the fullest possible information and would then be expected to look out for themselves. There would be nothing in such a case to protect the public against unreasonable financial burdens as these affect good service except the arbitrary discretion of the public service commission in fixing rates.

It has been suggested that joint use of facilities should not be permissible as between competing companies. The draft bill recognizes the propriety of the joint use of public facilities under certain conditions even as between competing companies. It gives to the commission ample authority to prevent competition in public utilities where competition is not in the public interest. Where joint use of any facility is permitted, whether as between competitors or non-competitors, the management of the facility thus jointly used should always be left in full control of the corporation owning it.

#### Depreciation

The draft bill deals with the question of depreciation, Messrs. Low and Wilcox add, upon the assumption that this term is broad enough to include obsolescence and replacement. In telegraphing, "depreciation" would usually provide adequately for replacement, but in telephoning the principal cost is not in lines and poles but in service stations. For the best service, apparatus that is comparatively new must often be discarded before it is worn out in order to give place to the last improvement. The same thing is true in power houses of electric railways, and probably in a greater or less

degree in connection with every public utility which depends upon so new a science as electricity. It is very difficult to lay down a general rule applying to all manner of cases which will not provide either too small or too large a fund for depreciation and obsolescence. Probably there is no way to deal with this question in a law except to give wide discretion of the commission representing the public. The provision of a depreciation fund board to adjust the matter from year to year in the light of actual circumstances appears to offer a wise solution of this very difficult problem.

The view of the majority of the executive council on the question of state versus local franchises is expressed in the provisions of the act and the dissenting opinion is set forth in the dissenting report. It is hardly conceivable that any locality will willingly abandon its right to say whether or not a franchise shall be granted for the use of any of its streets or public places; and to that extent the co-operation of the locality of the state commission is probably essential. To submit questions of rates to a local commission is practically to permit the users of the service to say what should be paid for it.

The indeterminate franchise is the best form of franchise, in the interest of the public as well as of the public service corporation, which has yet been developed. It would appear to be fair to permit the locality which has assented to the fixed term to pass upon the terms of the change of franchises running for a fixed term into indeterminate franchises. Any attempt to do this by general law without the consent of the locality would be likely to evoke popular resentment because of its unfairness. By the draft bill, where a new locality is to be served, the locality must give its consent, which in its nature will be indeterminate, and in doing so the locality can attach conditions not inconsistent with the provisions of the bill itself.

#### Holding Companies

Messrs. Low and Wilcox say that a local holding company of a local public service corporation would seem to be a device that can have no possible advantage for the public. A holding company which makes it its business to control the operations of many small public service corporations in as many different localities may have many advantages for the public. In the view of some the method of financing proposed by the draft bill would be likely to force the creation of such holding companies in order to provide adequate funds for local service. Whether this be so or not, it is clear that such a company under broad-minded management may give better service to every locality controlled by it than any small-sized locality could command for itself. Such a holding company can command better expert talent and, by comparing methods and results in different localities, can bring the operation everywhere up to the highest standard obtained anywhere. Whether or not a local company shall pass under the control of a holding company and the arrangements to be made in such a case for the protection of minority stockholders would seem to be legitimate subjects for the discretion of a public service commission.

It is believed that some standard of action must be laid down by the law on the capitalization of consolidated companies. The draft leaves large discretion to the judgment of the commission.

The issue between public ownership and operation and private ownership and operation under public regulation is not wholly, and perhaps not primarily, a question of economics. The application of the state civil service law to the men employed by a private electric railway company whose system was taken over by the municipality of San Francisco resulted in the loss of

their places by many members of the local union of electric railway employees. The effect upon the union was so serious that the American Federation of Labor sent a commission to Europe this year to study particularly this aspect of the question. The civil service system and regulation of rates of pay by law are inconsistent with the methods and objects of collective bargaining by organized labor. If it be imagined that collective bargaining, including the right to strike, may be permanently enjoyed in connection with the public service, anyone who thinks this should recall what happened in democratic France when the railroad employees of that nation went upon a general strike. The men were ordered to the colors and the strike was broken.

The political consequences of the acceptance of public ownership and operation on a large scale are certain to be not less vital. Public ownership and operation of public utilities of all kinds, if steam railroads are included, would add literally millions of men and women to the public payroll. If such a policy is adopted, it should be adopted deliberately, and Messrs. Low and Willcox point out that such questions as these far outweigh in public importance the financial questions that are involved as between public ownership and operation and private ownership and operation under public regulation.

#### Report of Executive Council

By order of the executive council Mr. Emerson McMillin, the chairman, submits a report for the department on regulation of interstate municipal utilities. This report says that the bill is offered in the hope and belief that, so far as it may be adopted, it will lead to a better understanding between vitally necessary industries and the public than has heretofore been possible under less carefully drawn legislation and that such regulation will be alike just and fair to the investor, the owner and the users of the service. The council reports substantial concurrence on the part of its members in the bill as a whole, the dissent to the bill as an entirety of Messrs. Maltbie, Gray and Bassett being reported. The dissenting report was filed at first by Mr. Maltbie, who was joined in it afterward by Messrs. Gray and Bassett.

#### Dissenting Report of Messrs. Bassett, Gray and Maltbie

The criticism is made that the bill contains no provisions giving commissions jurisdiction over holding companies. The subterranean and indirect method of buying up to 51 per cent or more of the stock of a public utility may be resorted to without any check, approval or even investigation. No protection, direct or indirect, is provided for minority stockholders. Without recommending that holding companies at present existing or the stocks now held by them be interfered with, the bill should prohibit any additional shares from passing into the hands of holding companies without investigation and approval by the commission, that purchases of stock in other public utilities should be subject to similar restriction, that companies not public utilities should be prevented from acquiring stock in public utilities beyond a certain small percentage, and that the commission should always have power to impose conditions and enforce regulations to protect minority interests and public rights.

A clause should be inserted declaring that in no case should the capitalization of a company resulting from merger or consolidation exceed the capitalization of consolidated companies. No commission should be practically forced by law, if companies so desire, to make value a basis for recapitalization. The dissenters are opposed to allowing capitalization of a surplus indirectly by means of consolidation. The present bill practically

invites consolidation of companies which have a surplus with companies that have watered capital.

Sections 277 to 289, relating to franchise grants and municipal operation, the dissenting report says, should either be omitted entirely or be redrafted along different lines. Particular objection is made to Sections 278 to 280, which undertake virtually to deprive cities of all control over franchise grants affecting their own streets. Any private corporation now operating a public utility may under the proposed law get a new franchise without consent of the municipality, abutting property owners, or the state itself. Is the new or old franchise to be effective in case of conflict? Stockholders and bondholders may have rights that they could not be deprived of by a mere agreement between the companies and the municipality. In the proposed bill municipal authorities have nothing whatever to say as to the terms of any automatically renewed franchise.

#### Treatment of the Arguments

The appendix prepared by Mr. William D. Kerr is a résumé of the arguments on objections to and criticisms of the bill submitted to the National Civic Federation by the executive council of the department.

The manner in which the suggestions are set forth is shown by the following in reference to the proposal that the act be applied specifically to municipalities:

"Argument For. Many municipalities own and operate facilities for rendering public utility services. The public deserves protection from unreasonable and discriminatory rates and from inadequate and unsafe service resulting from imperfect management of these facilities. The avowed purpose of the bill is to protect the public interest in these services. The agency, whether private or public, by which the services are performed is immaterial. Experience has demonstrated that municipalities in the administration of public utilities are prone to err even as are private corporations. The state should subject municipalities to the same regulation as is imposed on companies. Furthermore, in the same or adjoining municipalities municipal and private plants are found operating at the same time. Where actual competition exists the one agency should not be burdened with restrictions to which the other is not subject. Potential competition frequently exists where there is no actual competition, and comparison between the two kinds of agencies may result in undue prejudice to the one which is subject to legislative restraint, while seeming to favor the one which is not so restrained. Finally, to the extent that regulation of private companies is in the interest of stockholders and investors similar regulation of municipal enterprises is required for the protection of taxpayers.

"Argument Against. Wholly apart from its merits regulation of municipally owned utilities is outside the scope of this bill. The investigation which resulted in this bill was the logical consequence of an inquiry upon the relative merits of municipal and private ownership and operation, in which inquiry the final opinion favored ownership and operation under proper conditions of regulation. The purpose of this bill is to define such proper conditions of regulation so far as they are subject to control by legislative action. Considering the suggestion on its merits, state regulation of the rates and services of municipally owned utilities violates the so-called home-rule principle which accords to municipalities and their citizens the fullest possible political autonomy consistent with the welfare of the state at large. A municipality's conduct of its own public utility is a matter of primary concern only to its own citizens. The state is not justified in passing beyond the fundamental requirements of correct accounting and full publicity."



# Status of the Central-Station Industry

Mr. Harrison Williams Says that Gross Earnings of the Average Public Utility Are Affected Little as Compared with Other Lines of Business—Mr. F. G. Sykes Finds Earnings in Excess of Advance Estimates for 1914

## MR. HARRISON WILLIAMS ON THE OUTLOOK

Gross Earnings of Average Public Utility Affected Little as Compared with Other Lines of Business

In an interview on the present outlook for public utility business Mr. Harrison Williams, who is on the executive committees of the American Gas & Electric Company, the Central States Electric Corporation, the Federal Light & Traction Company and the Republic Railway & Light Company and identified with many other utility and industrial enterprises, expressed his opinion to the *Electrical World* in the following language:

"The gross earnings of the average public utility have been affected little as compared with other lines of business. The only effect noticeable so far in the electric-lighting and motor-service field comes from the suspension of manufacturing where energy is supplied for motor service, but this is not so radical for the larger situations and holding companies which supply a diversified market as in other business, because in certain industries to which the war has brought increased business an increased consumption of energy for motor service offsets the loss from other customers adversely affected. Electric light, water and gas are necessities which cannot be greatly curtailed without a decrease in population, and the same is true in somewhat less degree of the electric railway transportation business.

"The larger situations and holding companies have been financed more readily under ordinary conditions because of the volume and diversity of their business, and while only absolutely necessary construction work is now being undertaken, there is little difficulty in supplying the necessary capital for the present limited requirements of companies of recognized standing. Somewhat higher rates are paid, and therefore financing for short periods only is now being attempted.

"Until conditions become settled short-time financing for the minimum construction requirements is likely to prevail. The limiting of construction to the needs of the immediate future will tend to reduce the rate of increase in earnings temporarily, but the effect on operating expenses will be slight through greater attention being given to economies of operation. When the time arrives for permanent financing I anticipate little difficulty in obtaining a broader market for public utility bonds at prevailing rates of interest and at former or perhaps slightly better prices. The general regulation by utility commissions should have a substantial effect in stabilizing the market on both bonds and preferred stocks, and I see no reason to expect any radical change in methods of financing.

"Even if interest rates should continue higher for some time, the greater stability in the earnings of these companies should make their securities more attractive than the securities of other industries where the fluctuation in earnings is greater.

"It seems to me that the ultimate effect of the war will be to increase the confidence of investors in the securities of public utility operating and holding companies. I believe the war will modify the attitude of some of the commissions by inducing a more liberal consideration on their part of the hazards which may en-

ter into any business however well protected it may be, thus tending toward a higher rate of return.

"There seems to be nothing in the present situation to compel any further action by public utilities than to limit their immediate capital expenditures to the minimum consistent with meeting the requirements of the individual situation.

"The public utility situation can be helped most by a policy of frank and open dealing with the commissions and the public, a policy that has already made much progress in the past two years. This policy is bound to produce confidence and increase the popularity of this class of securities.

"While the return to ordinary methods of financing may be delayed until European peace is in sight, there should be a gradual improvement as channels are found for resumption of trade in other lines of business. To what degree or how soon these conditions will change there seems to be no sound basis of making a prediction at the present time."

## MR. F. G. SYKES ON CONDITIONS

President of American Power & Light Company Finds Earnings in Excess of Advance Estimates for 1914

Mr. F. G. Sykes, president of the American Power & Light Company, in speaking to a representative of the *Electrical World* of the operations of his company and its subsidiary properties, said that earnings are still being maintained at a rate in excess of the advance estimates made before the beginning of the year 1914.

"That we are able to maintain such satisfactory earnings in spite of the adverse conditions created by the European war," said Mr. Sykes, "is due largely to the fact that our properties are located in widely separated sections of the country and therefore, as a whole, reap the benefits accruing from diversification of industries. For instance, some of our companies operate in the States of Oregon, Washington and Idaho, in which section the raising of wheat and fruit, the catching of salmon, the lumber business, and the sheep and cattle business predominate; another of our subsidiaries operates in Kansas, the great corn, wheat and cattle State, and still other of our companies operate in Texas, a large part of our Texas properties lying in the rich so-called 'Black Waxy Cotton Belt,' where approximately one-eighth of the cotton crop of the world is raised. Other of our Texas properties operate in the west Texas cattle country, and still others along the Rio Grande, where irrigation is coming to the front. It would be highly improbable that all of these stable resources should suffer reverses at the same time, and, in fact, owing to large crops and war prices, some of our communities are unusually prosperous.

"In common with all other corporations, we have found the cost of new money too high for ordinary construction purposes at this time and have curtailed our construction operations. However, we have continued such construction as was urgently required in order to take care of new business already under contract when the European war started. As an instance, we have practically completed the work of constructing the first

unit of a new 15,000-kva modern steam turbo-generating plant situated at East Waco, Tex., and this plant will commence the operation of a 7500-kva Curtis turbine about Dec. 1, 1914.

"We feel optimistic as to general business conditions in the localities served by our properties. As a reason for our optimism I might say that the earnings of the American Power & Light Company and its subsidiaries were better in September than for a long previous period, the net from operation of the American Power & Light Company properties as a whole for the month having increased 21 per cent over September, 1913, and for the twelve months 18 per cent over the preceding twelve months. The wheat crops in the States of Washington, Oregon and Idaho, as well as in Kansas, are the best they ever had. Texas has a good cotton crop, and, although there is some difficulty in selling it, people are not depressed. It must be remembered that Texas is a very large state and produces a great deal besides cotton. Our Texas properties furnish a large amount of energy for the operation of cotton-oil mills and cotton gins, flour mills, ice plants and municipal and irrigation pumping, which operate at such times during the twenty-four-hour period as materially to better our load-factor, thus enabling us to get lower costs and a larger benefit from our investment. It might be interesting to central-station managers to know that the average load-factor of our principal Texas power plant is in excess of 70 per cent.

"Bankers say that conditions are better in the bond market. Prices of securities are, of course, not so good as they were before July 30, but the decline in value of the higher-grade public service corporation securities is relatively small. We are trying to shape our course so as to increase earnings through the acquisition of new business largely on lines already constructed.

"After all, the one predominatingly advantageous feature about public utilities such as those which furnish electric light, power, water and gas is that they supply a necessity, and therefore in times like the present their earnings are much less affected than those of other industries."

### Electrical Development Society Directors Meet

The regular meeting of directors of the Society for Electrical Development, Inc., was held in accordance with the by-laws in New York on Nov. 11. On account of the absence in Europe of President Henry L. Doherty, Vice-president W. H. Johnson presided. Those present were Messrs. J. E. Montague, W. E. Robertson, Ernest Freeman, Ernest McCleary, Charles W. Price, H. B. Crouse, Homer E. Niesz; John R. Galloway, representing James R. Strong; E. W. Rockafellow, representing Gerard Swope; George H. Duffield, representing G. M. Sanborn; L. H. Boynton, representing J. Robert Crouse; James M. Wakeman, general manager, and James Smieton, acting secretary-treasurer.

Reports of the general manager and secretary and treasurer were approved. The board expressed satisfaction with the way in which the work is carried on, the progress made and the economical operation of the society. The treasurer's report showed a bank balance of \$65,610.

Messrs. W. E. Robertson, Ernest McCleary, Gerard Swope, J. E. Montague and Walter H. Johnson were appointed a committee to consider the questions of individual membership, co-operation with the Board of Fire Underwriters on the compilation of model city ordinances and co-operation with the National Electrical Contractors' Association committee on legislation.

The annual meeting of the society will be held on the second Tuesday in May.

## PUBLIC SERVICE COMMISSION NEWS

### Massachusetts Commission

The order of the Gas & Electric Light Commission approving motor service and cooking rates of the Reading municipal lighting plant but denying the request for authority to sell energy at 2 cents per kw-hr. to the town water department for pumping purposes has been mentioned in these columns.

At the hearing the advisability of the policy of the town in entering upon the supply of energy to the municipalities of North Reading, Lynnfield, Wakefield and Wakefield was sharply questioned. Wakefield has recently contracted with the Edison Electric Illuminating Company of Boston for its entire service and is consequently eliminated from the decision. Doubt was expressed at the hearing as to whether the plant investment had not increased more rapidly than was justified in the interest of the town, and the sale of a large proportion of the output at low rates was criticized. It was also generally conceded that the electricity furnished the town for street lamps was not paid for by the taxpayers at cost as defined by the statute. The issue of the case was not the reasonableness of the different prices already established, or their equity as between different customers or groups of customers, but rather the expediency of consent to prices which are less than cost as defined by the law.

In determining this cost there must be included all operating expenses, interest on the plant investment at the rate paid upon the debt incurred for it, the maturing debt requirements, all operating expenses and depreciation at not less than 3 per cent upon the cost of the plant, and all energy used by the town itself must be charged at cost, expressed at the average computed upon the total kilowatt-hours delivered for all uses. The commission is authorized to permit departures from sale at or above cost but cannot authorize such sales to the town departments. In approving the above power and heating rates the commission recognizes the influence of diversity-factor but cautions the management to watch the development of the power business and the effect of its rates upon operation in order that no energy shall be sold at an actual loss and an undue burden thus be imposed upon taxpayers and any class of customers. It appeared at the hearing that the heating rate had been allowed for the use of electric irons and other small devices. The commission points out that while probably few will avail themselves of the rate for this purpose because of the minimum charge, it is doubtful whether expediency requires other than regular rates for such devices in cases where the volume of business is relatively small.

The commission holds that the 2-cent pumping rate is less than cost and points out that the town owns and is equally bound to maintain both the electric and the water plants, stating that a definite charge for services interchanged is essential for proper accounting and administration. The delivery of energy to the water department is not a "sale" for which the law requires a "price" to be fixed. Without the requirement of sale at cost to the town departments the board points out that all the items of expense upon which the cost is figured might be loaded upon the output to private consumers instead of raising the money by the proper channels of taxation. Taxation must bear the proper share of the operating and fixed charges of the plant. The commission takes the view that the street-lighting revenue, although not under review, is too low, while the prices charged private consumers approach closely the maximum limit allowed by law, which includes a profit of 8 per cent.



In closing, the commission states that inasmuch as the so-called "loss" in operation of any year must be taken care of in the succeeding year to the extent that this results from an inadequate tax levy in the preceding year, the private customers must share with the taxpayers in taking care of a deficiency for which they are in nowise responsible. Had the plant been independently owned and had it received from the town for the energy supplied for municipal use its cost as defined by law, it would probably have shown some profit in excess of all operating expenses and fixed charges, including depreciation and the payment of its maturing debt. This indicates that it is the taxpayers and not the private customers who have failed to carry their fair share of the financial burdens of the business. The commission therefore dismisses the portion of the petition bearing upon the water department motor-service rate and states that it can neither give nor withhold its consent to the recently established price of 5 cents per kw-hr. for municipal buildings, although the latter price was not included in the application.

#### New York Commissions

The report of business done by the Second District Commission for October shows an increase in the number of new cases filed. The commission disposed of seventy-six formal cases during the month, while eighty-seven new cases were submitted. One hundred and six informal cases were filed, and final disposition was reached in 129 old and new informal complaints.

The First District Commission has ordered the New York Edison Company to cancel certain clauses in its schedules and rates providing that customers who make contracts with it shall not use any other electric service without the consent of the company. The order was made in the case of G. Perceval, Inc., against the New York Edison Company. Mr. Perceval alleged that he applied to the company to furnish electrical service to a building which he was to occupy. The company submitted a form of contract which included a clause barring him from using any other electric service. He struck out this clause, and the company declined to accept the contract as amended. The commission, in February, 1914, adopted an order dismissing the complaint. Mr. Perceval took the matter into the courts, where it was reviewed under a writ of certiorari. In July last the Appellate Division decided against the commission's ruling, holding that the complainant was entitled to service from the company. The matter came back to the commission, which held further hearings and ordered the cancellation of the exclusive service provisions.

#### Ohio Commission

Mr. H. Whitford Jones, of H. Whitford Jones & Company, Cleveland, calls attention to an error in the notice published in these columns on Oct. 24 in regard to the decision in the Bucyrus Light & Power Company case. He writes:

"The residence rate is 10 cents net per kw-hr. for the first thirty hours' use per month of the connected load, 7 cents net per kw-hr. for the next thirty hours' use per month of the connected load, and 3 cents net per kw-hr. for all electricity used in excess of the above. Domestic appliances of a certain class are included on a basis of one-half their total maximum capacity. The above rates apply to residences, flats and rooming houses. For commercial lighting the rates are the same, excepting that a discount is made of 5 per cent for the first 1 kw connected load, 10 per cent for the next 2 kw connected load, and 30 per cent for all above 3 kw connected. The distinct difference is that the rates are for the hours' use of the connected load and not for a certain fixed number of kilowatt-hours per month."

## Current News Notes

**FOOTBALL FIELD LIGHTED FOR NIGHT PRACTICE.**—The athletic association at Northwestern University, Evanston, Ill., in striving to produce a winning football team, has lighted a portion of its gridiron by arc lamps to permit night practice out of doors. The four lamps used are suspended from short mast-arms at the top of 35-ft. poles. Shades are carried on the poles just back of the lamps, so that most of the light from the lamps is directed out on the field.

\* \* \*

**EXAMINATION FOR HYDROELECTRIC ENGINEER.**—An examination for hydroelectric engineer will be held by the United States Civil Service Commission on Dec. 15 to fill a vacancy in the Quartermaster Corps of the Army, War Department, for service at Camp John Hay, Philippine Islands, and for vacancies as they may occur in positions requiring similar qualifications. The salary of the position is \$2,400 per annum. Applicants must be between twenty-five and forty-five years of age and have had at least six years' practical experience, of which two must have been in the constructing and installing of electric and hydroelectric machinery and four in mechanical and electrical engineering. Those desiring to take the examination should write for Form 304, relating to the examination for hydroelectrical engineer, to the United States Civil Service Commission, Washington, D. C., before Dec. 15.

\* \* \*

#### SOCIETY MEETINGS

**NATIONAL CIVIC FEDERATION MEETING.**—National problems resulting from the European war will be discussed at the fifteenth annual meeting of the National Civic Federation in New York on Dec. 3, 4 and 5.

\* \* \*

**CHICAGO JOVIANS HEAR ELECTRICAL MUSIC.**—Members of the Chicago Jovian League heard Mr. Gilbert A. Pond describe the "tel-electric" piano, Nov. 9, preceding a demonstration of the device in operation. The speaker told of the motion analysis employed in order to design an electromagnet which would simulate the action of the pianist's finger. In preparing records for the perfected player the device used makes an autographic record of the artist's performance, the force with which each note is struck, the operation of the pedals, etc.

\* \* \*

**THE ECONOMICS OF INCREASING LAMP EFFICIENCIES.**—Before a joint meeting of the electrical section of the Western Society of Engineers, the Chicago Section of the American Institute of Electrical Engineers and the Chicago Section of the Illuminating Engineering Society, scheduled for Nov. 23, Mr. S. E. Doane, chief engineer of the National Lamp Works of the General Electrical Company, Cleveland, Ohio, is to speak on the general topic of the economics of the increasing efficiency of light production and its effect on the electrical industry.

\* \* \*

**NEW YORK JOVIANS.**—At a meeting of the Jovian Order held in New York on Nov. 11 the past, present and future activities of the order were outlined by Sixth Past-Jupiter W. E. Robertson, Retiring Jupiter W. N. Matthews and Reigning Jupiter Homer E. Niesz. Plans for the present year were discussed by Statesman-at-Large William Gloeckner, of Philadelphia, and First Tribune Frank E. Watts, of New York City. Mr. Watts announced that the motto for the order's activity during the year will be "Boost business." A meeting of the New York Jovians will be held on Nov. 25.

## Hydroelectric Development on Bishop Creek, Cal.—V

Hydraulic and electric features of stations Nos. 4 and 5 of the Nevada-California Power Company — Static head at the former station, 1100 ft.. By C. O. Poole

THE intake for plant No. 4 is situated directly below plant No. 3, and the water backs up into the tailrace of that station. The intake dam is of reinforced concrete, 30 ft. in height at the spillway. The spillway section is of cyclopean concrete and is curved so that the water will cling to the surface. It was not possible to obtain bedrock at this site, and the excavations were extended down until a clay cement and gravel mixture was reached. The foundation was laid upon this formation and a curtain wall extended down into this formation for a distance of 4 ft. on the upstream edge of the dam. The depth of the excavation of the wing walls varied from 4 ft. to 15 ft., depending upon the formation encountered. Two 36-in. sluiceways extend through the spill section for sluicing out accumulation of gravel. Fig. 42 is a plan and Fig. 41 a section of the dam. The screen chamber is arranged similar to that at No. 3 intake, except that the screens are placed parallel with the stream. Fig. 40 is a general view of the dam.

The water is taken from the intake by a 54-in. wood-stave pipe that extends for a distance of 400 ft., where it connects to a 42-in. wood-stave pipe extending a further distance of 6426 ft., the total fall in this line being 42 ft. and the intake pressure increasing this head to a total of 64 ft. This pipe, like the others described, is placed on a side-hill bench and is covered with soil. It was constructed in 1905 and, although in use for nine years, it is in fair condition yet, but will be replaced by a 60-in. pipe next season as the plant installation requires a larger pipe, the demands for energy having been increased beyond the original expectations.

The 42-in. wood-stave pipe terminates in a sheet steel Y with two 30-in. outlets. To one of these outlets is connected a 30-in. inside diameter sheet-steel pipe 5500 ft. in length, the plates varying in thickness from 3/16 in. to 1/4 in., the lower third of the pipe being butt-strapped and triple-riveted and the upper two-thirds being lap-riveted, the pipe itself being designed with a factor of safety of four. A 34-in. cast-iron gate controls the water on the upper end, and a 14-in. strand pipe admits air below the gate. There are four 6-in.-drop air valves placed 600 ft. apart on the light steel. To the other branch of the Y there is connected a steel

pipe 36 in. in diameter for a distance of 1063 ft., connecting to 1062 ft. of 32-in. steel pipe. This pipe is of sheet steel varying in thickness from No. 10 gage to 1/4 in. It joins a lap-welded steel pipe of 25-in. outside diameter, the steel varying from 1/4 in. to 1/2 in. in thickness. The upper section of pipe is provided with a standpipe and air valves, and the water is admitted through a 30-in. gate at the Y. This pipe, like all the other pressure lines, is designed with a factor of safety of four. The static head at the station is 1100 ft. The two pressure lines are joined together at the lower end by means of a cross-over pipe and gates, the valves being arranged so that either line can be disconnected from the system should circumstances make this desirable.

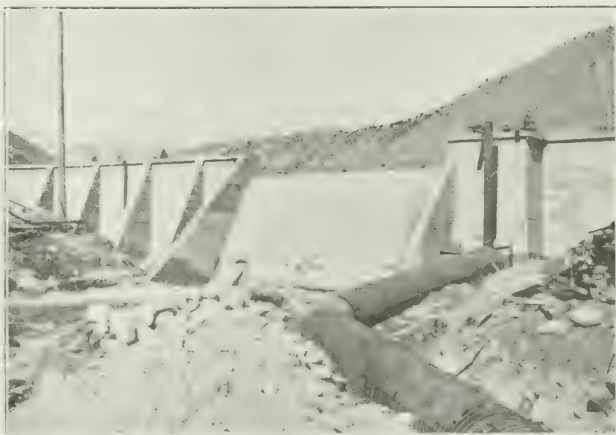


FIG. 40—GENERAL VIEW OF DAM FOR STATION NO. 4

This station is the original station of the system, and the first units were installed in 1905, when the company was known as the Nevada Power, Mining & Milling Company. It was thought at that time that 3000 kw would be the maximum requirement, and the plant was designed accordingly. The original installation consisted of two 750-kw units, but the mining operations increased so rapidly that before the plant was put into operation a third

unit of 1500-kw rating was ordered, and by the time that was installed a fourth unit was ordered, and so on until the development reached its present stage. Ground was broken on this plant in February, 1905, and on Sept. 20 electricity was delivered into Tonopah and Goldfield, a distance of 118 miles. Station No. 4 is constructed of concrete with steel roof trusses and galvanized-iron roofing. The general dimensions and layout are shown in Fig. 43. It will be seen that the transformers are under the same roof as the generators, but arrangements are now being made to move the transformers outdoors, thus diminishing the fire hazard. Fig. 44 is an outside view of the plant, and Fig. 45 shows the interior of the station.

The hydraulic equipment consists of two 750-kw, 450-r.p.m. Pelton waterwheels of the overhung type, equipped with hand-regulated needles and deflecting nozzles controlled by Sturges oil-type governors, the water entering through 14-in. steel gate valves built by the Pelton company. There is also one 1500-kw unit Pelton water-wheel equipped with hand-regulated needles and deflecting nozzle controlled by a Lombard governor. This unit



was modified about a year ago by fixing the deflecting nozzle in a rigid position and attaching a balanced

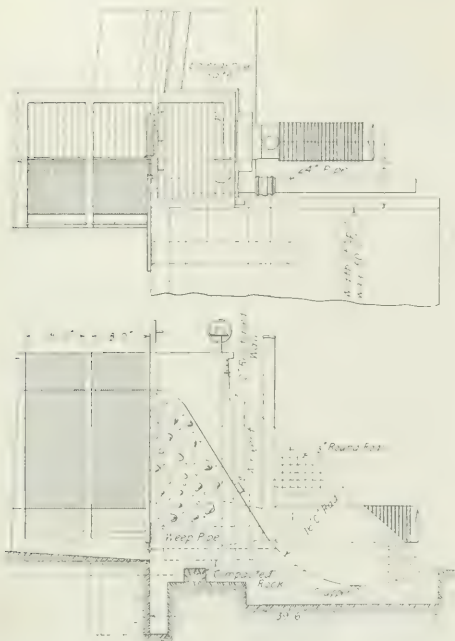


FIG. 41—CROSS-SECTION OF DAM FOR STATION NO. 4

stream deflector to the end of the nozzle which is actuated by the governor. This change has proved highly satisfactory, as the governor has much less work to do and the regulation is much improved. The other units will be equipped in the same manner. The fourth unit in the plant is a 1500-kw machine and is driven by a Doble wheel with hand-regulated needle and deflecting nozzle controlled by a Lombard governor. The fifth unit is equipped with a Doble auxiliary nozzle type of apparatus similar to the unit described in station No. 2. This apparatus has proved quite efficient in conserving water and is used almost entirely in the governing of the system. It is exceptionally quick and accurate in its operations. Each of the three last-named units is fed through 20-in. steel gates, and all three units operate at 400 r.p.m. The oil pressure for the governors is furnished by a Lombard triplex motor-driven pump and a belt-driven Lombard pump connected to one of the generators.

The generators in this plant are five in number, two 750-

kw National Electric Company machines and three 1500-kw Allis-Chalmers units, all wound for 2200 volts, sixty-cycle, three-phase. There are two 50-kw National exciters, each driven with a Pelton waterwheel overhanging on one end of the shaft, and one of the units is equipped with an induction motor in addition to the waterwheel. There is also one 60-kw General Electric exciter driven by a Doble waterwheel and a General Electric 90-hp, 2200-volt, three-phase induction motor. This unit is equipped with a Replogle mechanical governor. All the exciters are compound-wound for 120 volts and are arranged for connection to a common bus. The switchboard for this plant consists of a separate panel for each generator and a separate panel for each exciter. The voltage of the station is controlled by a Tirrill regulator. The 500-kw transformers are placed directly back of the switchboard. There are three banks of Stanley transformers of three each, with one spare unit to be cut in for emergency purposes. The transformers step the voltage up from 2200 to 55,000 and are delta-connected on the low-tension side and star-connected on the high-tension side with solid grounded neutral. Each bank of three transformers is connected to the 55,000-volt bus by means of Baum oil switches. These transformers will later be moved outdoors. The transformers are placed on elevated concrete foundations with 2-in. iron rollers under them, and a transfer truck runs alongside, so that any transformer can be taken out at will.

At this plant is the principal switching station for the Nevada lines. The 55,000-volt line from station No. 4 leads directly into this building, which is a steel-frame, galvanized-iron-covered structure, as does the line from station No. 2 up the stream. The line from station No. 5 down the stream also leads into this building. Each of these three lines enters through a Baum oil switch and connects to a common bus. From this bus the two main lines lead out of the building through Baum oil switches. Station No. 3 can be tied in with

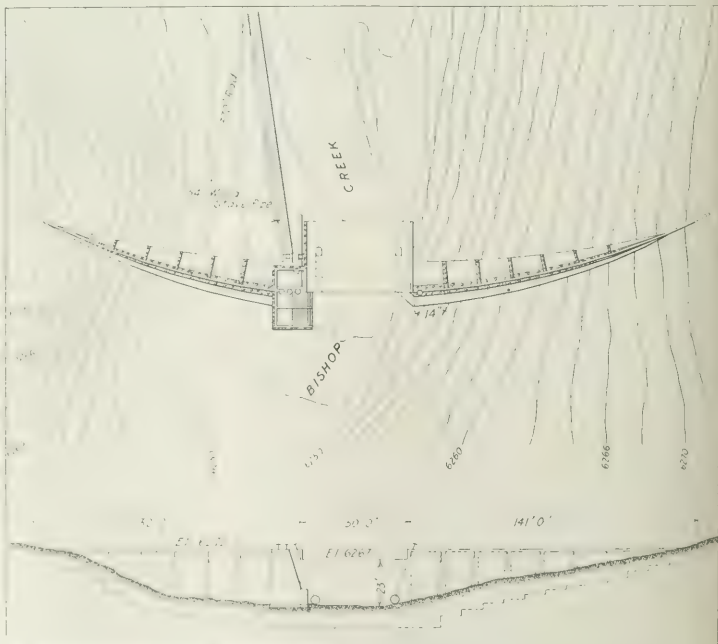


FIG. 42—PLAN OF DAM FOR STATION NO. 4

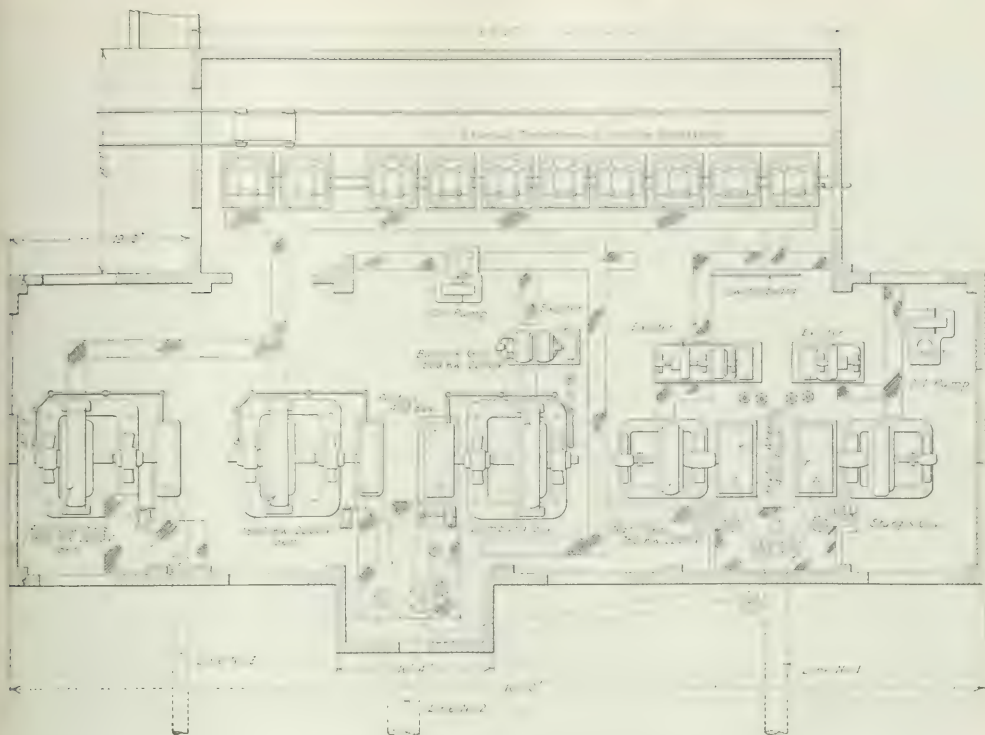


FIG. 43—PLAN OF GENERATING STATION NO. 4

this system by connecting it to station No. 2 line as it passes that plant by means of an outdoor-type switch, and station No. 6 can be connected through the control station to station No. 5 line, as shown on diagram Fig. 46.

#### Station No. 5

The intake of station No. 5 is directly below station No. 4, and like the other intakes described backs the water up to the tailrace of the other station. The dam is of reinforced concrete with rubble-concrete spillway



FIG. 44—EXTERIOR VIEW OF STATION NO. 4



section in the lower half. The upper half of the spillway section is of reinforced concrete, the dam having been raised two years after the lower half was built. As the overflow water has a sheer drop of 20 ft., provision was made for cushioning the shock by impounding water at the base of the dam by means of con-

Air valves are installed on the pressure pipe and on the flow line every 1000 ft.

The station is of steel frame, covered with galvanized iron. It contains one unit at the present time. This is a 1500-kw Allis-Chalmers machine wound for 2200 volts, three-phase, and operated at 400 r.p.m. by a double

Doble tangential waterwheel. The two wheels are mounted on the extended shaft of the generator with an extra outboard bearing. Water passes to the wheels through a 42-in. hydraulically operated gate valve, the wheels being equipped with auxiliary nozzles and controlled by a Lombard governor. The needles can be connected either singly or doubly to the governor and can be set in any position by hand and locked to take any predetermined load. A 50-kw Allis-Chalmers exciter is driven by a Doble waterwheel. The unit has been in operation for six years and has given excellent service. Fig. 49 is an exterior view of the power house. This plant was the second one installed on the system, having been put into service in 1908. The first installation consisted of a turbine wheel directly connected to the generator shaft, but after eighteen months' service it

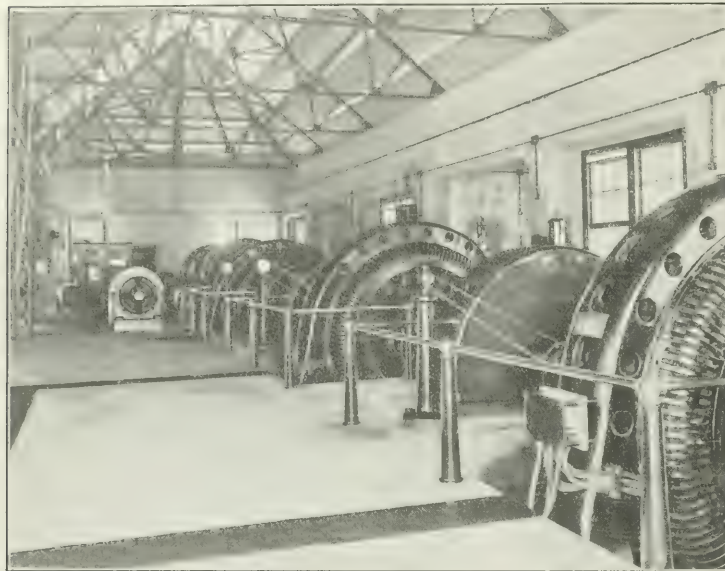


FIG. 45—GENERATING EQUIPMENT OF STATION NO. 4

crete walls 4 ft. in height. Fig. 48 shows this arrangement and Fig. 47 is a section of the dam. The intake chamber gates and screens are similar to the others described.

The flow line is 54-in.-diameter wood-stave pipe, made of Douglas fir, using  $\frac{5}{8}$ -in. steel bands spaced from 10-in. to 5-in. centers, the spacing changing every 200 ft. The pipe is 3500 ft. in length and is laid on a grade of 4 ft. per 1000 ft., the grade being benched out of the side hill and the pipe covered as in the case of the other pipe lines. The pipe, like the other wood pipes, was figured to have a coefficient of friction of  $N = 0.012$ , but tests on some of the flow lines indicate that  $N = 0.011$  is about right. This flow line terminates in a steel Y on the brow of a hill, each branch of the Y being 42 in. in diameter. A cast-iron gate is mounted on each branch, and a 12-in. steel standpipe is connected to the steel pressure pipe just below the gate. At present only one pressure pipe is in place, but provisions are made for a second pipe. The present pressure line is 42 in. in diameter and 5500 ft. in length, and is made of lap-riveted steel, the metal varying in thickness from  $\frac{3}{16}$  in. to  $\frac{3}{8}$  in. The static pressure at the lower end is 410 ft.

was taken out, completely ruined by the sharp sand and gravel carried in the water during the flood season.

The switchboard consists of a simple generator panel and an exciter panel provided with indicating and registering instruments. Three 500-kw Stanley transformers are connected to the switchboard bus through selec-

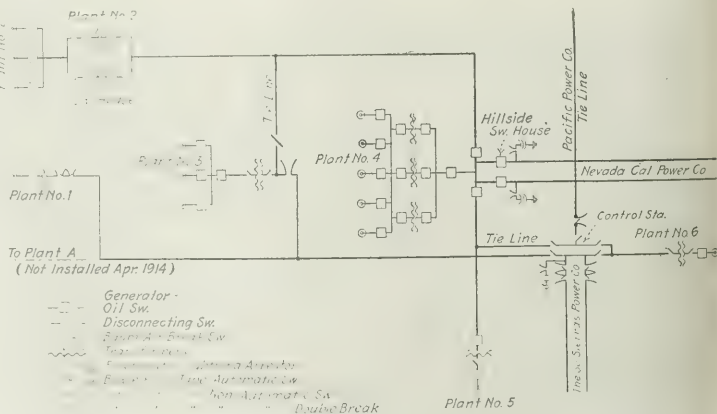


FIG. 46—CONNECTIONS OF HYDROELECTRIC PLANTS ON BISHOP CREEK

tor switches, an additional transformer being kept in reserve. The 55,000-volt leads pass directly to a three-pole Kelman oil switch and out of the building to the line connecting with the switching house at plant No. 4,  $1\frac{1}{2}$  miles distant. This line is also connected to the bus arrangement at the control station 800 ft. distant from

the station. Another unit will be installed in this plant.

#### Station No. 6

Station No. 6 constitutes the lowest development on the stream. The water coming from the tailrace of this plant is discharged directly into the irrigation ditches

uniform grade to the power house. The wood-stave pipe operates under a maximum head of 70 ft.; the bands are of  $\frac{5}{8}$ -in. steel spaced from 10-in. centers to  $3\frac{1}{2}$ -in. centers, and the pipe cost \$7 per foot laid in the trench. It connects directly to a 54-in. steel pipe 4360 ft. in length, making the total length of the pipe line 7360 ft. The

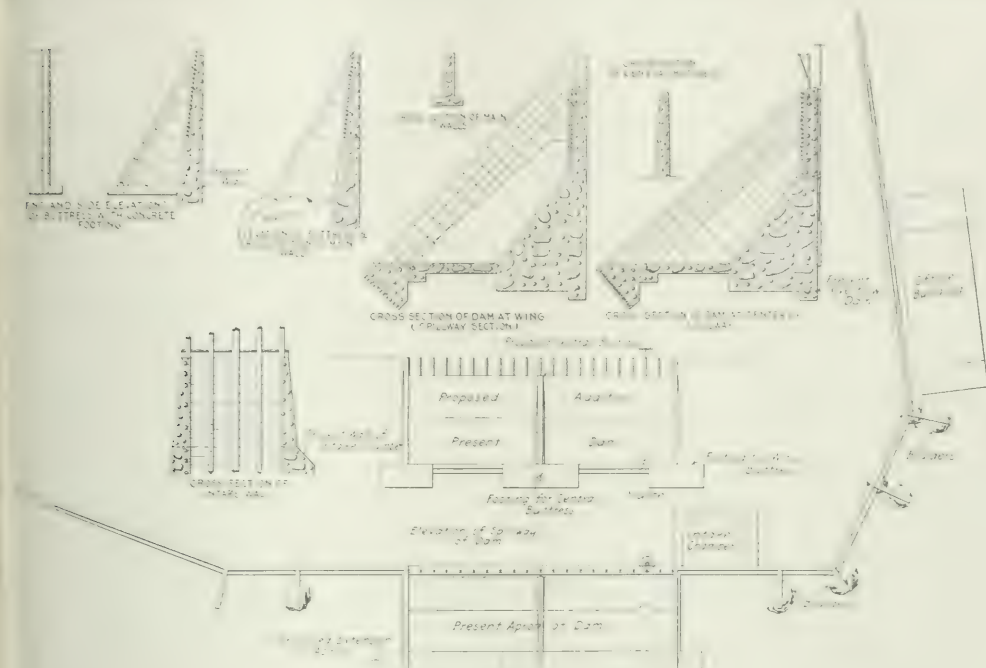


FIG. 47 -GENERAL PLAN FOR RAISING DAM

of the land owners in that locality. The intake dam for the plant is situated 300 ft. downstream from station No. 5 and, like the other intakes, backs the water up to the tailrace of the plant above. The intake dam is of reinforced concrete with rubble-concrete spillway 60 ft. in width. The dam is only 15 ft. in height and

total head is 257 ft. The pipe line is buried in a trench the whole distance, and at a point about half way in the line there is a gravel trap with valves for blowing out any gravel that may find its way into the pipe. An illustration showing the design of the trap will be printed in the next instalment. Four drop air valves



FIG. 48—INTAKE FOR STATION NO. 5

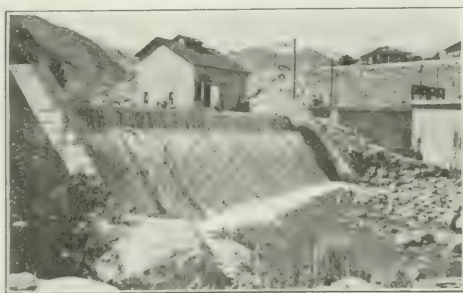


FIG. 49—GENERAL VIEW OF STATION NO. 5

the intake chamber and screens are similar to the intake at station No. 3 in arrangement.

The water leaves the intake chamber through a 60-in. redwood-stave pipe for a distance of 3000 ft. The first 1000 ft. of the flow line is on a grade of 4 ft. per 1000 ft. from that point, and the pipe drops on an almost

are placed 1000 ft. apart on the upper end of the pipe. The steel pipe varies in thickness from  $\frac{1}{4}$  in. to  $\frac{3}{8}$  in.

A description of the power house and equipment of station No. 6 will be given in Part VI of this article next week.



# Adapting the Tungsten Lamp to Photography

Application of the new high-efficiency unit to portrait-taking facilitated by making use of colored glass with proper transmissive qualities. By M. Luckiesh

A STUDY of the actinic value of the new high-efficiency tungsten lamp indicated that this lamp is destined to become a factor in the photographic arts. The natural characteristics of the tungsten lamp, such as portability, steadiness, ease of operation, unvarying quality and high efficiency, are valuable allies to the most essential characteristic, namely,

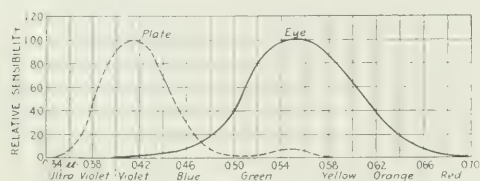


FIG. 1—SPECTRAL SENSIBILITIES OF THE EYE AND THE ORDINARY PHOTOGRAPHIC PLATE FOR RAYS OF EQUAL ENERGY VALUE

radiant energy of high actinic value. The recent developments in incandescent lamps have been such as to produce a tungsten lamp having all the characteristics of a successful photographic lamp.

However, it was found that for ordinary photographic plates the light from a gas-filled tungsten lamp operating at 22 lumens per watt was only one-third to one-fourth as effective as daylight or mercury-vapor light for the same luminous intensities. In portraiture, in order to obtain a reasonably short exposure, conditions of glare would exist. This undesirable feature has been overcome by eliminating some of the visible rays which are of little or no actinic value in general photography. Ordinary photographic plates are practically insensitive to rays longer than  $0.60\mu$ , the range of appreciable sensibility extending from about  $0.46\mu$  into the ultra-violet region. It is, therefore, evident that the most luminous rays, which extend between  $0.50\mu$  and  $0.62\mu$ , can be greatly suppressed, their suppression affecting the actinic value of the radiation from the new high-efficiency tungsten lamp very slightly for ordinary plates. In Fig. 1 is shown diagrammatically the sensibility of an ordinary photographic plate *P*, and also the sensibility of the human eye *E*, to various spectral rays of equal energy values. It is seen from this diagram that the rays of longer wave-length than  $0.50\mu$  can be to a great extent suppressed without appreciably affecting the actinic.

The writer has developed a colored glass of proper transmission both as to quality and quantity of light so that the luminous intensity is reduced to one-third of its original value while the actinic value for ordinary plates has been barely affected. This results in radiation of high actinic value and of sufficiently low luminosity to eliminate glare in portraiture. The resultant light appears white, and as all visible rays are present, there is no undesirable distortion in the appearance of colors. The effects of this colored glass upon the actinic rays from the high-efficiency tungsten

lamp are shown in Fig. 2 for various plates used in general photographic work. The effects on these plates were studied by means of a prism spectrophotograph. First, the spectrum of the light from a clear tungsten lamp (20 lumens per watt) was photographed through clear glass. This is designated as *C* in each case. Next the spectrum of the light was photographed separately through two samples of the proposed glass, which transmitted respectively 50 per cent and 35 per cent of the total visible light. These are designated respectively as *A* and *B*. With these ordinary plates the difference is practically undetectable by the unaided eye. Even the densitometer revealed differences so slight as to be quite masked by the apparent variations in the emulsion. While Fig. 1 indicates that the maximum photographic effect is due to rays near the extreme short-wave end of the visible spectrum, this is not apparent from Fig. 2. This is due to the fact that a prism spectrograph was used, and as a result of prismatic dispersion the energy density is very much reduced in the short-wave end of the spectrograms.

As an illustration of the low sensibility of ordinary photographic plates to green and yellow rays, attention is directed to the mercury spectrum which was photographed at the top and bottom of each plate for determining the absolute wave-lengths. The line on the left is  $0.408\mu$  and the other bright line is  $0.436\mu$ . While these lines are fully exposed, the green ( $0.546\mu$ ) and yellow ( $0.578\mu$ ) do not reproduce on the print, notwithstanding the fact that about 95 per cent of the total luminous intensity of the mercury arc is due to the green and yellow lines.

The effect of the proposed glass was also studied

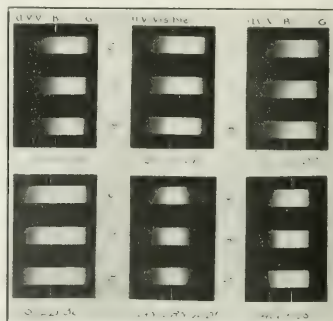


FIG. 2—SPECTRA SHOWING NEGLIGIBLE EFFECT OF PROPOSED COLORED GLASS ON THE RAYS AFFECTING ORDINARY PHOTOGRAPHIC PLATES

with various so-called orthochromatic plates, which are more sensitive to rays in the middle of the visible spectrum than the ordinary plates. Even these are far from being truly orthochromatic. A loss in actinic is noted, but even here it is not excessive. These plates are used so seldom in portraiture that they are of lit

the importance in considering the proposed glass. As a matter of fact, the character of the light through the proposed glass is nearer to daylight owing to the decrease in the excessive amounts of long-wave energy. Other tests were made, with the result that the glass developed has been found to be satisfactory for use with

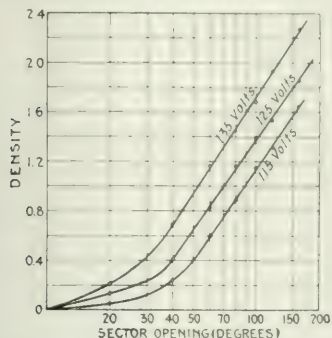


FIG. 3—EFFECT OF OVER-VOLTAGE ON ACTINICITY OF THE LIGHT FROM A 1000-WATT GAS-FILLED TUNGSTEN LAMP WHICH OPERATES AT 115 VOLTS AND 20 LUMENS PER WATT

the new high-efficiency tungsten lamps for portrait photography. It appears that the more feasible plan would be to use the proposed glass in making the lamp bulbs, for it permits the photographer to carry out fully his own ideas regarding equipment.

Various methods of using this lamp in studios have been proposed. A very feasible method is found in the use of a hand switch by means of which a lamp can be operated at low voltage except during the exposure. A lamp of lower voltage than that of the line can be placed in series with a resistor. During the exposure the resistor can be short-circuited, thus taking advantage of the higher actinic density resulting from the excessive voltage. The effect of increasing the voltage is shown in Fig. 3. A 1000-watt gas-filled tungsten lamp operating normally at 115 volts and equipped with a bulb of the proposed glass was used. A sectored disk having ten openings varying from 0 deg. to 180 deg. was rapidly rotated in front of a photographic plate (Seed 30). The exposure was of sufficient duration to be accurately timed by means of a stop-watch. When the various densities on the plate were measured and plotted against the logarithm of the sector opening in degrees (proportional to illumination), the curve, 115 volts, was obtained. (Density is taken as the logarithm of the reciprocal of the transparency.) Without changing the position of the lamp, two other plates of the same kind were exposed separately with the lamp operating at 125 volts and 135 volts respectively. The increase in the photographic effect (density) is evident. Of course, the illumination increased as the voltage increased, but a given point on the abscissa axis corresponds to a certain sector opening for all three voltages.

The effect of voltage variation on the actinic value of the radiation from a clear 1000-watt, 115-volt gas-filled tungsten lamp operating at 20 lumens per watt is shown in Fig. 4. The photometric intensity of illumination on the photographic plate (Seed 26) was kept constant throughout a range of voltage above and below the normal voltage. The procedure was repeated for several different photometric intensities, designated relatively as 40, 50, 75, 100 and 150 units of illumination. The densities on the photographic plates are plotted as

ordinates and the voltages as abscissas. It will be noted that there is a considerable gain in photographic value per unit of luminous flux as the voltage is increased.

The object of this work has been to produce a screen that would reduce the luminous intensity without seri-

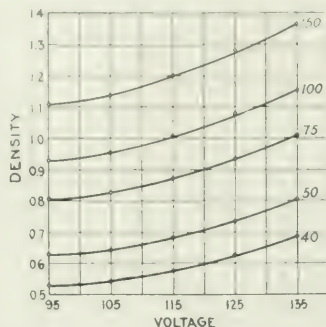


FIG. 4—EFFECT OF VOLTAGE VARIATION ON THE ACTINIC VALUE OF THE RADIATION FROM A CLEAR 1000-WATT, 115-VOLT GAS-FILLED TUNGSTEN LAMP; LUMINOUS INTENSITY CONSTANT IN EACH CASE

ously affecting the actinic value of the radiation for ordinary photographic plates. This has been done by suppressing some of the visible rays that are quite ineffective on ordinary photographic plates. The resultant light appears white in color, and as all the visible rays are present the appearance of a human subject is pleasing. Further, the eyes of the operator see more nearly what the photographic plate records, owing to the suppression of a large amount of the non-actinic rays. Thus the tungsten lamp is enabled to invade the field of portraiture without meeting with disfavor owing to conditions of glare which would often exist when the clear lamp is utilized in cases demanding short exposures.

The writer takes pleasure in acknowledging the assistance of Mr. H. McMullan in the work described above, which was performed in the Nela Research Laboratory, Cleveland, Ohio.

### Managing a Large Electric Service System Through Branch Offices

Before the recent Spokane (Wash.) meeting of the Northwest Electric Light and Power Association the method of conducting business through branch offices as employed by the Pacific Power & Light Company was described in a paper by Mr. Lewis A. McArthur on "Organization and Operation of Branch Offices." This company has over a dozen branches, each of which is in charge of a local manager who is vested with considerable authority, making it possible for him to conduct the local business without referring all matters to the home office. The local managers have charge of local employees, local accounting, and stores and store ledgers, reporting directly to the vice-president and general manager. Local supplies are ordered through the main office by requisitions from the local manager. The payrolls are also kept in the branch offices and at the end of each month are sent to the main office, where proper distributions are made in advance. Small extensions to plants, etc., can be made by the local manager, who is provided with a checking account in local banks.



## Use of Arc Lamps for Photographic Purposes

Results derived from tests of carbon and flame-arc lamps to determine the actinic properties of their light and the values of current and voltage best adapted to photography. By V. A. Clarke

THE following is an account of a series of tests made to determine the relative efficiency of various carbon and flame-arc lamps for photographic work and to ascertain at what values of current and voltage each particular type of lamp would give the best results. Inasmuch as no tests have heretofore been published, so far as the writer knows, on this subject, the tests will be outlined in detail in order that other investigators who are interested may duplicate the conditions.

Carbon and flame-arc lamps suitable for photographic purposes may be divided into three general types:

(1) High-amperage open-arc lamps, such as the Macbeth, Bogue and others, designed especially for photo-engraving and commercial photographic work.

(2) High-amperage inclosed lamps, such as the Aristo, designed especially for studio work.

(3) Regular inclosed lamps commercially used for street lighting and general illumination.

White-flame electrodes are recommended exclusively by the manufacturers of the first type of lamp, and

blueprinting and general studio work where special photographic lamps are not installed. Before the introduction of the white-flame arc lamp these installations were almost invariably of inclosed carbon lamps operating on 110-volt alternating current or direct current and on 220-volt direct current. A series of tests has been made to determine whether or not these lamps can be converted to use flame electrodes satisfactorily, and if so, what is the increase in photographic efficiency and saving in cost of energy to the consumer. The present article will be devoted exclusively to this problem.

The illumination from a given light source, as tested by a photometer, would give absolutely no measure of the value of the light for photographic purposes. For example, the distribution of the direct-current inclosed-arc lamp takes a form such as is shown in dotted lines in Fig. 1, where the maximum candle-power is at or near the 45 deg. angle. It is well known that 90 per cent of the visible light comes from the incandescent tips of the electrodes and not more than 10 per cent from the faint blue arc stream between them. On the other hand, the maximum photographic power of the inclosed arc is in a nearly horizontal direction, as

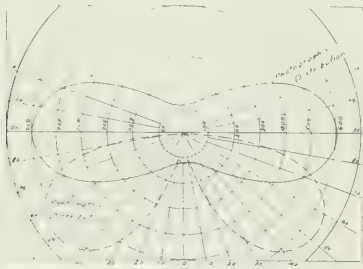


FIG. 1—PHOTOGRAPHIC AND PHOTOMETRIC LIGHT VALUES

hence their superiority seems to be well known to the trade. One of the largest uses of these lamps is in photo-engraving work for newspapers, where the element of time is of great importance. They are also used extensively in commercial photography, where extreme detail is required. For this purpose two lamps are generally employed at the same time, one on each side of the object photographed, thus almost entirely eliminating all objectionable shadows.

The second class of lamps burns either inclosed or flame electrodes, the latter either with or without globes. Laboratory tests have shown that at 28 amp or thereabouts, which is the rated current taken by the Aristo lamp, the printing power of the flame electrode is approximately two and a half times that of the inclosed. The natural tendency of the inclosed arc to wander is noticeable even in this lamp, but on account of its special design it is not so important a factor as in the third class of lamps, which will be discussed below. The greater efficiency of current and the superior color value of the light from the white-flame electrode are points in favor of the use of this type of arc. The third class of lamps includes the field of both large and small consumers for routine photographic work, such as

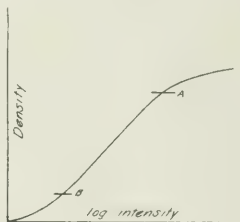


FIG. 2—VARIATION OF DENSITY WITH INTENSITY

shown in solid lines in Fig. 1, indicating that the photographic power comes principally from the nearly visible blue arc stream in which is contained the short blue and ultra-violet rays that affect a sensitized surface to the greatest degree. This curve must not be taken as accurate, since the determinations were qualitative rather than quantitative.

### Standards

As a unit of illumination we have the candle-power, but there is as yet no standard of photographic power, and in order to compare the actinic properties of any two lights we must assume a standard. Of the commercial illuminants, the inclosed carbon arc is far too unsteady for satisfactory work, and the constancy of the white-flame arc had not yet been proved; besides, it was thought best not to use as a standard either of the two lamps which were to be tested. A light from a tungsten lamp was at that time considered too yellow to make a good photographic standard, though further researches might have indicated that it would have been suitable. In lieu of anything better, the light from a clear north afternoon sky was chosen. Photographers often refer to such a north light as a photographic

standard, though realizing at the same time that this will vary enormously with the time of year, transparency of atmosphere, and the presence or absence of clouds. The question of absolute color should not affect the results appreciably, since the lamps were not compared to this light directly, but their effect upon a strip of sensitized paper was compared to that from the assumed standard light on the same kind of paper. While no difficulty was caused by this selection of standard it obviously cannot be duplicated and the writer would recommend that for any future work some reproducible standard be employed.

In making up the standard, several strips of sensitized paper were placed in light-tight envelopes and pulled out about half an inch at a time every half minute, as in Fig. 3, thus giving a series of regular gradations of tone.

Some of these strips were selected as working standards and used for comparison with the test strips obtained from the lamps, while others were not opened until after the entire test was completed. All comparisons were made in a dark room under a yellow non-actinic light. After the tests were completed the

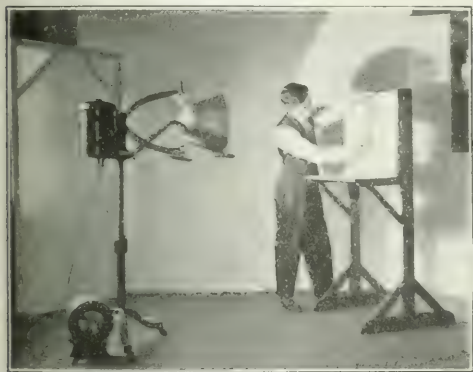


FIG. 3—APPARATUS FOR OBSERVING PHOTOGRAPHIC VALUE OF LIGHT

working standards were compared to the other standards and no difference of color was discernible. The unexposed part of the standard strips was of the same color as new paper fresh from the box, so it was felt that the standards had undergone no deterioration.

#### Theoretical Considerations

For measuring photographic power there are no direct-reading instruments, and use must therefore be made of the sensitized surfaces themselves.

In experimenting with photographic plates, Dr. Herbert E. Ives (*Transactions I. E. S.*, March, 1912) found that if a perfect negative of a transparency were superimposed upon the transparency the picture would be obliterated and the whole surface of the plate would have an opacity equal to the minimum transmission of either plate. If  $T$  and  $T'$  are the transmission coefficients or transparency factors of the negative and positive plates respectively,

$$\text{In symbols } TT' = C \quad (1)$$

where  $C$  is a constant which may be small though not zero.

By definition,

$$\text{Transparency } T = \frac{\text{transmitted light}}{\text{incident light}} = \frac{J_t}{J_i}$$

$$\text{Opacity } S = \frac{1}{T} = \frac{J}{J_t}$$

$$\text{Density of plate } D = \log \text{ opacity} = \log \frac{J}{J_t} \quad (2)$$

and is a measure of the actual quantity of deposited matter on the sensitized surface.

But in the case of the positive and negative plates superimposed upon each other the intensity  $i$  of the light which can pass through the positive and act on the negative is directly proportional to the transparency factor  $T'$  of the positive plate. One can therefore replace  $T'$  by  $i$  in equation (1).

Then  $iT = C$ , where  $C$  is still a constant

$$\text{Replacing } T \text{ by } \frac{J_t}{J_i} \\ i \frac{J_t}{J_i} = C, \text{ or } iJt = C J_i \quad (3)$$

Taking logarithms,  $\log i + \log Jt = \log C + \log J_i$

$$\log i - \log C - \log \frac{J_i}{J_t} = D$$

Since  $\log C$  is a constant,

$$D = \log i - K, \text{ where } K = \log C \quad (4)$$

In the case where an arc lamp is the source of illumination, assume for a moment that the intensity  $i$  varies as some constant power of the current supplied to the arc.

Then

$$i = I^a \text{ or } i = I^{\frac{1}{a}}$$

Substituting in equation (3)

$$I^a J_t = C J_i$$

$$\frac{1}{a} \log I + \log J_t = \log C + \log J_i$$

$$\frac{1}{a} \log I = \log C + \log \frac{J_i}{J_t}$$

$$\frac{1}{a} \log I = \log C - \log S$$

$$\log I = a \log C + a \log S$$

Since  $a$  and  $C$  are both constants,

$$\log I = m \log S + b \quad (5)$$

If now the assumption is correct that the intensity varies as some constant power of the current, equation (5) plotted on logarithm cross-section paper will have the form

$$y = mx + b,$$

which is a straight line. Conversely, if the experimentally determined points fall on a straight line, it may be said that the assumption has been proved.

In using this formula, however, it must be remembered that it applies only to the straight portion of the curve, which Dr. Ives found to be of the form shown in Fig. 2. This curve is practically a straight line between points  $A$  and  $B$ . Beyond the range indicated the lines will no longer be straight, as will be seen in Fig. 8.

#### Method of Taking Readings

After the exposure has been made the transparency can be measured by special photometric methods and the capacity and density calculated. The purpose of this investigation was to ascertain the effect of the lights on photographic paper, and a printing-out "Solio" paper (trademark "Kresco") was chosen. A developing-out paper ("Azo") was tried, but its speed made it difficult to handle and its use introduced more variables—time of development and strength, composition and temperature of developer.

The readings were taken in a manner similar to the making of the standards, by exposing about half an inch of paper successively every half minute for five minutes. In this way an integrating effect was obtained on the lower portion of the paper. Fig. 3 shows the method, although the lamp in the photograph was not used in these particular tests.



Swartzschild's law for points of equal density is as follows:

$$i_1 t_1^2 = i_2 t_2^2$$

where  $i_1$  and  $i_2$  are two unequal intensities and  $t_1$  and  $t_2$  are the times of exposure required to give equal density of the negative.

By keeping the time of exposure constant at one-

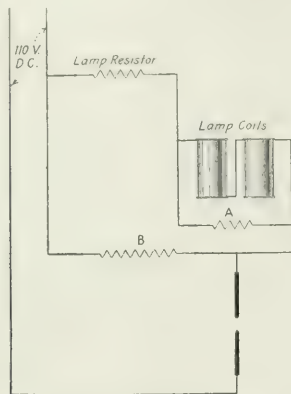


FIG. 4—CONNECTIONS FOR TESTING DIRECT-CURRENT LAMPS

half minute, the values of  $t_1^2$  and  $t_2^2$  become equal and can be canceled.

Hence  $i_1 = i_2$  for equal densities, and since the opacity  $= \log^{-1}$  of the density, the photographic intensity or printing power of the lamps is equal for equal opacities or equal depths of color. This law will apply only to the straight portion of the curve shown in Fig. 2, known as the region of correct exposure, so that care had to be taken to compare only those parts of the test strips that lay within these limits. Where the printing power was too low the distance from the light source to the paper was decreased, and where it was too

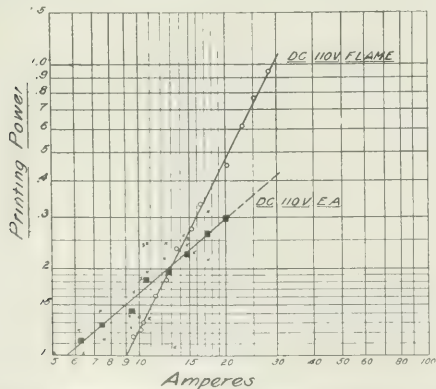


FIG. 5—PRINTING POWER OF LAMPS OPERATING WITH DIRECT CURRENT

great it was increased, the readings being corrected to constant distance by means of the inverse square law.

Suppose that a part of the test strip which had been exposed to the light of the flame arc for two minutes was of the same color as that part of the standard strip which had been exposed to the north light for one minute, then it was considered that the arc had a printing power of one-half at that current. Several compari-

sons were made from each strip of test paper and averaged, though more weight was given to the comparisons made near the lower end of the strip on account of the integrating effect spoken of above.

#### Tests of 110-Volt Direct-Current Lamps

A regular General Electric inclosed-arc lamp was used for this test. It was hung in a long photometric

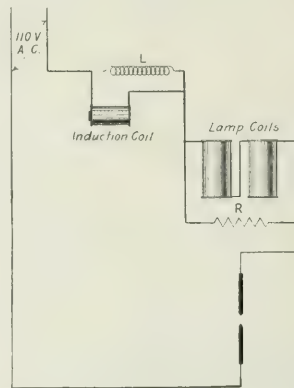


FIG. 6—CONNECTIONS FOR TESTING ALTERNATING-CURRENT LAMPS

gallery completely inclosed with dull black cloth so that no light could get in from the outside and so that there was practically no reflection from the walls or ceiling. The electrical instruments were outside of this gallery and readings were taken by a second observer every half minute during the test.

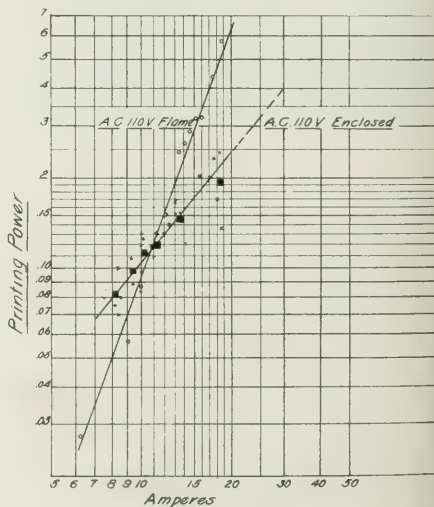


FIG. 7—PRINTING POWER OF ALTERNATING-CURRENT LAMPS

For the first test the lamp was converted so as to use flame electrodes by the scheme shown in Fig. 4. Referring to this sketch, it is important to change the polarity of the lamp so that the lower electrode is positive since much better printing power has been found to be secured by this means. Inclosed arcs are usually designed to carry not more than 7.5 amp, and therefore to put a high current through the lamp coils would

cause serious heating if not actually burn them out. Hence a high-current resistor *B* is shunted across the line from the negative terminal of the lamp to the negative electrode. In this way the usual current of 5 amp flows through the lamp resistor and the coils, while any current desired, such as 20 amp, flows through the resistor *B*, and the current through the arc is the sum of these two, or 25 amp, all of which flows back to the line through the positive lead, which is heavy enough to accommodate it. In making these experiments it was found that the voltage of the lamp started at about 55 and then gradually increased as the electrodes burned away until practically inclosed-arc voltage of 70-75 was reached, at which time the electrodes would feed and the voltage again drop to 55. A resistor *A* of low resistance, shunted across the lamp coils, satisfactorily overcame the trouble. At moderately low currents, around 10 amp, about 1 ohm resistance was found necessary, but as the current through the arc was increased, this was gradually cut out until at currents of 30 amp and over no resistance was necessary.

Twelve tests were made, varying the current from approximately 10 amp to nearly 30 amp. The emf of the flame lamp should be around 56 volts, but it was found impossible to keep it constant at that value. It might be said that these tests are in the nature of a check on some made a year ago. The slope of the line was very closely the same, though the position was different owing to the use of a different standard. It has been found by supplementary tests that the flame arc starts with an average emf of 23 volts and that the printing power of a flame arc varies directly not with the actual voltage but with the arc voltage minus the voltage at which the arc starts; in other words, as  $V - 23$ . This value of 23 is not correct for all currents. Indications are that at extremely low current it is less than 23 and at very high currents it is more than 23, but the variation is far within the limit of error imposed by the other conditions of the test and no attempt was made to correct for this variation. Inasmuch as it was found that for both the inclosed and the flame arcs the maximum printing power was approximately in a horizontal direction, the middle of the test strip was placed directly in line with the arc. In determining the color of the light the personal equation has its greatest influence; the colors were matched with the greatest care, and it is hoped that the effect, if any, of this personal equation was constant, so as to influence all results uniformly. The readings were reduced to a 4-ft. basis by applying the inverse-square law. All the readings could not be taken at the standard distance because at low currents the test colors were so faint that color matching was impossible and it was further thought better to use comparable values of test and standard in order to keep within the region of current exposure. The value of printing power corrected for voltage variation was used in plotting the accompanying curves.

After the test on the flame arc was completed the lamp was again arranged to use the regular inclosed-arc carbon electrodes, still keeping the resistor *B* in the circuit, so that the current could be varied. Readings were taken similar to those with the flame lamp 2. In this case the normal voltage of the lamp is 80, and 40 is the approximate voltage at which the arc will start, so that the printing power values have been corrected for actual voltage as noted above. Inasmuch as the position of the arc caused a great variation in printing power many readings were necessitated in order to obtain a fair average.

#### Discussion of Curves

Referring to Fig. 5, values of amperes are plotted against comparative printing power. The points so

plotted seem to lie very close to a straight line in the case of the flame arc, and hence the assumption that the intensity varies with some constant power of the current seems justified.

The individual points for the inclosed lamp are shown as small crosses and give what is known as a "shot-gun" diagram. This is accounted for by the fact that the light is two or three times as strong when the arc is in the front of the carbon as when it has wandered to the back. From this fact the flame arc has a decided advantage, since the wandering of the arc is inherent to the inclosed lamp. By averaging all of the readings taken at or nearly at the same value the large squares were obtained, and with these as points the curve was drawn.

From Fig. 5 are obtained the equations of the two curves, which are as follows:

$$\text{For the flame lamp } y = Kx^{1.96},$$

$$\text{For the inclosed lamp } y = K'x^{0.85};$$

or, in other words, the printing power of the flame lamp

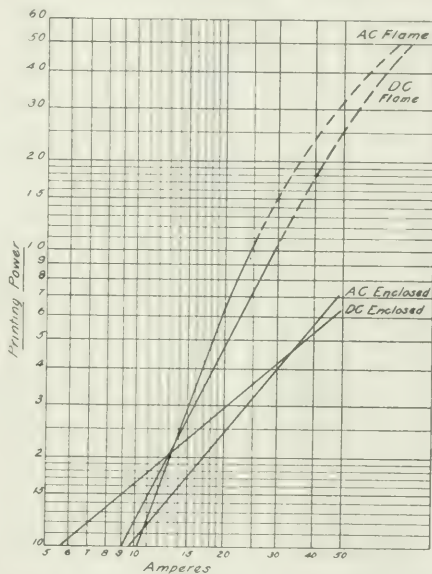


FIG. 8—COMPARISON OF OPERATION OF DIRECT-CURRENT AND ALTERNATING-CURRENT LAMPS

varies as the 1.96 power of the current, while that of the inclosed lamp varies as the 0.85 power. Referring to Fig. 5, it will be seen that the two curves cross at 13 amp. Below this value the inclosed arc gives actually more printing power than the flame arc, but at 30 amp the latter gives approximately two and one-half times the photographic power of the former. It must be remembered, however, that inclosed lamps cannot be operated commercially at more than 10 amp, because their globes would soon burn through at the higher currents.

#### Test of 110-Volt Alternating-Current Lamps

As in the direct-current tests a regular General Electric 110-volt lamp was arranged to use flame electrodes. On account of the alternating nature of the current the connection scheme of Fig. 4 could not be followed, but instead the connections were made as in Fig. 6. The regular lamp inductor *L* is not of sufficient size to carry the increased currents desirable for efficient operation with flame lamps, so this coil was open-cir-



cuted and replaced by an induction coil with an adjustable iron core. For this experiment one of the choke coils that used to be regularly supplied with the old-style Adams-Bagnall lamps was used. Obviously, the high current would burn out the lamp coils, and hence a non-inductive resistor of variable resistance  $R$  was shunted around them; thus the regular lamp current

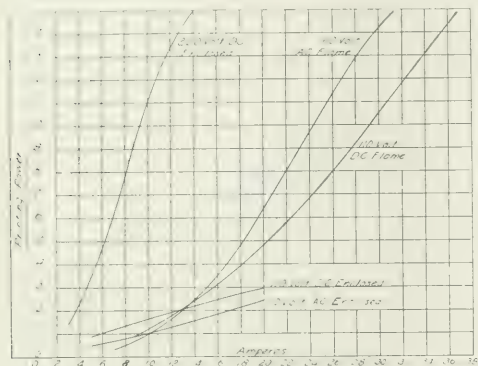


FIG. 9—COMPARISON OF OPERATION OF DIRECT-CURRENT AND ALTERNATING-CURRENT LAMPS

of, say, 5 amp could flow through the coils and any desired current (up to the carrying capacity of the inductor and resistor) through the resistor, and the sum of the two through the arc. The data were similar to those taken in the direct-current tests and the same undesirable wandering of the arc was apparent in the case of the inclosed lamp, though to a little less degree. The alternating-current flame lamp is a little harder to handle than the direct current on account of having both resistance and inductance in the circuit. The current was varied by pulling out the iron core of the choke coil, which necessitated a corresponding change in the resistance of  $R$  in order to keep the voltage at the proper value, which was assumed at 56. Inasmuch as in commercial installations a fixed working current will be determined, this trouble should be almost, if not entirely, eliminated, because the resistance and inductance would be kept constant. The carrying capacity of the coil limited the current which could be taken by the flame lamp to about 20 amp, and the globe was a limiting factor on the inclosed lamp, so that at about 18 amp the glassware melted through.

The curves in Fig. 7, drawn to printing power of amperes, show the same general characteristics as in the direct-current lamp. The flame lamp starts at 6 amp with a very low printing power and at about 11 amp crosses the curve for the alternating-current inclosed lamps, above which point its printing power increases rapidly over that of the inclosed lamp until at 20 amp it is more than twice as great.

In Fig. 8 all four curves are plotted upon one sheet. The upper parts of the curves have been drawn by dotted lines as an indication of their curving off from a straight line at high currents. Of the four lamps the alternating-current flame has the greatest slope and about 15 amp will produce more printing power at a given current than any of the others. Supplementary tests, however, indicate that the falling off from a straight line is greater than in the direct-current flame lamp, and that the point A in Fig. 2 is reached at a lower current value than in the case of the direct-current lamp, showing that the range of a normal exposure is more limited. By peculiar coincidence the direct-

current inclosed and the two flame curves cross at very nearly the same point, showing that at about 13 amp there is very little to choose as regards intensity of actinic power. Other considerations which will be discussed later would, however, influence the selection of the lamp even at this current. At very low currents the direct-current inclosed lamp is undeniably supreme. The alternating-current inclosed lamp seems to be rather poor for printing, for, although its curve is a little steeper than that of the direct-current lamp, the two curves do not cross until about 35 amp is reached, which is a current far in excess of any that could be used commercially in these lamps on account of the glassware.

The actual slopes are given by the formulas:

For the alternating-current flame lamp  $y = K''x^{2.15}$ .

For the alternating-current inclosed lamp  $y = K'''x^{1.32}$ .

#### Test of 220-Volt Direct-Current Lamp

For this test use was made of a 220-volt direct-current Adams-Bagnall lamp, adjusted to take 3 amp at 150 volts at the arc. After several trials it was found commercially impossible to arrange this lamp to use flame electrodes, since the mechanical construction of the lamp and the electrical construction of the coil were such as to preclude the drawing of the flame arc of the length corresponding to the voltage required. Even when the arc was struck and the electrodes held far apart by hand, the arc stream was very thin and the photographic as well as the "illuminating" light was very poor. This lamp could, however, be made to burn as a regular inclosed lamp at varying currents by means of a resistor placed between the positive lamp terminals and the upper carbon in a manner similar to that of the direct-current 110-volt lamp, with the addition of a resistor of suitable resistance directly across the coils. Under these conditions the inclosed arc appears under its most favorable light and is superior in printing power to any of the other lamps tested. Its slope, as shown in Fig. 9, is 1.79, being less than that of either of the flame lamps, and the upper limit of its

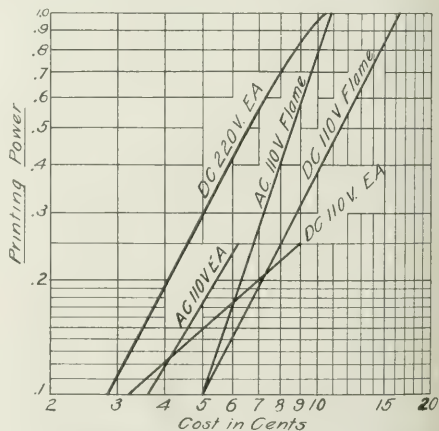


FIG. 10—VARIATION OF COST OF OPERATION WITH PRINTING POWER

region of correct exposure occurs at the comparatively low current of 8 amp or 9 amp, so that at exceedingly high currents its curve would apparently be crossed by those of the alternating-current and the direct-current flame lamps, but at commercial currents its actual photographic value is far better than either. The original test showed results so good as to excite sus-

picion as to their correctness, and hence a check run was made under entirely independent conditions. The direct-current 110-volt flame lamp having proved so constant in actinic power, several standard strips were made from it at a current value of as near 15 amp as it was possible to obtain. Readings were then taken on the 220-volt inclosed lamp at various current values, and the strips thus obtained were checked with each of the four standard strips separately. Inasmuch as standard D was taken at 3 ft. instead of 4 ft., suitable correction had to be made to bring it to the 4-ft. basis. The final averaged results confirmed the original tests.

In these tests the following electrodes were used:

Lamp	Upper Electrode	Lower Electrode
D. C. 110-volt flame.....	0.5-in. H. G. cored	10-mm. white-flame
D. C. 110-volt inclosed	0.5-in. H. G. cored	0.5-in. H. G. solid
A. C. 110-volt flame.....	10-mm flame	10-mm flame
A. C. 110-volt inclosed	0.5-in. H. G. solid	0.5-in. H. G. cored
D. C. 220-volt inclosed.....	0.5-in. H. G. cored	0.5-in. H. G. cored

The flame electrodes used in these tests were Columbia 415 C., designed especially for photographic work. Electrodes of 10 mm were used instead of 0.5-in. electrodes, since the photographic efficiency was higher. On the inclosed-arc half-inch regular Columbia high-grade electrodes were used in every case. These were cored where experience has taught that greater power would be obtained, such core being, of course, of non-flaming but simply arc-supporting material.

#### Efficiency and Costs

On the basis of the printing power of the watts taken both at the arc and the terminal, the alternating-current lamps show to better advantage owing to their fractional power-factor. Thus, while the direct-current 110-volt flame arc requires 5000 watts to produce a value of printing power taken as unity based on efficiency at 0.10, the inclosed arc takes only 4560. However, the slopes of the lines enter at higher wattages, and at a printing power of 0.25 the flame-arc lamps are better. Above this point it is impossible to operate the inclosed-arc lamps on account of their globes, though it is evident that the efficiency would be very poor as compared to that of the other lamps. The 220-volt direct-current lamp again shows very favorably.

The cost per hour of use is shown in Fig. 10. From this it is evident that the direct-current 220-volt inclosed arc actually costs less to operate than does any one of the other lamps at and below the printing power of unity as assumed in these tests, though in the upper part of the curve it is seen to approach the alternating-current flame-lamp line, and above this the latter lamp will undoubtedly cost less to operate. In justice to the other lamps it should be said that the 220-volt direct-current lamp is not of great commercial importance, since there are comparatively few 220-volt installations. Where such lamps are already installed it would be highly advisable to make use of them, but from other considerations than that of cost it would seem inadvisable to install them instead of 110-volt white-flame lamps if both 220-volt and 110-volt service is available.

A discussion of the advantages of the flame-arc lamp except that of cost is outside of the scope of this article, no work of this nature having been done in this particular test; but it is a fact well known to photo-engravers and to photographers in general that for all work requiring special color value or light approximating daylight in its actinic properties the white-flame lamp is far superior to any of the inclosed types of lamps.

## MECHANICAL LOADS ON ELECTRIC LINES

Effect of Ice, Sleet and Wind on Tower Design—Weak Spots  
Developed by Torsional Stresses, Non-Rigid Foundations and Compression Members

By R. D. COOMBS

MORE inaccurate assumptions have been made in designing towers than in any other detail of a transmission system. Either too many conditions are assumed to exist coincidentally or else some stress is disregarded entirely. It is useless to assume that a load on the wires is transmitted to the tower if the wire connections, insulators or cross-arms cannot stand the stress or components of the stress. The writer believes that no consideration need be given to accidental loads due to falling objects such as trees, etc., and that a single set of ice and wind loads will very satisfactorily determine the design of towers for nearly every part of the country.

#### Ice and Sleet Loads

Severe ice loads are rare, but records of telephone companies show that sleet loads may be encountered throughout nearly the entire United States, except pos-

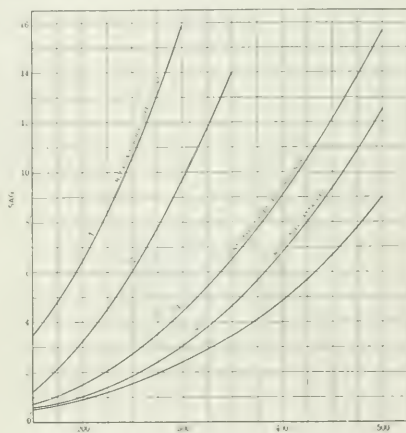


FIG. 1—COMPARATIVE SAGS OF NO. 1 WIRE UNDER VARIOUS LOADS AT 60 DEG. FAHR.

Curve No.	Ice Deposit, in Inches	Wind Pressure, Lb. per Sq. In.	Ratio of Maximum Stress to Ultimate
1	0.5	20.0	0.4
2	1.0	2.8	0.5
3	0.5	8.0	0.5
4	0.5	8.0	0.6
5	0.25	8.0	0.9 elastic limit

sibly in certain restricted localities in the South and West. The thickest deposits are usually of snow-ice, which is lighter than clear ice and more easily removed by sunshine and wind.

Small conductors are more affected by sleet deposits than large cables as the weight and wind load of the coated wire are relatively larger in the first case than in the latter. The most reasonable assumption for general use is 0.5 in. of deposit around the wire. Loads heavier than this are not of common occurrence in any part of the land.



## Wind Load

In ordinary broken country with the usual changes in direction of a line it is not practicable to assume the wind blowing in only one direction. Neither is it advisable to assume that the maximum sleet and wind loads occur at different times, as high winds are usually prevalent when there is a sleet storm. Contrary to the claims of some engineers, the writer believes that a combined sleet and wind load is much greater than any wind load in warm weather. This condition seems to be proved by records of the United States Weather Bureau.

The proper wind load to assume for crossings, in the opinion of the writer, is 8 lb. per sq. ft. on a conductor having a 0.5-in. coating. It is not denied that greater thicknesses of ice or higher pressures of wind will occur, but it is improbable that they will be coincident or that all sections of a line or even of a span will be similarly affected. To the knowledge of the writer a line has never failed which has been designed on this assumption if a proper factor of safety was used. Another specification provides for a combined load of 0.25 in. of ice and 8 lb. wind pressure with a stress

sleet may have been on the wires. Indicated velocities in excess of 80 miles per hour need rarely, if ever, be expected during the life of a structure, but velocities from 65 to 75 miles may occur several times a year, though less frequently in conjunction with sleet.

Assuming an indicated wind velocity of 70 miles per hour, or an actual velocity of 55.2 miles per hour, the pressure on flat surfaces may be taken as 13 lb. per sq. ft., while that on cylindrical surfaces may be assumed as 8 lb. per sq. ft. of projected area. On long spans, where the maximum pressure at one point may be considerably in excess of the equivalent uniform pressure along the wire, the unit pressure may be considered equal to  $0.0025 V^2$ . In considering wind pressures on wooden or cylindrical metal poles the projected area of their surfaces should be used. Latticed steel poles or towers should be treated as flat surfaces having an area equal to that of the windward members plus 50 per cent of leeward member area for poles and 100 per cent for wide-base towers.

## Unbalanced Loads

In designing towers it is also necessary to consider whether they are to be dead-end or corner supports, as these conditions impose from five to forty times the loading existing on straight-away towers. A straight-away tower supporting an unbalanced load in the direction of the line is equivalent to a dead-end tower. Curves in Fig. 2, plotted for a number of span lengths and three sizes of wire, give the ratio of the stress in a wire support when a single span is broken to that which exists with a balanced load.

Failures in wires may be considered as confined to electrical causes such as arcs between spans or at insulators, as the strength and elasticity are practically uniform throughout a span. Reports of conditions on existing installations indicate that improvement in insulation has a tendency to lower the number of broken wires per support. Therefore, where the aforementioned conditions are taken into consideration and care is used in preventing "flash-overs," the writer considers it unnecessary to construct a tower for excessive unbalancing of the normal loads.

The effect on a support caused by one wire breaking is relatively greater when only a few wires are supported than when a large number are present, owing to the pull-back of adjoining spans. Unless the wires are connected to their supports firmly enough to withstand broken-wire loads it is useless to consider such loads as being transmitted to the tower.

Even when the proper loading is assumed in designing towers, there is still a possibility of their developing weak spots after erection if compression members are not rigid enough, if torsional stresses have not been considered, if the foundation lacks rigidity, or if the material employed does not have the same characteristics as the test specimen.

## Flashlamp Signal to Lantern Operator

In lieu of the customary buzzer by which the lecturer on the stage signals to the lantern operator when he wants the slides changed, a pocket flashlamp, held in the hand of the speaker, affords a convenient and simple means of communication when there is no bell circuit available. The flash of the tiny lamp is easily seen by the lantern operator across even the largest hall, but causes no annoyance to the audience. It is silent in operation and is far more compact than the battery, buzzer and reel of wire necessary to run the ordinary temporary signaling circuit.

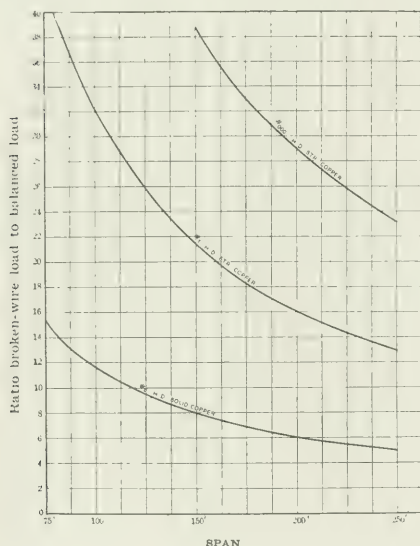


FIG. 2—RELATIVE EFFECT OF BALANCED AND BROKEN-WIRE LOAD

limit of nine-tenths the elastic limit of the wire. A more severe requirement made for crossings by the New York Central & Hudson River Railroad provides for 0.5 in. of ice plus 20 lb. wind pressure with a stress limit of four-tenths the ultimate strength of the wire. The accompanying curves in Fig. 1 show what effects various loadings and factors of safety have on the normal sag of No. 1 B. & S. gage hard-drawn stranded copper conductors.

Records of the Weather Bureau indicate a maximum velocity of 100 miles per hour, excluding tornadoes, cyclones, violent gales, etc. Records at Bidston Observatory, Liverpool, England, from 1884 to 1888 give as a maximum of ten severe storms an actual velocity of 78 miles per hour. The maximum velocity of 80 miles per hour observed in one station at New York City occurred during a sleet storm. Other observations in the vicinity of New York also showed that the maximum velocities occurred during the winter months when

# Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods and Current Practice Among Successful Utilities

## An Unusual Use for Electric Light on an Indiana Farm

It has been the experience of the Noblesville (Ind.) Heat, Light & Power Company in pioneering in the rural electric-service field that farmers are quite ingenious in finding new uses for electricity. One instance of the progressive tendency which prompts the



SIGN LIGHTING IN THE COUNTRY

farmers to use electrical energy wherever possible is to be found at the home of Mr. Nick Tescher, the "Prairie Homestead," where both the name of the owner and the farm name painted in large letters on the barn are lighted electrically every night. A single lamp with a hooded reflector illuminates the painted signs and also lights the roadway leading to the main door of the barn.

## Premiums Offered Present Customers in House-Wiring Campaign at Minneapolis

In the ordinary routine of central-station business at Minneapolis, Minn., about seventy-five finished dwellings are equipped for electrical service each month, although the number is materially reduced during the summer and fall. A recent premium campaign undertaken by the Minneapolis General Electric Company had the effect of reversing this tendency toward autumn "slackness," so that in October, even several weeks after the campaign had closed, house-wiring orders were still breaking all weekly records.

The plan of the campaign consisted in offering electrical household devices free to customers of the company for their assistance in locating and securing house-wiring orders. It applied only to houses already built and on existing lines of the company. The customer was expected to interest friends and acquaintances in the house-wiring proposition; then to notify the sales department, which sent a salesman to close the order. If the salesman was successful, the premium was awarded to the customer.

The campaign opened in June and closed Sept. 10. During this period 685 already-built houses were wired, including a number of apartment buildings, which, though enumerated as single installations, involved from

six to fifty new customers each. In June the advertising was confined to printed circulars mailed with the monthly bills. During July, August and September the plan was set forth by 40-in. advertisements appearing one time per week in the three daily newspapers. The response to these advertisements was pronounced, most of the inquiries coming over the telephone. Out of the 685 house-wiring orders, practically all of which were closed by the company's salesmen, 300 electrical appliances were awarded as premiums, which would indicate that, allowing for the ordinary run of business, 90 per cent of the increased business had been directly influenced by the premium offer.

No cut prices on house-wiring or fixtures were made, nor was there any attempt to emphasize a bargain opportunity. One of the reasons dictating the management's selection of this particular method of campaign was the realization that every customer who attempted to earn a premium would necessarily have to analyze the good points of the service and discuss them favorably with the prospective customers approached. The advertisements therefore persistently carried this thought—that customers of the company could easily convince their friends because they knew from their own experience how valuable the service was in their

**Earn An  
Electric Premium  
By Helping Us  
Get New Customers**



**Earn An  
Electric Premium  
By Helping Us  
Get New Customers**

## Convince Your Friends

### That They Should Wire for Electric Light

You can talk it over when they are at your home. Show them the many advantages of electric lighting. It is clean, bright, and safe. It is the most modern and most economical way of lighting. It is the only way to get the most out of your home. It is the only way to get the most out of your money. It is the only way to get the most out of your life.

We will send a representative to place the electric light fixture in your home. It is approved in getting their order. It is the only way to get the most out of your home. It is the only way to get the most out of your money. It is the only way to get the most out of your life.

**Electric Flatiron**—Retail value \$3.50

**Electric Toaster**—Retail value \$3.50

**Electric Table Stove**—Retail value \$4.00

Or if you desire for no two-houring orders you may have your choice of two of the above or a beautiful electric refrigerator. It is the only way to get the most out of your home. It is the only way to get the most out of your money. It is the only way to get the most out of your life.

This plan makes it easy for you to get the most out of your home. It is the only way to get the most out of your money. It is the only way to get the most out of your life. It is the only way to get the most out of your home. It is the only way to get the most out of your money. It is the only way to get the most out of your life.

Remember, the house that is wired for electric light is the only way to get the most out of your home. It is the only way to get the most out of your money. It is the only way to get the most out of your life.

**Call up our Sales Department for information or details**

Telephones Main 149 and Center 1320

## The Minneapolis General Electric Company

A CUSTOMER-GETTING "AD"

own homes and of the courteous and efficient conduct of the company through its employees.

In preparing the advertisements it was appreciated that the appeal should necessarily be to the housewives, inasmuch as they were the ones interested in electrical household appliances. For these reasons the "ads" were written to them, and it turned out that the great



majority of inquirers and premium winners were women. Probably three or four times the number of those actually successful located "prospects" who failed to order electrical installations. These unsuccessful cases were due to a number of reasons, but in every instance the name and address of the suggested "prospect" were filed by the company for future effort.

As premiums the successful contestants had the

TABLE SHOWING RESIDENCES WIRED, FIRST NINE MONTHS OF 1913 AND 1914

Period	1913	1914	Percentage of Increase
January to June	359	442	23
June	104	153	47
July	92	149	62
August	82	150	83
September	75	233	210

choice between an electric flatiron, a toaster and a table stove for one house-wiring order and an electric percolator for two house-wiring orders. The cost for the premiums was, of course, very moderate, and there was no other extra expense involved except the original circulars, the advertising space used being that regularly contracted for and occupied week in and week out by the company.

Another phase of the campaign was its direct effect in advertising and promoting the use of electric household appliances. Every premium, it should be remembered, went into the home of a customer and began immediately to produce revenue for the company.

All of the wiring and equipment was installed by local contractors. The campaign demonstrated to the contractors the possibilities in this class of business and has shown them how they can profitably reduce their unit costs with increased volume of work. It also is felt that an important step has been taken toward bringing about co-operative effort in low-price or deferred-payment house-wiring campaigns, should the time come when such effort is thought expedient.

Mr. R. F. Pack is manager of the Minneapolis General Electric Company, and Mr. H. E. Young is sales manager. The newspaper advertising copy for the campaign was prepared by Mr. W. H. Hodge, manager of the publicity department of H. M. Bylesby & Company.

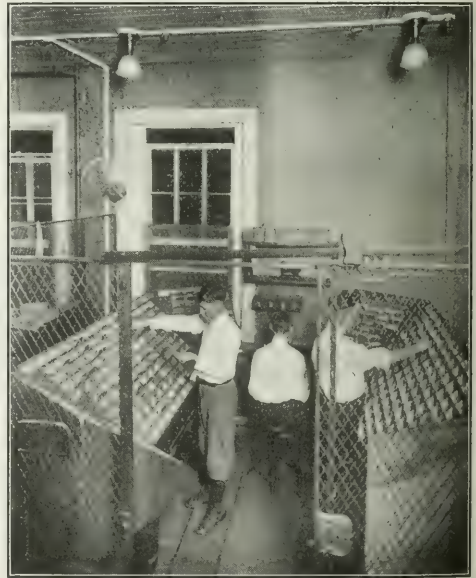
### How to Make Rural Transmission Lines Profitable

Before attempting to supply electricity to rural communities an electric-service company should investigate whether the territory is suited to extensive farming and whether enough prospective customers are available to make a transmission line pay. In his paper on "Extensions of Electric Service in Rural Communities," Mr. James E. Davidson, of the Pacific Power & Light Company, pointed out to the members of the Northwest Electric Light and Power Association assembled in convention at Spokane, Wash., that a company cannot afford to furnish electricity in a rural territory unless the conservatively estimated yearly revenue is equivalent to 50 per cent of the cost of construction of the extension including the usual overhead expenses. Contracts for rural electric service should be closed before construction work is started and then for periods of not less than ten years and preferably for fifteen or twenty years. The author recommended rates made up of a fixed charge based on the maximum peak demand for a season with an additional meter charge

based on the peak demand per month. Irrigation pumping by electricity can be made desirable for consumers and profitable to the central-station company if a large installation is made to serve several land tracts in rotation. Data from actual installations rated at 2 hp to 20 hp were also included covering the number of acres irrigated per horse-power and the cost of energy per acre per annum. The average cost of energy per acre irrigated was \$6.60 a year. By installing motors to pump water and operate farm machinery in the Yakima Valley, Washington, the Pacific Power & Light Company has provided itself with a load which brings in \$50 per hp-yr.

### Stub-Assorting Racks

In order to handle the 6000 or more cash stubs that are received daily in the stub-assorting department of the Consolidated Gas, Electric Light & Power Company of Baltimore, Md., the services of three clerks are required to place the stubs in racks in the proper division of ledgers. The stubs are then later reassorted numerically by folio. For this work the company heretofore had a comparatively flat rack, with divisions the proper



RACKS FOR ASSORTING CASH STUBS

size of a stub but arranged only for a division of 100 ledgers. Owing to the increase in the number of customers, with a consequent increase in the number of ledgers, the number of stubs to be assorted has been considerably augmented. In order that the assortment might be made expeditiously, new racks as shown in the accompanying illustration were designed, each containing 252 compartments. One of the racks is used for electric accounts and the other for gas accounts. The angles on which the cabinets are constructed effect considerable saving in time and labor, as each compartment, No. 1 to No. 252, is within easy reach of the assorter. The racks move on a miniature railway so that they can be brought close to the clerks when assorting or can be pushed back to the extent of three feet so as to provide ample space when the stubs are reassorted numerically by folio.

## Illumination and Wiring

### Lower Telephone Cross-Arm to Reduce Induction

An electric-service transmission company of widespread reputation throughout the Middle Western States has adopted a rather unusual expedient to rid its telephone dispatch circuits of induction troubles. The method was simple, consisting only of changing the

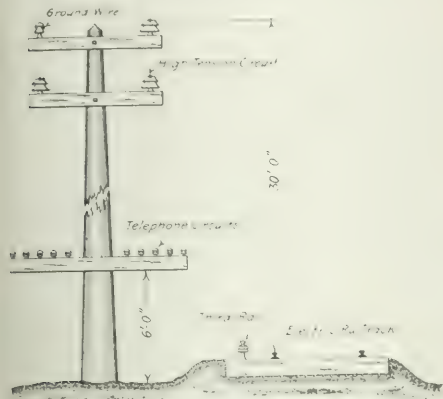


DIAGRAM OF TELEPHONE POLE WITH CROSS-ARM LOWERED TO REDUCE INDUCTION

position of the telephone cross-arm from its usual place a few feet beneath the high-tension circuit to a point on the pole about 5 ft. or 6 ft. above the ground.

Before going to the trouble and expense of moving the cross-arm, all lines were transposed and carefully inspected in an attempt to reduce the noise. It was only when all other attempts had failed that the plan shown in the sketch was successfully put into effect.

### Improved Lighting of a Well-Known Church

BY A. L. POWELL

The Peddie Memorial Baptist Church at Newark, N. J., is a building of most peculiar architecture. The main auditorium is semi-circular and the dome-shaped roof is broken by four circular arches. According to the system of lighting formerly employed, around each of the arches and along the lower front edge of the balcony were gas pipes with open burners spaced every few inches. Although this scheme followed the architectural lines of the building, it was unsatisfactory for a number of reasons. In spite of the multiplicity of light sources (about 100 on the main arch, 50 on each of the three side arches and 75 on the balcony front), the intensity of illumination was too low for comfortable reading. The ceiling is of wood painted dark and hence reflected little light. The natural distribution of the fish-tail gas jet is such that more than one-half of the light flux is directed upward, and hence the percentage of utilization of the emitted light was very low. For igniting the gas use was made of a friction-spark machine which was somewhat antiquated and unhandy to operate. Occasionally gas escaped between the time of turning on the flow and the igniting of the gas at all burners and was diffused through the church.

The church required a moderate intensity of evenly distributed general illumination from lighting units so arranged that annoying images were well out of the ordinary field of vision of both the congregation and the

speaker. A portion of the dome is of glass, and sunlight through this serves to illuminate the center part of the room for the day services. Consideration of the subject, however, showed that it was impracticable to attempt to illuminate the room artificially through this dome, for the glass was of rather dense amber and had a very high absorption, thus requiring an excessive amount of power. Moreover, the construction of the building was such that cleaning of equipment and renewal of the lamps would have been dangerous.

The ceiling is so broken up and of such a dark color that direct lighting units are the only ones suitable for use. The incandescent lamp with bowl-shape reflectors



FIG. 1—REFLECTOR SELECTED

of rather dense opalescent glass met the requirements, and the following system was finally adopted:

At symmetrical points on each of the arches cast-metal gargoyles formerly supported the gas pipe, and the mouths of these ornaments were logical points for the suspension of lighting units. In each arch three 150-watt bowl-frosted tungsten-filament lamps with 10-in. "Sudan" bowl-shaped opal glass reflectors were found to give the correct amount of light. From the center of the dome a 1000-watt high-efficiency tungsten-filament lamp in an ornamental bell fixture was suspended by a chain about 15 ft. in length. This fixture, shown in one of the illustrations, is massive and well proportioned, consisting of a dense opal upper half and a bottom plate of rough crystal glass. The combination directs the light downward as well as providing diffusion. The band and fitter are so designed as to ven-

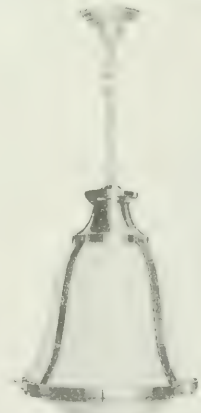


FIG. 2—FIXTURE FOR 1000-WATT LAMP

tilate readily, and the arrangement of metal parts is such that there are no strains to cause breakage.

The great height of the dome caused the problem of cleaning and renewal of this unit to receive attention. After a discussion of the advisability of installing a cable and windlass for lowering the fixture, it was discovered that the glass sections of the dome were removable, and by reaching through these at a convenient



point the fixture might be drawn over and pulled up until within reach. This, obviously, was a simple solution.

Below the balcony were placed at regular intervals light-density opal-glass ceiling bowls with small tungsten-filament lamps. One of the halftones shows the

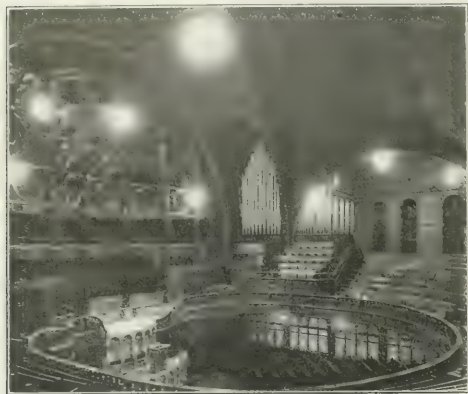


FIG. 3—ILLUMINATION OF AUDITORIUM

resultant illumination to be very even, and observation indicates that an adequate intensity is provided.

From a purely lighting standpoint the three units on the arch in the rear of the pulpit are unnecessary and inadvisable, as they may come within the angle of vision, thus causing discomfort. They were deemed necessary, however, by those having the matter in hand, to secure an architectural balance.

Owing to the fact that the balcony projects over part of the main floor, the power consumption per unit of floor space cannot be accurately expressed. A total of about 3.5 kw. is used, giving a value of less than 0.5 watt per square foot.

In the prayer-meeting room, which is on the ground floor at the rear of the auditorium, combination gas and electric fixtures were originally hung so low that the lamps were only about 6.5 ft. above the floor. Clear



FIG. 4—PRAYER-MEETING ROOM

lamps in crystal-glass shades lightly etched with a flower pattern provided the light. Needless to say, the room was very uncomfortable. An idea of the new installation as it appears at night may be had from an accompanying illustration. Close to the ceiling are placed 60-watt bowl-frosted tungsten-filament lamps

with reflectors of the type previously mentioned but of the proper relative size. The specific power consumption in this room is about 0.5 watt per square foot, and this provides the desirable intensity throughout.

## Letters to the Editors

### The Value of Service in Rate-Making

*To the Editors of the Electrical World:*

SIRS:—The comments of Mr. H. W. Ashley in your issue of Sept. 26 require some explanation. In the first place, he failed to quote in full the conclusions of the N. E. L. A. committee and omitted the recommendation that the value of the service theory of rate-making should not be applied without "giving proper consideration also to the relative cost of service."

In the second place, rates as low as 2 cents per kw-hr. are rarely made for hotels and apartment houses, and finally the statement, "a difference of 400 per cent in the charge made for light and contemporaneous public services rendered 'under similar circumstances and conditions,'" is a most violent assumption. Mr. Ashley entirely disregards the fact that the load-factor of a household load as shown by his own curve is considerably lower than that of the hotel and apartment house load, and that the quantity delivered to a single hotel which may be earning the low rate referred to is probably equivalent to that delivered to from 500 to 1000 houses, each of which requires a service and a meter, and that the cost of maintenance, operation, reading, billing, account keeping and collecting for each house is practically as great as, and in some cases greater than, the cost of service to the hotel. The fallacy of Mr. Ashley's comments lies in the assumption that the service for which there is a difference in rate is made under similar circumstances and conditions.

Salt Lake City, Utah. BAYARD W. MENDENHALL.

### Charge for "Surplus Power"

*To the Editors of the Electrical World:*

SIRS:—I am much interested in the discussion which has taken place in your paper from time to time on the rates for electricity. Quite recently I had a viewpoint submitted to me which is quite interesting, and I should be glad to get the opinion of your readers.

The statement was made that electricity could be supplied to railroads or other large users at a very low price from the equipment of the central station, because it was necessary to have in the central station surplus apparatus for future growth, and since this apparatus was put in for this purpose, any power which might be sold from it could be sold at operating cost plus a profit without any fixed charges being made against it, thus selling at a very low price.

A question in my mind arises as to the correctness of this view. If it be true, what is to prevent the central station constantly increasing its plant, so as to have this surplus power, charging its fixed cost to the smaller consumers and always supplying power to railways or other large users without charging these costs against such users? It would seem to me that this character of business is decidedly unfair, because if these large users—that is, the railway and the large industrial customers—were not in existence, no growth would be necessary and the increased fixed costs which are required by the increased growth would, therefore, not be necessary. Which viewpoint is correct?

Boston, Mass.

HENRY D. JACKSON.

# Field of the Operating Engineer

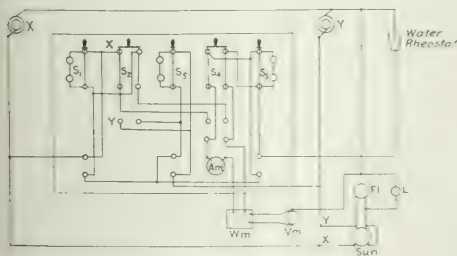
A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

## Grounding Rotary-Converter Frames

Recent troubles due to flash-overs from the positive brush of a rotary converter to the frame when it is grounded have raised a question as to the desirability of grounding the frame. If the negative brush is grounded, a flash from the positive terminal to the frame will be followed by a dynamic discharge of energy. In a paper presented before the convention of the Association of Edison Illuminating Companies it was suggested that it would be better to limit the resistance of the ground connection and in all cases provide a fuse of low rating in the grounding circuit to prevent disastrous results caused by continued and heavy arcing. To warn the operators when a ground-fuse "blows" and prevent anyone running the risk of being shocked by touching the frame it was suggested that some alarm system be used.

## Terminal Board to Facilitate Tests on Polyphase Machines

When polyphase generators or motors are to be tested separately or in parallel considerable difficulty and inconvenience in switching sometimes arises from the complexity of instrument connections unless some simple terminal board is employed. Shown in the diagram



TERMINAL BOARD

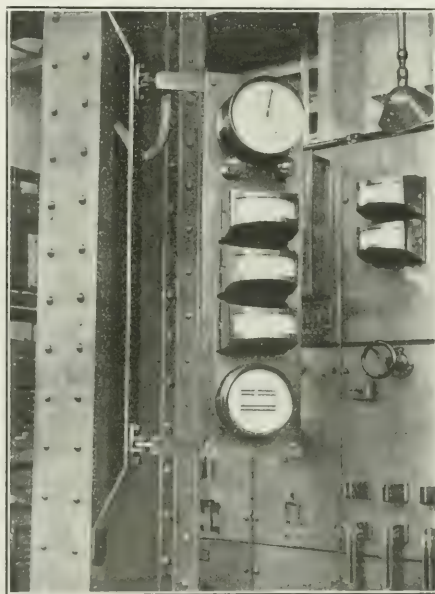
herewith is a combined terminal and switchboard which permits of testing anything up to a three-phase machine without the possibility of short-circuiting phases when switching. This board can be employed in conducting general-characteristic or synchronizing-characteristic tests. One ammeter and one voltmeter can be used for reading current and potential values in any phase.

On the lower part of the board are four pairs of plug sleeves which are connected with the double-blade, double-throw, and single-blade, single-throw switches and synchronizing lamps as shown. The only external connections on the board are made by inserting plugs in these sleeves. The set-up shown herewith is for determining the synchronizing current flowing between two machines X and Y under different conditions of load. For synchronizing with lamps (considering X as the incoming machine) all of the switches are left as shown with the exception of  $S_1$ , which is opened. The machine voltage is regulated and the speed is adjusted until the lamps shunting  $S_1$  flicker very slowly;

the switch can be closed when the lamp is dark. If it is desired to measure the synchronizing or exchange current  $S_1$  and  $S_2$  should be thrown into the lower position when the lamps are dark. The voltage across the operating machine can be determined by placing  $S_3$  in the upper position, while that across the incoming machine can be measured by throwing  $S_4$  down and  $S_5$  up. The operation of this board for different purposes can be easily determined by studying the permanent connections.

## Flexible-Switchboard Instrument Mounting

At the Bonny Eagle generating station of the Cumberland County Power & Light Company, in Maine, a convenient flexible bracket illustrated in the accompanying photograph is used at the side of the main switchboard. As the latter is installed just behind a row of



FLEXIBLE INSTRUMENT MOUNTING

columns separating the generator room from the bays containing the step-up transformers, bus and oil switch compartments, the usual mounting of the synchroscope, frequency indicator and three edgewise voltmeters on a stiff bracket at the end of the panels would render them less conveniently seen from the floor of the operating room than is now the case. By attaching the instruments to a panel carried on hinges by two pieces of 2-in. by  $\frac{3}{8}$ -in. strap-iron, and mounting the hinges on a third strip provided with offsets at top and bottom and

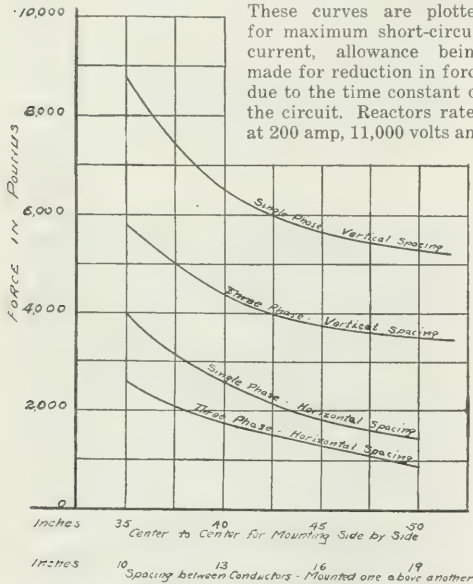


bolted by  $\frac{3}{8}$ -in. bolts to the steel column at the ends, with swinging cable connection to the instruments, the latter can easily be seen from points in the operating room proper, and if necessary can be swung toward any one of the generators which may be going into service on the bus.

### Mutual Forces Between Reactors

The forces exerted between reactors during current surges may be either attractive or repulsive, this depending on the connection of the coils. If energy from a three-phase circuit is fed into the reactors similarly, the net force will be attraction. If the connections of one coil are reversed, the net force will be repulsion. The actual forces exerted between coils during short-circuits are shown by the accompanying curves, presented originally before the American Electric Railway

Engineering Association. These curves are plotted for maximum short-circuit current, allowance being made for reduction in force due to the time constant of the circuit. Reactors rated at 200 amp, 11,000 volts and



FORCES BETWEEN REACTORS WITH MAXIMUM SHORT-CIRCUIT CONDITIONS

5 per cent reactance were considered in compiling the data. In all cases greater force is exerted between coils when they are mounted one above the other than when spaced horizontally. A single-phase short-circuit produces the most intense stresses. The supporting structure of a reactor should be designed to withstand twice this force, however, as it may exist if the short-circuit occurs when the instantaneous voltage is zero.

### Effect of Internal Characteristics of Transformers on Load Division and Wattless Currents

When transformers having the same rated voltage are connected in parallel they will share a load inversely as their respective impedances. The wattless current which will flow between units is determined by their relative ratios of internal resistance to reactance. It can be seen, therefore, that if units of different manufacture have to be used ample consideration should be given to their internal characteristics.

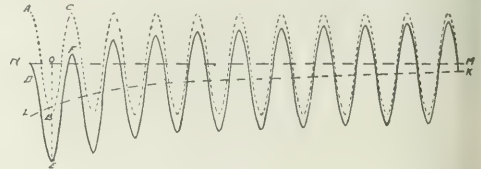
In a paper presented recently before the American

Electric Railway Engineering Association, it was stated that reactance in the transformer circuit causes a phase displacement in the delivered voltage by the amount of the reactive drop, which lags 90 deg. behind the current in the transformer. Resistance, on the other hand, causes a drop in voltage in phase with the transformer current. A change in the ratio of reactance to resistance will therefore affect the amount of wattless current carried by each unit.

Taking an extreme case of two transformers in parallel, one with an impedance made up chiefly of reactance and another mostly of resistance, the resistance drop in the latter would have to be equal to the reactive drop in the other; therefore the transformer currents would be approximately at right angles. The numerical sum of these currents would be considerably larger than their vector sum, which is the total load current. In other words, each transformer would be carrying a wattless current in addition to its load current. In practice, however, the difference between the ratios of reactance to resistance in different transformers is not usually large enough to cause a large wattless current to flow.

### Effect of Stored Magnetic Energy on Maximum Short-Circuit Current

The maximum possible peak value of a short-circuit current may be anything up to twice the value of the steady short-circuit peak, depending on the amount of stored magnetic energy in the circuit at the instant the short-circuit occurs. The stored energy will be maximum when the steady current is maximum, and since



SHORT-CIRCUIT CURRENT WAVE SHOWING DISPLACEMENT

the power-factor is zero during short-circuit, it will occur when the instantaneous voltage is zero. As pointed out in a paper presented recently before the American Electric Railway Engineering Association, the effect of stored energy is to displace the sinusoidal or steady short-circuit current wave, but owing to the time constant of the circuit which determines the dissipation of stored energy, the maximum peak is reduced about 10 per cent of its theoretical value. The accompanying illustration shows a current wave which is displaced the maximum amount from the axis of reference.

### Locating Faulty Insulators with a Megger

Is a megger suitable for locating faulty insulators under all conditions? O. S. G.

A megger is very often ineffective in locating faulty insulators which are thoroughly dried out. We have in mind an extensive test of insulators on a large transmission system some of which a megger test indicated had infinite resistance. The insulators, however, punctured internally on a break-down test before the potential was raised to the spark-over value. Moisture or dust on an insulator might cause a megger to indicate a low resistance and result in the scrapping of a sound unit. The megger has been used quite extensively, however, and is still being used with good results for detecting faulty insulators.

# Digest of Current Electrical Literature

Abstracts of Important Original Articles Appearing  
in the Periodical Electrical Press of the World

## Generators, Motors and Transformers

**Calculation of the Magnetizing Current of Three-Phase Induction Motors.**—S. PARKER SMITH AND W. H. BARLING.—It is shown how the large error introduced into the calculation of the magnetizing current by assuming a sinusoidal flux distribution can be avoided by simply taking the magnetic path one-third of the way along the pole-pitch, instead of at the middle, as usual. The several steps in the calculations of the magnetizing current are as follows: (1) Find the main flux  $\Phi_{max} = \frac{E_{10}}{k f T}$ . (2) Find

the areas and lengths of the various parts of the magnetic circuit. (3) Find the flux density in the teeth and gap at  $\Theta = 60$  deg. (namely, 1.36 times the mean flux density in the respective parts) and the corresponding ampere-turns. (4) Similarly, find flux density in cores in usual way and the ampere-turns needed to drive flux over two-thirds of the pole-pitch. (5) Sum up the several ampere turns to find  $AT$  at 60 deg. and calculate the magnetizing current from  $I = \frac{AT}{2.24 qu}$  amp, where  $q$  = number of slots per pole and phase and  $u$  = number of conductors per slot.—*London Electrician*, Oct. 16, 1914.

**Railway Motors.**—R. E. HELLMUND.—The continuation of his article on considerations in the design of railway motors. In the present instalment the author deals with bearing housings, axle caps, bearings, dust guards, shafts, gear case and case support, the gear and pinion, the commutator cover and axle collars.—*Elec. Journal*, November, 1914.

## Lamps and Lighting

**Brightness Measurements.**—A. G. WORTHING AND W. E. FORSTHE.—In brightness measurements made with the Holborn-Kurlbaum optical pyrometer a source of error was discovered due to diffraction at the filament of the pyrometer lamp of the light from the background. In some cases in measuring brightness errors as great as 60 per cent may occur, though in temperature measurements the corresponding errors would be much less. Determinations were made of the ratio of the brightness of the pyrometer filament to the brightness of the image of the background formed in the same plane. The use of large filaments as pyrometer filaments and large angles for the entrance-cone angle tends toward making the pyrometer filament less bright than the background image when an apparent match is obtained; conversely, small filaments and small angles for the entrance-cone angle tend toward making the pyrometer filament brighter than the background image for an apparent brightness match. Some necessary working precautions and some desirable working conditions are considered.—*Phys. Rev.*, September, 1914.

**Neon Tubes.**—GEORGES CLAUDE.—A brief French Academy paper on the influence of the diameter on the potential difference at the terminals of neon tubes.—*La Houille Blanche*, June, 1914.

**Search-Lanterns.**—An illustrated note on automobile search-lanterns used by the French army.—*London Elec. Review*, Oct. 23, 1914.

**Flame-Arc Electrodes.**—H. STAFFORD HATFIELD.—A paper read before the German Bunsen Society. Since Bremer invented his arc lamp, characterized by the use of calcium fluoride for the arc production, many have tried to discover new "lighting salts." A distinction must be made between salts which color the arc and salts which produce a large candle-power. The former result can be accomplished by almost any metallic salt which evaporates. But as soon as metallic salts are introduced into the arc the crater disappears almost completely and the white light radiation ceases. With the

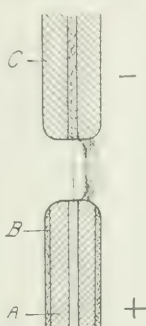


FIG. 1—FLAMING  
ARC ELECTRODES

use of calcium fluoride this loss is compensated by the reduction of the voltage at the arc and by the radiation of yellow light in quantities far superior photometrically to the white light given out by pure carbon electrodes for the same current. It is curious that no other salts have been found which have the same efficiency. The white flame-arc electrodes in which magnesium fluoride and cerium fluoride are used are not nearly so efficient as electrodes for yellow light. This is due partly to physiological reasons. Lewis has recently devised a flame-arc lamp in which the positive electrode is covered by an outside cylindrical layer of illuminating salts, which protect the inner electrode core against the oxygen of the air so that the consumption is reduced. This is shown in Fig. 1, where A is a homogeneous carbon electrode and B a layer of lighting salts (a mixture of calcium fluoride, sodium, tungstate and potassium chromate). The arc is quiet when it starts from all points of the positive electrode. The effect is chiefly due to the fact that on the carbon terminals "there is formed a kind of cover which is easily wetted by the fused lighting salts so that there is an abundant supply of the salts to the arc. There is no accumulation of slag." The negative electrode is an ordinary homogeneous carbon with a central core. The composition of the core is of importance but does not differ greatly from the usual composition. These electrodes must be used vertically. The life of one pair of electrodes is from forty to fifty hours. The specific consumption, including the series resistance for direct current, is 0.14 watt per candle.—*Zeit. f. Elektrochemie*, Oct. 1, 1914.

## Generation, Transmission and Distribution

**Excitation and Voltage Control in Power Plants.**—J. A. JOHNSON.—The Ontario Power Company has recently developed and put into successful operation a new system of excitation and voltage control, the fundamental feature of which is the use of a separate individual exciter and automatic voltage regulator for each of its main generators, instead of the usual system of a single central direct-current plant common to the entire installation. Other power plants have adopted the same practice.—*Elec. Journal*, November, 1914.

**Electric Cranes in Copper Refineries.**—An illustrated article on the use of electric cranes in electrolytic cop-



per refineries for placing anodes in the electrolytic tanks and removing the refined copper cathodes.—*Met. and Chem. Eng'ing*, November, 1914.

**Blast-Furnace Gases.**—J. E. JOHNSON, JR.—The first part of a fully illustrated article on the gas from blast furnaces, its cleaning and utilization.—*Met. and Chem. Eng'ing*, November, 1914

#### Installations, Systems and Appliances

**Trier.**—H. HENNEY.—The first part of an illustrated article on the electric central station of the city of Trier in Germany. The steam-power plant was equipped originally in 1902 with two dynamos of 180 kw and 300 kw respectively for the supply of both lighting energy at 440 volts and traction energy at 1600 volts. When the street railway was opened, a steam turbine was installed with two generators for the supply of lighting and traction energy. Besides the direct-current system with distribution at  $2 \times 220$  volts with earthed neutral wire, there is also a three-phase distribution system. For this purpose two three-phase generators are provided of 1500 kw and 1850 kw respectively, giving 5000 volts at fifty cycles. The article is to be continued.—*Elek. Kraft. u. Bahnen*, Oct. 14, 1914.

#### Wires, Wiring and Conduits

**Testing High-Tension Cables.**—LEON LICHTENSTEIN.—Stranded three-phase cables at 30,000 volts and single-phase cables at 60,000 volts have been in commercial use for some time. Every length of cable made is first tested in the cable works itself in order to find any accidental weak points. The author thinks that for this purpose testing with double the normal voltage is sufficient. After the cables have been placed in the ground they are again subjected to a test. In this case the author thinks that a test at 50 per cent above normal voltage is fully sufficient. This necessitates for 40,000-volt cables the use of 60,000 volts for testing. The author gives figures which show that the weights of transportable testing plants for this purpose become enormous, and he suggests that for this test high-tension direct current obtained by the method of Delon would be preferable. A transportable 10-kva Delon converter is in commercial use by Siemens-Schuckert company. The principle of the Delon converter is shown in Fig. 2. It consists essentially of a revolving insulated

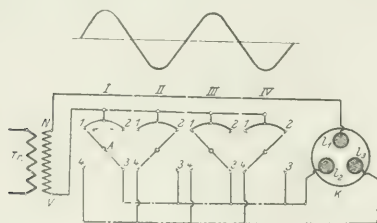


FIG. 2.—DIAGRAM SHOWING ARRANGEMENT OF TRANSPORTABLE DELON CONVERTER

metallic arm which while revolving passes along a number of isolated metallic electrodes. A is the revolving arm rotated about its center point and 1, 2, 3, 4 are the fixed electrodes. I, II, III, IV represent four successive positions of the arm A in relation to the fixed electrode. One pole V of the high-tension transformer  $T_r$  is connected to the fixed metallic electrodes 1 and 2. The other pole N is connected to the conductor  $l_1$  of the stranded three-phase cable K. The metallic electrodes 3 and 4 are connected to the two other conductors  $l_2$  and  $l_3$ , respectively, of the three-phase cable. The arm A rotates synchronously with the alternator feeding the transformer and makes in position I connection between

1 and 3, then in position II connection between 2 and 4, and so on, so that the pole V of the transformer is alternately connected to  $l_1$  and  $l_2$  respectively. There is not a direct contact between A and 1, 2, etc., but the gap is bridged by a spark. The position of the electrodes 1, 2, 3, 4, is so chosen that the rotating arm makes connection just in those instances in which the voltage curve of the transformer has a maximum. The author describes what happens if a cable is being charged by this method. While the cable is being charged the contact  $l_1$  gets all the time positive charges and the contact  $l_2$  all the time negative charges, while contact  $l_3$  gets charges alternately changing in sign. The final result is that if the transformer voltage is 50,000 volts effective, the voltage between  $l_1$  and  $l_2$  will be  $50,000 \times 2 \times \sqrt{2}$ —that is, about 140,000 volts—while between the contacts  $l_1$  and  $l_3$  and between  $l_2$  and  $l_3$  the voltage will be half this amount—that is, about 70,000 volts. The article is to be concluded.—*Elek. Zeit.*, Oct. 8, 1914.

**Earth Connections.**—FRANCIS H. DAVIES.—An article giving brief illustrated descriptions of various methods of making earth connections.—*London Elec. Review*, Oct. 16, 1914.

#### Electrophysics and Magnetism

**Thunderstorms.**—W. J. HUMPHREYS.—The first part of a comprehensive and fully illustrated paper on the thunderstorm and its phenomena and the origin of thunderstorm electricity.—*Journal Franklin Inst.*, November, 1914.

**Electric Resistance of Metals at Very Low Temperatures.**—L. SCHÜLER.—An illustrated review of the work of Prof. H. Kamerlingh-Onnes on the resistance of metals at very low temperatures (produced by the use of liquid helium). Planck's and Nernst's theoretical conclusion that the electric resistance of absolutely pure metals vanishes at absolute zero temperature was confirmed by Kamerlingh-Onnes experimentally for pure mercury. "At a temperature of 4.2 deg. absolute the resistance of the mercury was about 0.002 time the value at the freezing point of mercury. By decreasing the temperature below 4.2 deg. absolute there was within a few hundredths of 1 deg. a sudden decided drop of the resistance to less than 0.000001 time of the value at the freezing point. At the lowest temperature

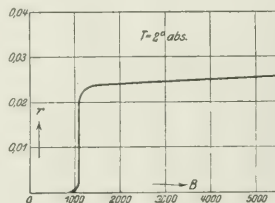


FIG. 3.—VARIATION OF RESISTANCE WITH FIELD STRENGTH AT 2 DEG. ABSOLUTE

reached in the experiment (1.8 deg. absolute) the resistance was about 0.000000001 the value at the freezing point." The new condition in which the mercury is below 4.2 deg. absolute is called by Kamerlingh-Onnes "superconductivity" (Ueberlistfaehigkeit). Similar sudden drops in the resistance were obtained with tin at 3.8 deg. absolute and with lead at 6 deg. absolute. A very curious observation was made which seems to indicate that the superconductivity of metals at low temperature is effected by magnetic flux. The result of a decisive experiment are shown in Fig. 3. At a constant temperature of 2 deg. absolute the resistance of a bifilar-wound lead coil was measured in a magneti

field which could be adjusted. The curve shows the resistance to be zero as long as the magnetic flux density is below 1000 gauss, but then it suddenly assumes a definite value which thereafter increases further with increase of the flux.—*Elek. Zeit.*, Oct. 8, 1914.

#### Electrochemistry and Batteries

**Electrical Process for Detarring Gas.**—F. W. STEERE.—An American Gas Institute paper on a process which differs from the Cottrell process in that alternating current is used directly without being converted into high-tension direct current. The gist of the process is this: It is practically impossible in mechanical extractors to free the gas from tar in the extremely fine state of subdivision which naturally results from rapid condensation. But there is no difficulty in removing relatively large drops. Now the electrical treatment simply converts the fine mist into large drops. The gas is subjected to an electrostatic treatment in the "ionizer" operated by alternating current, and the result of this treatment is that the fine mist of minute tar globules is agglomerated into large drops. The gas with the large tar drops is then swept into some form of mechanical extractor where a complete removal is effected with very little power loss. The process is now in commercial use at the plant of the Ford Motor Company at Detroit for cleaning the producer gas driving its large gas engines.—*Met. and Chem. Eng'g*, November, 1914.

**Calcium Carbide.**—BESNARD.—An illustrated article giving some details of the design and construction of electric furnaces for manufacturing calcium carbide.—*La Houille Blanche*, June, 1914.

#### Units, Measurements and Instruments

**Quality Test for Sheet Insulation.**—PHILLIPS THOMAS.—In the course of development of a new type of sheet insulation it became apparent that no means of accurate discrimination in quality between closely similar sam-

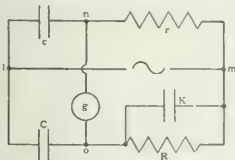


FIG. 4—PARALLEL-CAPACITY POWER-FACTOR BRIDGE

ples was at hand. The author developed a bridge method of comparing the capacity and the power-factor of two condensers, one of them containing the insulation the quality of which is to be determined. The arrangement is shown in Fig. 4.  $C$  represents a condenser of known and variable capacity, and  $K$  a standard subdivided microfarad, the power-factors of  $C$  and  $K$  being known.  $R$  and  $r$  represent non-inductive resistors and  $c$  the condenser to be tested. This latter consists of the insulation sample, held between two conducting surfaces. An Einthoven string galvanometer is represented by  $g$ . The routine of making a test is as follows: Alternating current of proper voltage and frequency is applied at points  $l, m$ . With  $K$  disconnected, the resistances of  $r$  and  $R$  are varied until a minimum deflection is read on  $g$ . Then  $C$  is adjusted until  $r$  and  $R$  are as nearly equal and as large as possible when the deflection of  $g$  is minimum. Then  $K$  is connected as shown and varied until a second minimum is obtained on  $g$ . Retaining  $K$  at above value, the values of  $R$  and  $r$  are slightly altered in succession until a third minimum deflection is found. This final deflection may be made as small as desired, by dividing  $R$  and  $r$  into sufficiently small steps. When a satisfactory balance has

been secured, the values of  $K, r, R$  and  $C$  are read, and the phase-angle of condenser  $C$  is found from the formula  $\tan \Theta = \frac{l}{2\pi f R K}$  where  $f$  is the frequency. The per cent power-factor of the sample is then  $100 \cos \Theta$ .—*Elec. Journal*, November, 1914.

#### Telegraphy, Telephony and Signals

**Protection of Telephone Circuits.**—W. A. DARRAH.—Three essential elements including the principal components of protection for telephone circuits against hazards from other electric circuits are as follows: Open space cutouts (sometimes called spark-gaps), heat coils and fuses. Moreover, there are three general divisions of telephone apparatus requiring protection as follows: First, subscriber station apparatus; second, central office (telephone exchange) apparatus, and, third, cables (submarine, underground and aerial). The protection to be employed at these three places is discussed in detail.—*Elec. Journal*, November, 1914.

**Electric Signal System in Heating and Ventilating Installations.**—EDUARD GOLDBACHER.—The first part of an illustrated description of the electric signal system in use to control the heating and ventilation equipment of a hospital in Vienna. The temperatures are recorded at a central point by the use of electric resistance pyrometers. Electric manometers are used for recording the pressures of the steam. If the pipe burst indication is at once made in the central office where the humidity in different rooms of the hospital is also electrically recorded.—*Elek. u. Masch.* (Vienna), Oct. 4, 1914.

## Book Reviews

**THE RAILWAY LIBRARY, 1913.** Compiled and edited by Slason Thompson, director of the Bureau of Railway News and Statistics. Chicago, Ill.: R. R. Donnelley & Sons Company. 469 pages, Price, 50 cents.

This is a collection of noteworthy addresses and papers dealing with the railway issue, principally delivered or published during 1913. It is a continuation of similar publications of the Bureau of Railway News and Statistics. The first number was issued in 1909, and one has been issued each year since that time. Many of the articles are on subjects that touch intimately the public policy issues that confront all classes of public utilities.

**LE TÉLÉPHONE INSTRUMENT DE MESURE.** By Augustin Guyau. Paris, France: Gauthier-Villars et Cie. 162 pages, 50 illus. Price, 2.75 francs.

An excellent little treatise on the use of the telephone receiver as an electrical measuring instrument. The instrument is discussed from the experimental and mathematical points of view. The author has not only investigated the apparatus as an acoustical alternating-current galvanometer but he has also developed it as a particular form of vibration galvanometer, using optical interference for measuring the extent of the vibration. The book is divided into five chapters relating to the following topics: Constants of the telephone receiver; the receiver as an indicator of maximum or minimum; interference oscillographs; conditions of operation and computation for an interferential oscillograph, and movement of the telephone diaphragm. The style is that of the engineer rather than that of the mathematician or physicist. The book will be of interest to students of telephony and of alternating-current measurement.



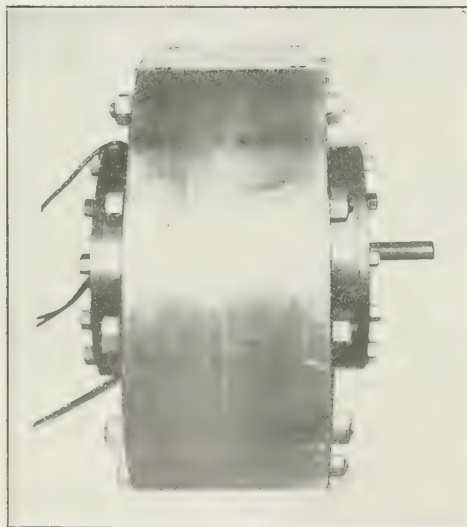
# New Apparatus and Appliances

An Illustrated Descriptive Record of Recently Developed  
Manufactured Products of Interest to Electrical Readers

## Submarine Signaling Device

Illustrated herewith is an electrically operated oscillator which was made by the Submarine Signal Company, Boston, Mass., for sounding, determining the proximity of icebergs and sending and receiving telephonic and telegraphic messages under water. By using one of these devices for sending and a microphone for receiving it is declared that a submarine telegraphic message has been sent 31 miles. If an oscillator is also employed for receiving, it becomes possible to signal over longer distances. Claims have also been made that with six dry cells and an ordinary transmitter in series with the oscillator conversation has been carried on between stations 400 yd. apart.

The device, which is about 20.5 in. in diameter by 15



OSCILLATOR FOR TRANSMITTING AND RECEIVING SUBMARINE MESSAGES

in. thick and weighs 850 lb., is very rugged and requires hardly any attention. It consists of a heavy diaphragm 1 in. thick, which is made to vibrate by being attached to the axis of a copper cylinder sliding in a gap across which a high-frequency magnetic flux is induced. Surrounding the cylinder but separate from it is a split solid-iron ring inclosing an annular coil which causes a constant unidirectional flux to pass through the center of the ring and across the copper cylinder. The reluctance of the magnetic path is minimized by a stationary solid-iron core inside the cylinder.

In grooves on both ends of the core are oppositely wound coils through which 500-cycle alternating-current energy is allowed to flow for signaling purposes. This sets up an alternating flux across the air-gap and through the copper cylinder which causes it to jump to

and fro at the same frequency. The vibration is imparted to the water, which is the transmitting medium, by the diaphragm attached to the cylinder. While this apparatus is built to consume 35 kw it can be operated by an ordinary telegraph key without excessive sparking, as the circuit is practically non-inductive. For determining the depth of water and the distance to a large body like an iceberg time is counted from the sending of a signal until an echo is heard. The distance is then a function of the time.

## Electric Floor-Lamp Fixture

The floor-lamp fixture shown herewith is 5 ft. 4 in. high and has been designed especially for reading purposes. The shade is of hand-woven reed, lined with silk, and is 20 in. in diameter. The fixture is equipped with cord and plug and two pull-chain sockets for 40-watt tungsten lamps. It may also be used with one pull-chain socket for a 100-watt lamp.

The floor-lamp fixture described above is being placed on the market by the Federal Sign System (Electric), Chicago, Ill.



## Electrically Illuminated Revolving Barber Pole

In the accompanying illustration is shown a barber's pole equipped with glass cylinder and globe inside each of which is an electric lamp. The cylinder is decorated in brilliant colors of baked enamel and is revolved by a spring motor. It revolves an entire day with one winding. The pole is being manufactured by the Theo. A. Kochs Company, Chicago, Ill.



## Adjustable Lamp Holder

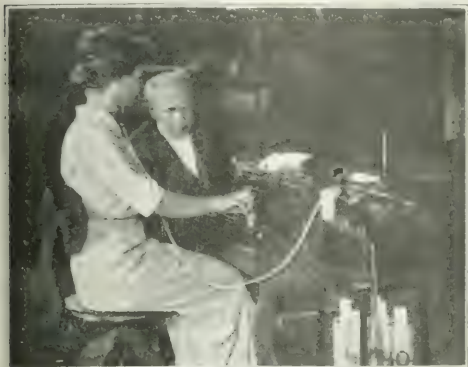
The lighting fixture shown herewith is equipped with three pairs of disks which are so placed that they act as a universal joint. These disks are hollowed in the center and thus have a bearing only on the outer portion of the face. The hollow space between each pair of disks is filled with graphite paste which provides permanent lubrication. The surplus cord is automatically taken up by means of a coil spring. A telescoping rod is inclosed in a metal tube, on the end of which is screwed a cap containing packing which bears on the rod. A brass clamp is provided for holding the lamp and shade, and it can be tilted at any angle.

The fixture is being made by the Adjustable Light Holder Company, 828 Broad Street, Newark, N. J.



### Dictaphone Controlled from Typewriter Keyboard

A dictating machine has recently been developed by Thomas A. Edison, Inc., which is electrically controlled from the keyboard of the transcriber's typewriter. By touching a button the operator can run over the record as often as desired without removing the hand from the

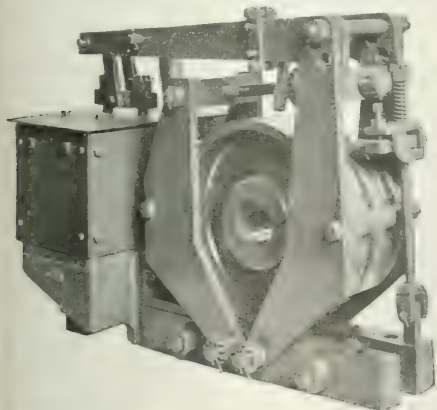


TESTING THE "TRANSAPHONE"

typewriting machine. In this way the typewriter operator may operate her machine without removing her eyes from the typewritten page. The arm of the "transaphone," as the machine is called, is moved back by means of a magnet.

### Automatic Solenoid Brake

Automatic solenoid brakes operating on either alternating current or direct current and designed for use with cranes, hoists, lift bridges, etc., have recently been placed on the market by the General Electric Company, Schenectady, N. Y. These brakes may be mounted on the floor or attached to the motor. When used with motors with ratings of 50 hp and higher the two base



ALTERNATING-CURRENT AUTOMATIC SOLENOID BRAKE

bars which support the brake are bolted to brackets. The two plate yokes which support each shoe are hinged at the lower end to the base bars and act as levers for applying the necessary pressure to the shoes to make the braking effective.

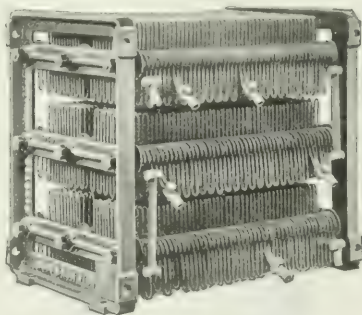
The energy for operating the brake is transmitted to the free or top ends of the yokes through horizontal

levers, which are attached to the movable element of the solenoid by means of links. When the solenoid is energized the movable element is forced up to the end of its travel and the brake is released. When the coil is demagnetized the brake is set by gravity.

The brake is equipped with a solenoid air-gap adjuster designed to maintain constant the distance between the upper and lower cores of the solenoid when the brake is on. The adjustment is made by means of a ratchet wheel, pawl and adjustment rod shown in the accompanying illustration. A shoe clearance adjuster is also provided for maintaining the clearance of the shoes constant. The solenoid used with the brake is of the inclosed, ventilated, rain-proof type and is equipped with a floating top core. With direct current a series-wound coil is used in crane work. Alternating-current solenoids are shunt-connected. Coils are designed for pressures as high as 2200 volts and for frequencies of from twenty-five cycles to sixty cycles.

### Continuous Grid-Type Resistor

The resistor shown in the accompanying illustration is made of strong drawn wire and, instead of being built up of single or separate grids, each section is made in one continuous length. Each terminal is fastened to a loop of the section by a bolt and nut which forms an integral part of the resistor. It is claimed that the resistor is unbreakable, has a temperature-



CONTINUOUS GRID-TYPE RESISTOR

resistance coefficient similar to that of cast iron, and has good radiating properties and therefore may be heavily overloaded. The resistor is being made by the Electro-Mechanical Brake Company, West Bromwich, England, for which the Elleon Company, 50 Church Street, New York, is the American selling agent.

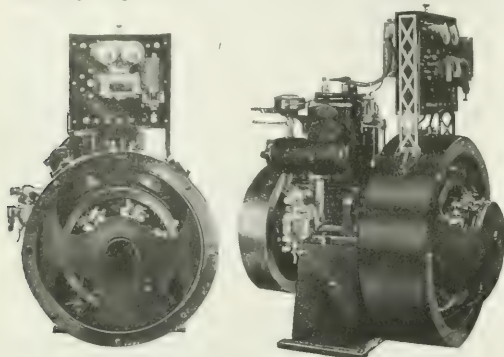
### Self-Contained Generating Outfit

A small generating unit consisting of a 1.25-kw, six-pole direct-current generator directly connected to a 3-hp four-stroke-cycle single-cylinder gasoline engine has recently been developed by the Regal Gasoline Engine Company, Coldwater, Mich. The field frame of the generator forms part of the engine-crank case. The set is operated at a speed of 500 r.p.m. The oiling system is automatically operated, the flow of oil starting when the engine starts and stopping when the engine stops. The switchboard is compact and is mounted on top of the generator as shown in the accompanying illustration. It is made of two panels of asbestos wood and the wiring is concealed between the panels. Mounted on the board are a voltmeter, an ammeter, two pilot lamps,



automatic high-voltage and low-voltage cutouts and a starting button. The high-voltage cutout can be adjusted so that it automatically stops the engine when the battery voltage has been charged to a certain desired value. The low-voltage cutout automatically stops the engine and disconnects the battery

oven is maintained uniform automatically by a steam-pressure diaphragm which interrupts or closes the circuit as the pressure varies. The oven can be made to start cooking anything at a predetermined time by setting the time switch which is furnished with the apparatus.

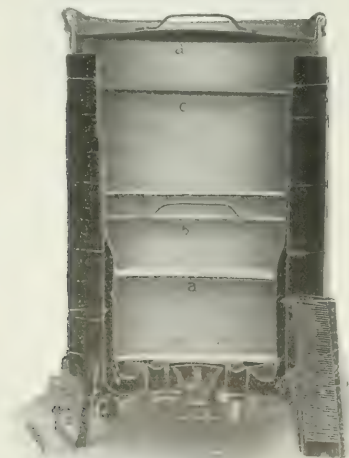


SMALL SELF-CONTAINED GENERATING OUTFIT

when the engine's speed slows down so that the voltage of the generator becomes lower than that necessary to charge the battery. In starting, the generator is used as a motor.

### Automatic Electric-Steam Oven

An electric oven which is heated with steam generated by an electric heater in the base is being manufactured by the Berkeley Electric Cooker Company, 282 Monadnock Building, San Francisco, Cal. The cooker consists of a copper cylinder with double walls between which is a small quantity of water which is turned into

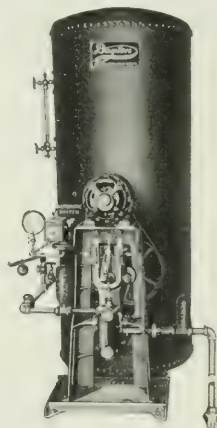


CUT SECTION OF AUTOMATIC ELECTRIC STOVE

steam when energy is supplied to the heater. Insulating the outer wall of the cylinder from radiation is a layer of fire-resisting, non-conducting material held in place by a Russia-iron casing. Inside the cylinder are four compartments for aluminum cooking receptacles. After electricity is turned on, the temperature of the

### Automatic Motor-Driven Pump

One of the features of the electrically operated pump illustrated herewith is the method of mounting the motor and switching apparatus above the pump, where it may be kept free of damp cellar walls and floors. When the pressure in the tank is 40 lb. per sq. in. the motor is automatically cut off; then when the pressure falls to 25 lb. per sq. in. it is automatically restarted. The pump is double-acting and is rated at 275 gal. per hour. It is operated by a 0.25-hp motor, which is connected by a 1.5-in. belt to the pump. The pump, motor and switch are mounted on a cast-iron frame. Either a tank with a capacity of 220 gal. or one with a capacity of 315 gal.



ELECTRICALLY OPERATED AUTOMATIC PUMP

is used, the dimensions being 30 in. by 6 ft. and 36 in. by 6 ft. This pump is being made by the Dayton Pump & Manufacturing Company, Dayton, Ohio.

### Transmission-Line Calculator

In the *Electrical World* of July 15, 1911, was described an alternating-current transmission line calculator designed for the rapid calculation of voltage drop in alternating-current circuits. This device has been greatly enlarged so as to cover more extensively the field of transmission and distribution. In its new form the calculator consists of a threefold morocco-leather volume of quarto size (8.25 in. square), containing separate diagrams for sixty-cycle and twenty-five-cycle work. Each diagram is laid out for four different spacings of conductor and is equipped with a revolving transparent disk. The diagrams have been doubled in diameter so that the various scales are more open and therefore more easily read than those of the first edition, while at the same time they have been expanded so as to include a wider variety of operating conditions.

For transmission at ordinary voltages quadrants are provided for 18-in., 36-in. and 60-in. spacing of conductors. It is possible by means of the spacing an frequency conversion chart to make determinations for

any spacing up to 100 in. and also for any frequency up to 100 cycles per second. For the benefit of those engaged in mill work quadrants have also been included for 6-in. spacing, and with this same work in mind the circular scales have been extended so as to include loads

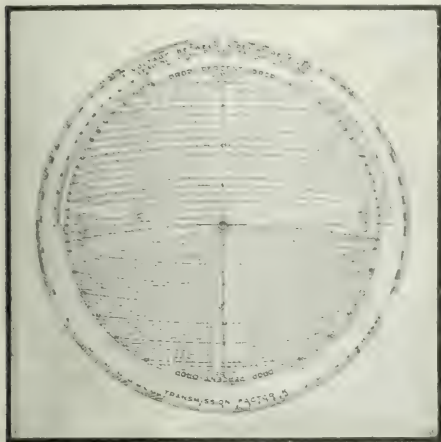


DIAGRAM OF TRANSMISSION-LINE CALCULATOR FOR SIXTY-CYCLE WORK

as low as 1 kva, voltages as low as 100 volts and distances as small as 100 ft.

A new provision has been made for the calculation of the energy loss in a circuit, whereby it can be read at a glance together with the voltage drop. Other new features are the adaptability of the calculator to current determination, leading power-factors, transformer regulation and direct-current work, and also a special wire table which gives costs of bars and weatherproof wire as well as the usual information as to weights and ampere capacity.

The calculator described above is being placed on the market by Robert W. Adams, 180 Taber Avenue, Providence, R. I.

### Pull-Switch Rosettes

The pull-switch rosettes shown in the accompanying illustrations are equipped with male and pendent "Fluto" caps. These caps are  $\frac{1}{8}$  in.,  $\frac{1}{4}$  in. and  $\frac{3}{8}$  in. in diameter. The rosette in this form, the manufacturers declare, really becomes a 250-watt feed-through



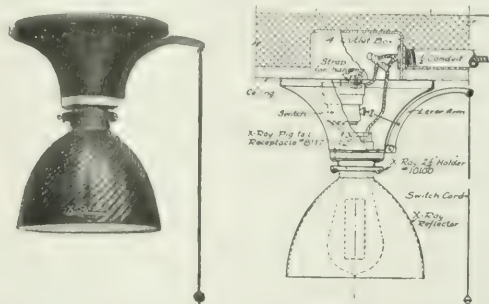
ROSETTES EQUIPPED WITH PULL SWITCHES

switch. The various sizes of caps make the rosette convenient for attaching to small devices such as semi-direct fixtures, heating appliances, etc. Each switch is equipped with 10 ft. of black cord and a composition ball. Pass & Seymour, Inc., are manufacturing the rosettes described above.

### Ceiling Fixture with Pull-Switch Attachment

Illustrated herewith is a ceiling fixture which can be attached to a fixture stud or to the lugs on any standard outlet box without employing an insulating joint. One very desirable feature of the fixture is the switch and lever-arm attachment which enables the individual unit to be controlled independently of all others on the circuit. The switch is not an integral part of the socket, and hence the fixture may be furnished with or without the mechanism. Three types of shade holders have been developed for use with the fixture.

When it is desirable to suspend the reflector at some distance below the ceiling a cap with a center-bushed

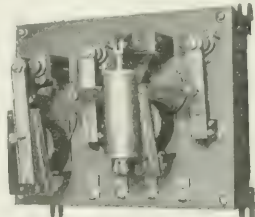


FIGS. 1 AND 2—EXTERNAL AND INTERNAL VIEWS OF CEILING FIXTURES

opening can be employed instead of the holder shown. The reflector is then attached by a standard shade holder to a brass-shell socket at the end of a drop cord. The fixture is being manufactured by the National X-Ray Reflector Company, 235 West Jackson Boulevard, Chicago.

### Time-Element Starting Device

A time-element starter designed for use with motors when it is desired to start them whether overloaded or not has been developed by the Rowan Electric Manufacturing Company, Baltimore, Md. If the initial inrush of energy is not sufficient to start the motor in a few seconds, some of the starting resistance is automatically cut out and the energy flow is increased. This operation will continue until the motor starts or the fuse blows out. The device is suited for use with vacuum cleaners, pumps, compressors and other machinery where time gained in starting is of no particular value. Instead of a vertical solenoid, a flapper switch is



TIME-ELEMENT MOTOR STARTER

used in the accelerating mechanism. This is shown in the right of the accompanying illustration. The dash-pot mounted on the front of the switch retards its action. The contacts are of graphite and copper and are connected to copper laminations. The starter is operated by push-button, float switch or pressure gage.



## Jobber, Dealer and Contractor

### The Elements of Successful Selling

Speaking before a commercial division session at the annual Jovian congress, Mr. W. E. Robertson, Buffalo, N. Y., delivered a very forceful address on selling. "As regards the individual," said he, "the elements of success in selling rest on sincerity, industry and the intelligent application of knowledge gained through experience. The biggest single factor is sincerity. I heard Hugh Chalmers, speaking at a banquet in Buffalo several years ago, use a simile which made a deep impression upon me. To emphasize the importance of sincerity, he said, you can no more maintain an insincere thought in your mind and have the man to whom you are talking receive a sincere thought from you than you can throw a cup across this table and expect the man on the other side to catch a platter. That which you give is received. Have conviction. Believe that you are serving mankind and believe that for serving you are entitled to the reward of honest effort."

### Contractors, Dealers and Central Station Unite

"To give Brooklynites the best of electric service at a minimum of expense" is the purpose of a Brooklyn (N. Y.) society composed of contractors, fixture dealers, manufacturers and representatives of the local electric-service company. The society, which is officially called the Kilowatt Club, is the outgrowth of a co-operative arrangement between the contractors and the Edison



KILOWATT CLUB'S HEADQUARTERS AT ELECTRIC SHOW

Illuminating Company of Brooklyn to wire houses at a flat rate per room, allowing the new consumer to pay for the work on a monthly instalment basis. At the Electrical Exposition held recently in New York City the electric-service company devoted one end of its space to the club's headquarters, which is shown in the accompanying illustration. Booklets describing the house-wiring plan were distributed from the booth by representatives who were present to explain the details and arouse interest in the project. Considerable enthusiasm was expressed by the contractors, who secured a number of orders to wire houses each day during the exposition, which lasted ten days. To remove anyone's objections to having his house wired on the ground that the woodwork, etc., would be torn up, a section of a wall and floor were exhibited to show how flexible conduits are fished between outlets with no resulting damage.

### The Electrical Contractor and the Central Station

At the recent convention of the Rhode Island Electrical Contractors' Association Mr. E. R. Davenport, of the Narragansett Electric Lighting Company, Providence, stated that his company considers the electrical contractor as important as one of its own departments. The Narragansett company does not give free renewals, being of the opinion that the consumer should pay for lamps just as the gas user does for mantles. Citing further co-operation, the speaker said that the company had never done any of its own wiring, and that even where services are changed over from direct to alternating current the work is given out to the contractor. If a house-wiring campaign is inaugurated shortly, the wiring will be done by local contractors. Mr. Davenport said that it is difficult in conducting special sales to satisfy everyone, but previous to the present lamp campaign being inaugurated in Providence the approval of several contractors was secured before a public announcement was made. By carrying a large stock of appliances the company benefits the jobber as well as the contractor, allowing both to make a profit without the expense of a special stock. The low rates for electric service at Providence are a powerful factor in the contractor's welfare. Mr. Davenport urged contractors to come at once to headquarters in case of any misunderstanding or inquiry, and pledged the fullest co-operation of his organization in behalf of electrical advancement.

### Value of Proper Wiring for Incandescent Lamps

The effect of low voltage on lamp service and energy consumption was discussed by Mr. M. D. Cooper, of the National Lamp Works, Cleveland, Ohio, before the Massachusetts Contractors' Association, recently. The author gave a number of useful tables, among which was one giving the allowable current for a drop of 1 volt for various circuit lengths and sizes of wire commonly used in interior installations, with segregations of currents prohibited by the capacity and 660-watts-per-circuit rules. The circuit lengths included varied from 15 ft. to 500 ft. Mr. Cooper recommended figuring wiring not to exceed an interior drop of 1 volt in lighting installations. A decrease of 1 volt at the terminals of a 110-volt lamp cuts the candle-power 3½ per cent, the wattage 1½ per cent, the efficiency 2 per cent, and the renewal expenses 15 per cent. This means, with a 40-watt lamp, a loss of candle-power equivalent to 15 cents, a loss of 6 cents in income from energy sold, and a 30 per cent increase in lamp life. In other words, the total cash loss to the customer is 4½ cents, figuring the renewal price at 30 cents and energy at 10 cents per kw-hr. The effect of a considerable drop in voltage on the operation of heating appliances is not so generally realized as it should be.

Excessive drop entails a loss to the contractor of the extra outlets and copper required to minimize the voltage fall. The owner loses in quantity of light, in economy of production and satisfactory service, and the central station loses in the sale of energy. It is highly important, in Mr. Cooper's estimation, to pay more attention to baseboard and wall outlets for appliance service. In twenty-one industrial plants at Cleveland the average drop on lighting circuits was 2.94 volts with an average load of 5.1 kw; in twenty commercial installations (mercantile) the average was 3.06 volts with an average load of 10.9 kw, and in eighteen apartments the average drop was 1.8 volts with an average load of 0.462 kw, while in fourteen houses there was an average drop of 1.29 volts with a lighting load of 0.655 kw.

# Industrial and Financial News

## Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

**Electric-Sign Installations.**—A large electric sign has recently been erected at Washington, D. C., by the Thos. Cusack Company, Buffalo, N. Y., for Liggett & Myers. The flasher and operating equipment for this installation was supplied by the Betts & Betts Corporation, New York. The latter company has also received an order for three large flasher dimmers for use at the Panama-Pacific Exposition.

**China Adopts Radio Communicating Apparatus.**—It is reported that a ten-million-dollar contract has been closed between China and the Marconi Wireless Telegraph Company, Ltd., of London, for the installation of a number of radio communicating stations. Under the terms of this contract the company will receive a certain remuneration and in addition a royalty of 15 per cent on receipts for the next twenty-five years.

**Electric-Vehicle Prospects Bright in Utah.**—Mr. George D. Smith of the General Vehicle Company has been in Salt Lake City during the past week making a study of the electric-vehicle situation in Utah. Mr. Smith reports that prospects are bright for a rapid extension of the use of both commercial and pleasure machines owing to the favorable road conditions and the most satisfactory business which the business houses and industrial concerns are enjoying.

**Turbo-Generators for New Haven, Conn., and Bridgeport, Conn.**—The United Illuminating Company, New Haven, Conn., has arranged to add to the equipment of the Grand Avenue station in New Haven two 4000-kw Curtis steam turbo-generators. In the Congress Street station at Bridgeport, Conn., will be installed two additional 2500-kw Curtis units of the same type. The contract to build these machines and all accessories has been awarded the General Electric Company, Schenectady, N. Y. The new units, it is expected, will be placed in operation next spring.

**Greenville (Ohio) Business Shows 40 Per Cent Increase.**—The Greenville (Ohio) Electric Light & Power Company's business for 1914 has shown an increase of 40 per cent over that for the same period last year, according to the president of the company, Mr. D. L. Gaskill, who is widely known as the secretary of the Ohio Electric Light Association and the National District Heating Association. During the last twelve months the rating of the Greenville plant has been doubled and a new coal dump and other improvements have been added. Greenville has a population of 7500. Mr. S. M. Rust is superintendent.

**To Manufacture Cheap Commercial Electric Vehicles in Quantities.**—A new manufacturing plant has been built by the Ward Motor Vehicle Company at Mount Vernon, N. Y., where the company purposes to manufacture a low-priced 750-lb. electric truck which will have a total mileage of 35 miles to 45 miles a charge. The plant is 162 ft. by 302 ft., and provision has been made to manufacture 3000 cars a year. The "Ward special," as the new vehicle is called, is equipped with Timken axles and a Westinghouse motor, and was exhibited at the recent New York Electrical Show for the first time. It is planned to build 500 of these trucks for the present season.

**Heat Tests of Synthetic-Gum Insulating Material.**—Samples of the synthetic-gum insulation "redmanol," manufactured by the Redmanol Chemical Products Company, 636 West Twenty-second Street, Chicago, have been tested by a number of electrical manufacturers with successful results. One reported particularly favorably upon the ability of redmanol to withstand heat and to resist carbonization in the presence of arcs. As pointed out in the article on page 923 of our issue of Nov. 7, redmanol is heated and softened during the process of forming it, but after being formed it re-

mains unaffected by heat and will not soften even at high temperatures.

**Growth of Gas and Electric Company.**—The total number of customers supplied with gas, steam and electricity by the Pacific Gas & Electric Company has more than doubled in the last seven years, according to a statement recently made by Vice-president Hockenbeamer. Comparing the number of customers served by each of the three departments in 1907 with the present service, he states that the gas consumers have increased by 99,727, electric-energy consumers by 91,979, and steam and water consumers by 3854. The company is now serving in all departments a total of 368,498 patrons.

**Cadmium in the United States.**—According to the United States Geological Survey, cadmium, which is used in the manufacture of automatic-sprinkler apparatus and fuses, has been produced in this country since 1907 in metallic form. There are now three American firms making cadmium either in sticks or as cadmium yellow. The principal cadmium-producing country is Germany, which in the last few years has had an output of between 90,000 lb. and 100,000 lb. annually, sold at 43 cents to 67 cents per lb. The United States has annually imported 4000 lb. to 14,000 lb. of stick cadmium from Germany, but in 1913 the imports dropped to 1556 lb., valued at \$1,232.

**Krupp-Diesel Engines to Be Made in America.**—The American Krupp System-Diesel Engine Company, 165 Broadway, New York, has been formed to manufacture the Diesel engines, developed by the Friedrich Krupp, A. G., Germaniawerft, Kiel, Germany. These engines have met with considerable success in European countries, particularly in Germany, where they are being used in manufacturing establishments and central stations. In the latter service frequently the entire energy output for small towns is obtained from Diesel engine sets. In large stations they are often used to assist in taking care of the peak loads. Diesel engines are also sometimes utilized in substations to take the place of storage batteries.

**Kerosene Oil for Resistance Measurements.**—Special kerosene oil for use in resistance measurements is being placed on the market by the Leeds & Northrup Company, 4901 Stenton Avenue, Philadelphia, Pa. The oil is recommended for use by the National Bureau of Standards. The oil has been found to absorb little water and is free from acids and acid-producing substances. Two grades of oil are produced—the "light government" oil and "medium government" oil. The former oil is used in sealed resistance standards and in apparatus where no special devices are provided for stirring. It may be used where it is desired to maintain as nearly as possible the same temperature throughout. The latter oil is used in comparison baths and for standard resistances designed for heavy currents. The "medium" oil is said to be more useful than the "light" oil.

**South American Opportunities.**—Mr. C. E. Sharp, who represented the Business Men's League and the St. Louis League of Electrical Interests in a tour of South American countries, in the November *Jovian* cites a number of his experiences and observations. He states that the landing places on the west coast are bad and that the mail sacks are usually thrown from the deck of steamers to the lighters. For this reason packages sent by parcel post should be properly and thoroughly wrapped. Freight shipments should be carefully packed in small lots because often they are sent from the ports to the interiors by mule-back, man-back or llama-back. Mr. Sharp also spoke of the need of reciprocal trade. Our share of South American exports is only about 16 per cent, he asserted, and it ought to be at least 50 per cent or 60 per cent—the same as with Mexico.



A handicap to manufacturers of this country is the lack of direct American banks in South America. Plain discounts should be used and there should be no substituting of orders. Only high-class salesmen should be sent to the South American republics. The trade is desirable in every way, because great quantities are ordered at one time.

**Steam as a By-product of Gas Engines.**—The Bruce-Macbeth Engine Company, Cleveland, Ohio, has received orders from the following concerns for gas engines equipped with apparatus for generating low-pressure steam: The Microscope Company, Cleveland, Ohio; the Steffan Shoe Company, Buffalo, N. Y.; the Strootman Shoe Company, Buffalo, N. Y.; C. W. Downey (garage), Cleveland, Ohio; the J. P. Eustis Manufacturing Company, Cambridge, Mass.; the Detroit City Gas Company, Detroit, Mich.; the Wellington Milling Company, Wellington, Ohio; the Ohio State Reformatory, Mansfield, Ohio; the Chisholm Steel Shovel Works, Cleveland, Ohio; the Consumers' Ice & Cold Storage Company, Lexington, Ky.; the American Glove Company, Dunkirk, N. Y.; the Younglove Building, Cleveland, Ohio; the Wood & Spencer Company, Cleveland, Ohio; the Northside Cameraphone Building, Pittsburgh, Pa.; the United States Paper Goods Company, Cincinnati, Ohio; Swarthmore College, Swarthmore, Pa.; the Cleveland Steel Barrel Company, Cleveland, Ohio, and the Fessenden Light & Power Company, Fessenden, N. D.

**High-Efficiency Incandescent-Lamp Fixtures for Armories.**—The armory board of New York State has approved an order for 250 sets of lighting fixtures for nitrogen-filled lamps from the Electric Operations Company, until recently the McLeer Electric & Manufacturing Company, Bush Terminal, Brooklyn, N. Y. Fixtures designed by this company for use in armories are equipped with a 20-in. bathtub-enamelled-steel reflector, black on top and white underneath. The above company is also making various types of steel service and cutout boxes. These boxes are electrically welded and are equipped with a ring handle which when not in use reposes in a depression in the door of the box. These boxes are being supplied in considerable quantities to the following concerns: L. K. Comstock & Company, the Western Electric Company, the Sprague Electric Works of the General Electric Company, and the Thompson-Starrett Company. Other activities of the Electric Operations Company include the repair and manufacture of motors and the manufacture of a fire extinguisher designed by Mr. W. Lawrence, mechanical engineer for the Interborough Rapid Transit Company. This extinguisher will be sold exclusively by the Electric Operations Company to electric concerns, but the Hansin Neiter Safety Company has been formed to sell it in other fields.

**Activities of Boston Edison Company.**—During the year a storage battery has been installed at the Homer Street substation of the Edison Electric Illuminating Company, in Newton, Mass., and will shortly be in operation. This is the first installation ever made of a storage battery in connection with an alternating-current distribution system, and it is expected that this equipment will be of much value to both the railway and commercial lighting and power service in this district. A new 15,000-kva turbo-alternator has just been installed at the L Street station in South Boston. The substations on Stuart Street, Boston, Beacon Street, Chelsea, and Massachusetts Avenue, Lexington, have all been completed and are in successful operation. The erection of a permanent substation in the Dorchester district has been postponed until another year. During the year transmission lines have been placed underground from Dedham through Norwood to Walpole, from Natick to Framingham, from Waltham to Lexington, from Arlington to Woburn, and from East Boston to Chelsea. One of the most notable contracts of the year was with the town of Wakefield, which formerly operated a municipal lighting plant but changed to Edison service, following the example of Wellesley and Norwood. An agreement of much interest has also been entered into between the Edison company and the Boston Elevated Railway. The principal generating plant of the latter is only a few hundred feet away from the L Street station, and an installation of underground cables and a 9000-kw frequency-changer set will permit the interchange of twenty-five-cycle and sixty-cycle energy at advantageous points on the mutual load curves.

## Corporate and Financial

**Western States to Issue \$731,000 Three-Year Notes.**—The California Railroad Commission has authorized the Western States Gas & Electric Company to issue \$731,000 three-year 6 per cent. notes for retiring floating debt and making important extensions and additions to the properties which serve communities centering at Stockton, Richmond and Eureka.

**To Buy Back Dividend Scrip.**—The Philadelphia Company, by Mr. C. J. Braun, Jr., secretary, has sent the following notice to stockholders: "In order to avoid inconvenience and expense both to yourself and to the company, we have arranged to obtain funds from an outside source with which to purchase its common-stock dividend scrip issued Nov. 2, 1914, to the holders of ten shares and under, provided the said scrip is surrendered immediately."

**International Steam Pump Company.**—Over 60 per cent of the first lien sinking-fund bonds having been deposited, the committee has given notice that after Dec. 15, 1914, deposits will be received only upon such terms as shall be approved by the committee. The committee hopes to be in a position at an early date to formulate and announce a plan of reorganization. The committee is composed of Messrs. Charles H. Sabin, chairman; Thomas B. Gannett, George G. Henry, R. Walter Leigh, H. J. DeLanoy Meijer and Allen T. West.

**Byllesby Note Offering.**—H. M. Byllesby & Company, Chicago, are offering \$450,000 three-and-one-half-year 6 per cent gold notes of the Louisville (Ky.) Gas & Electric Company at 97, yielding 7 per cent. Proceeds of the notes are to go for retiring floating indebtedness and important extensions and additions to the property, one being the enlargement of the principal generating station to take care of the increasing electric load. These improvements were all under way when the war began and could not be discontinued.

**Atlantic Gas & Electric Bond Deposits.**—At the office of the Guaranty Trust Company of New York, depository for the bonds of the Atlantic Gas & Electric Company, it was stated that the bonds are coming in at a very satisfactory rate. The committee has permanently decided on Nov. 25 as the last day on which Series "A" bonds may be deposited, after which date deposits will be received only upon such terms as shall be approved by the committee. The committee is composed of Messrs. Charles H. Sabin, chairman; F. W. Allen, W. H. Bennett and Frank B. Newell.

**Boston Edison Company Growing Faster.**—Despite war conditions, the Boston Edison Illuminating Company experienced a greater growth rate during the past three months than in the corresponding period of the previous year. While the industrial demand has lessened somewhat, the domestic demand has grown so rapidly that the company has had to take on additional help. The contract with the New Haven Railroad for 400 hp at the Back Bay Station and the recent contract for over 300 hp with the City Club will cause the company's reports to show still greater gains.

**Bondholders' Committee Arranges for Interest Payment.**—The committee representing holders of the first lien refunding 5 per cent gold bonds of the Kansas City (Mo.) Railway & Light Company announces that it has arranged for the payment on Nov. 16, 1914, of interest on the bonds from May 15, 1914, to Nov. 15, 1914, at the rate of 5 per cent. Interest will be paid to holders of certificates of deposit representing the bonds. The bonds were due May 15, 1913. The bondholders' committee is composed of Messrs. John B. Dennis, J. J. Hanauer, Acosta Nichols and James J. Storrow.

**Water Power Company in Hands of Receiver.**—The Great Shoshone & Twin Falls Water Power Company went into the hands of a receiver on Nov. 2 owing to prevailing conditions in the money market. Judge Dietrich, in the United States court, on petition of Mr. James R. Towle, of Twin Falls, appointed Mr. William T. Wallace receiver. The petition sets up that the company has no bonded indebtedness but had financed itself with short-time loans. These notes are now due in the East, with no funds to meet them and no opportunity for extension or renewal. It is stated that the company is to be refinanced under the receivership.

**Pacific Gas & Electric Shows Gains.**—The Pacific Gas & Electric Company, San Francisco, reports the number of consumers in the electric department on Sept. 30 as 143,134, a gain of 91,979 since the company started in 1907. The gain over 1913 was 16,580, or roughly 13 per cent.

**Detroit Edison's First Decade.**—The Detroit Edison Company has issued a pamphlet showing the operations for the first ten years of its existence, from January, 1903, to September, 1914. The company was incorporated on Jan. 17, 1913, in New York. It purchased the Edison Illuminating Company of Detroit and the Peninsular Electric Light Company, both doing business in Detroit. The company also owns all the stock of the Eastern Michigan Edison Company. The area under service is 428.2 miles and has a population of 759,462 inhabitants. Since the Detroit Edison Company's incorporation its total earnings have grown from \$533,847 to \$5,546,587. The maximum load has grown from 8400 kw in 1904 to 74,800 kw in 1913 and the output from 14,640,000 kw-hr. in 1904 to 282,484,300 kw-hr. in 1913. The company's load-factor was but 19.9 per cent at the beginning but is now 43.1 per cent. The principal business of the company is the supply of energy to private customers, at least 80 per cent of the revenue being from this source. The capital of the company has been raised by issues of stock, issues of 6 per cent ten-year debenture convertible bonds, and two different issues of 5 per cent bonds. The outstanding capital Sept. 30, 1914, was \$13,486,100 capital stock, \$3,464,700 of 6 per cent convertible bonds, \$10,000,000 of Detroit Edison Company 5 per cent bonds due 1933, and \$3,901,000 of Eastern Michigan Electric Company 5 per cent bonds due 1931. The consolidated earnings and income account show the gross earnings to have increased from \$685,504 in 1904 to \$6,189,300 in 1914. Operating expenses in 1904 were \$451,313 and in 1914 were \$3,572,873. The net income, therefore, grew from \$234,191 in 1904 to \$2,616,427 in 1914. After deducting interest charges, the net before adjustment and depreciation was \$106,465 in 1904 and \$1,791,791 in 1914.

**Stockholders' Protective Committee Formed.**—A protective committee for the deposit of common and preferred stock of the Atlantic Gas & Electric Company has been formed, composed of Messrs. H. A. McElwain, president of Alonzo Elliott & Company, Manchester, N. H.; E. Howard George, of Durell, George & Company, Boston, and Thomas C. Perkins. In a letter to the stockholders urging them to deposit their stock with the committee, Mr. Perkins said, in part: "From the report of Stone & Webster relating to the Atlantic Gas & Electric Company, referred to in my previous circular (printed in the *Electrical World*, Oct. 31, 1914), as I understand it, the essential conditions necessary to put the Atlantic company on its feet are substantially as follows: First, to provide substantially \$100,000 in cash to liquidate the unsecured obligations of the Atlantic Gas & Electric Company and of the Atlantic Construction Company, or to provide some means of funding the same; second, to provide substantially \$100,000 in cash to pay the interest due on the purchase-money notes and on the first mortgage bonds of the Eastern Pennsylvania Power Company, one of the subsidiaries of the Atlantic Gas & Electric Company, which interest payments are now due, or to provide some method of permanently funding same; third, to provide \$30,000 in cash, the amount estimated as necessary to close up and complete the construction work on the new power plants in New Jersey and Pennsylvania, and to provide substantially \$60,000 additional in cash for additional transformers, meters, etc., necessary during the coming year to take care of the rapidly increasing business of the subsidiary electric-lighting companies. In addition to the above it will be necessary to provide as soon as practicable approximately \$200,000 in cash to liquidate the secured obligations of the Atlantic Gas & Electric Company, thus releasing the securities of the Atlantic company now held as collateral for these obligations. In other words, approximately \$500,000 in cash must be provided, about half of this amount at once and the balance as soon as practicable, through the sale of securities or otherwise, or some general plan effected for funding these obligations. Failing this, some sort of a reorganization of the Atlantic company will have to be made which will provide the money or accomplish this result."

## LIGHTING INDUSTRY IN MIDDLE WEST

**August Figures for Electric Utilities in Central States Show a Lessening Growth Rate—East North Central States Keeping Up to Past Records.**

The operation figures from the electric utility companies of the Middle West, as collected by the *Electrical World*, show that the depression owing to the war has caused some

TABLE I.—COMPARATIVE FIGURES COVERING THE OPERATIONS OF 50 PER CENT OF THE CENTRAL-STATION INDUSTRY OF THE EAST NORTH CENTRAL STATES OF OHIO, MICHIGAN, INDIANA AND WISCONSIN (ILLINOIS EXCLUDED)

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
May	\$1,895,130	\$1,713,706	10.6	93,815,971	86,001,868	9.1
June	1,776,809	1,592,880	11.5	90,218,696	81,626,045	10.6
July	1,821,029	1,699,163	7.3	94,192,229	85,167,825	10.6
August	1,997,575	1,814,775	10.0	107,904,474	97,665,027	10.6

curtailment in all sections with the exception of the East North Central States. The companies in the States of Ohio, Michigan, Indiana and Wisconsin maintained their growth rate, as experienced in the previous months, in both income

TABLE II.—COMPARATIVE FIGURES SHOWING THE OPERATIONS OF 80 PER CENT OF THE CENTRAL-STATION INDUSTRY OF THE WEST NORTH CENTRAL STATES

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
May	\$778,029	\$633,432	23.0	76,302,296	55,015,511	38.7
June	754,935	610,224	23.6	71,864,644	53,909,090	33.3
July	749,597	676,788	10.9	75,463,726	66,525,278	13.4
August	755,420	738,123	2.3	76,451,635	73,560,807	2.5

and output. The figures received from the State of Illinois are very meager, and while they show a 10 per cent growth in income and a 23.7 per cent increase in output over 1913, they represent such a small portion of the central-station

TABLE III.—JUNE, JULY AND AUGUST OPERATIONS OF THE CENTRAL-STATION COMPANIES IN THE EAST SOUTH CENTRAL STATES

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
June—76 per cent of industry	\$246,876	\$235,469	5.0	10,893,631	10,191,363	7.0
July—75 per cent of industry	279,359	245,676	13.7	15,601,528	13,095,744	19.2
August—83 per cent of industry	362,754	351,414	3.2	17,575,372	15,814,846	11.1

activities of the State that they can have no definite weight. The companies in the Northwestern group did not experience the same rate of growth in July and August as they did in previous months. Table II represents the operations of twelve companies in this section, of which but two showed



a decrease in output for the month. One of these showed but a small decrease in output and none in income. The lessening in growth, however, it would seem from Table II, was not altogether due to poor times but may have been because of decided activities in the previous year. The figures in Table III are not comparable, but simply represent

TABLE IV—JUNE, JULY AND AUGUST OPERATIONS OF CENTRAL-STATION COMPANIES IN THE WEST SOUTH CENTRAL STATES

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
June (66 per cent of industry)	\$574,410	\$490,007	13 0	19,843,957	14,246,882	39 3
July (66 per cent of industry)	591,572	518,169	14 2	20,952,906	15,784,865	32 8
August (72 per cent of industry)	695,941	629,340	10 6	22,983,356	18,102,013	27 1

all the returns received by the *Electrical World* from companies operating in Kentucky, Tennessee, Alabama and Mississippi. In like manner the figures in Table IV cannot be compared month by month. However, the difference in companies represented is much less in this group than in the Southeastern group.

TABLE V—RETURNS FOR MAY, JUNE, JULY AND AUGUST OPERATIONS FROM CENTRAL-STATION COMPANIES IN THE CENTRAL STATES (EXCLUDING ILLINOIS)

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
May (56 per cent of industry)	\$3,200,553	\$2,841,685	12 7	202,611,026	162,363,929	24 8
June (66 per cent of industry)	3,914,836	3,459,497	13 2	217,920,183	182,406,207	19 4
July (68 per cent of industry)	3,802,126	3,307,719	15 0	217,928,950	188,569,581	15 6
August (75 per cent of industry)	4,389,696	4,051,678	8 4	247,501,400	226,276,638	9 4

The figures for the entire Central group, with the exception of Illinois, as contained in Table V, indicate a falling off in the rate of growth. The growth rate for August, however, was greater than many states show in normal times. Of all the companies which reported to the *Electrical World* from the Central States, but six showed any falling behind 1913, and of the six the only one to show a serious decrease has been falling behind now for some time.

## Business Notes

The Habirshaw Wire Company has removed its sales office from the Metropolitan Tower, New York, to its works in Yonkers, N. Y.

The American Rotary Valve Company has moved its general offices from 1510 Lytton Building, Chicago, to Anderson, Ind., where the company's factory is situated.

The Elcon Company, 50 Church Street, New York, has recently secured the rights to sell in America resistance grids manufactured by the Electro-Mechanical Brake Company, West Bromwich, England. E. C. Geither, formerly with the Ingersoll Rand Company, has been placed in charge of the selling of this material.

The Electric Operations Company, Bush Terminal, Brooklyn, N. Y., is the name of the concern formerly known as the McLeer Electric & Manufacturing Company. J. F. O'Ryan is president and treasurer, H. H. Rogers and J. F. McLeer are vice-presidents, F. X. Cleary is secretary and manager, and C. B. McLeer is engineer.

## New Industrial Companies

The B. & K. Specialty Manufacturing Company, 36 East State Street, Trenton, N. J., has been chartered with a capital stock of \$50,000 to manufacture electrical and porcelain goods. The incorporators are Lester W. King, Solomon Berman and U. G. King, of Trenton.

The Goodchild Electrical Company, of New York, N. Y., has been incorporated by Walter Goodchild, John D. Caplinger and K. M. Caplinger. J. D. Caplinger, 132 Nassau Street, New York, is attorney. The company is capitalized at \$30,000 and purposes to manufacture and deal in electrical apparatus and supplies.

The Coin Device & Signal Company, of New York, N. Y., has been chartered with a capital stock of \$70,000 to manufacture coin-collecting and indicating devices and to do a general contracting, electrical and engineering business. The incorporators are G. M. Mazza, of Weehawken, N. J.; H. A. Drew and E. C. Hocroft, of New York, N. Y.

## Trade Publications

Electrical Apparatus.—MacGovern & Company, 114 Liberty Street, New York, have issued a booklet listing various types of used apparatus for sale.

Portable Voltmeter.—The General Electric Company, Schenectady, N. Y., has recently issued Bulletin No. 46,018, which describes a portable voltmeter known as type P-8.

Electric Christmas Gifts.—The Western Electric Company, New York, has recently issued a booklet which suggests various electric devices suitable for Christmas gifts.

Small Lighting Plant.—The Barber Dwinell Electric & Manufacturing Company, Kansas City, Mo., has issued a catalog which describes and illustrates a number of small electric lighting plants.

Automatic Charging Panel.—Features of an automatic charging panel with a Martin converter are contained in a folder issued by the Northwestern Electric Company, 611 West Adams Street, Chicago.

Outdoor Substations.—The Delta-Star Electric Company, Chicago, Ill., is distributing Bulletin No. 14, containing extracts from a paper on outdoor substations read before the Indiana Electric Light Association.

Railway Motors.—The General Electric Company, Schenectady, N. Y., has just issued Bulletins No. 44,403 and No. 44,405, describing ventilated commutating-pole railway motors for 600-volt to 1200-volt service.

Electric Machine Tools.—Electric motors for machine-tool service are the subject of Catalog No. 3002-A, Section No. 3042, published by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Electricity for Textile Manufacturers.—"The Situation Before the Cotton Textile Manufacturers" is the subject of the Textile Quarterly No. 8, issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Nitrogen-Filled Lamps for Photography.—A circular entitled "The Photolite," which describes the uses of the 1000-cp nitrogen-filled lamps for photographic purposes, has been issued by the National Lamp Works of the General Electric Company, Cleveland, Ohio.

Handling the Small Consumer in Europe.—Bulletin No. 21, issued by the National Lamp Works of the General Electric Company, Cleveland, Ohio, is entitled "The Successful Handling of the Small Consumer in Europe," and it contains a reprint of a paper read before the N. E. L. A. convention by Mr. S. E. Doane and also printed in the *Electrical World*, May 23, 1914. The bulletin also contains editorials pertaining to this paper which have appeared in the *Electrical World*.

# Personal Mention

**Mr. Edgar N. Ash** has been appointed assistant superintendent of lamps and lighting of Baltimore, Md.

**Mr. J. W. Smith** has been appointed superintendent of the Missouri Electric, Gas & Water Company, of Cainesville, Mo., to succeed Mr. L. J. Beauregard.

**Mr. J. Isbister**, an electrical engineer of many years' experience, has taken charge of the Onaway (Mich.) Electric Light & Power Company, which recently changed ownership.

**Mr. John Coghlan**, manager of the claim department of the Pacific Gas & Electric Company, San Francisco, Cal., has been appointed receiver of the Northern Electric Railway, Chico, Cal.

**Mr. F. E. Murray**, formerly manager of the Louisiana (Mo.) Light & Power Company, has succeeded Mr. E. J. Baum as manager of the American Light & Power Company, of St. Charles, Mo.

**Mr. D. E. Bent** has been appointed manager of the Missouri Valley Light & Power Company, Eldorado Springs, Mo., succeeding Mr. D. F. Foote. Mr. Bent was formerly with the Chicago Central Station Institute.

**Mr. W. T. Wallace**, formerly manager of the Great Shoshone & Twin Falls Water Power Company, Twin Falls, Idaho, has been appointed receiver of the company by the United States District Court at Boise, Idaho.

**Mr. L. J. Beauregard**, formerly superintendent of the Missouri Electric, Gas & Water Company, of Cainesville, Mo., has been appointed treasurer of the company. Mr. J. W. Smith succeeds him as superintendent of the plant.

**Mr. Thomas F. Kelly**, of the Dayton (Ohio) Power & Light Company, who is now statesman of the Jovians for Ohio, has been appointed chairman of the membership committee for Ohio of the National Electric Light Association.

**Mr. W. L. Farrington**, sales manager of the Amesbury (Mass.) Electric Light Company, has been transferred to the office of the Central Massachusetts Electric Company at Palmer, Mass., where he will serve in a similar capacity.

**Mr. A. L. Kempster**, manager of the Seattle division of the Puget Sound Traction, Light & Power Company, has been elected a life member of the Seattle Press Club. He will be presented with a silver life membership card on Nov. 19.

**Mr. Richard S. Buck**, recently chief engineer of the Dominion Bridge Company, Canada, and previously with the engineering firm of Sanderson & Porter, New York, has been appointed engineer of maintenance of way of the New York (N. Y.) Railways.

**Mr. Frank E. Watts**, of the *Electrical World*, was elected first tribune of the Jovian Order for New York City and duly appointed to that office by Jupiter Homer E. Niesz at a meeting in the Hotel Martinique, New York, Nov. 11. Mr. Watts is a past-Jupiter of the order.

**Mr. Elmer E. Bernard**, assistant city engineer of Lynchburg, Va., has resigned and accepted a position with the Lynchburg Traction & Light Company and the Roanoke Railway & Electric Company, of Roanoke, Va. Mr. Bernard will make his headquarters in Lynchburg.

**Mr. William O. Morgan** has been elected vice-president of the Empire United Railways, Syracuse, N. Y. Mr. Morgan was formerly vice-president of the Sheboygan (Wis.) Railway & Electric Company and for a time was also an officer of the Greensboro (N. C.) Electric Company.

**Mr. W. H. Glenn**, of the Georgia Railway & Power Company, Atlanta, Ga., has surrendered the title of vice-president and manager of railways for that of vice-president and operating manager in charge of trolley lines, generating stations, transmission lines and distribution system.

**Mr. Norman B. Hickox** has resigned as treasurer and manager of the Greenwood Advertising Company, Knoxville, Tenn. Mr. Hickox was formerly contract agent for the Muskogee Gas & Electric Company, of Muskogee, Okla. After Nov. 1 he will be stationed at Springfield, Ill.

**Mr. Frederic Nicholls**, president of the Canadian General Electric Company, Toronto, Ont., a past-president of the National Electric Light Association, and recognized as one

of the electric pioneers of the Dominion of Canada, has been appointed an honorary colonel of the Canadian militia.

**Mr. F. W. Hoover**, vice-president and general manager of the Nashville (Tenn.) Railway & Light Company, and also vice-president of the Tennessee Power Company, has been elected president of the Nashville-Gallatin Interurban Railway to succeed Mr. H. H. Mayberry, who is now chairman of the board.

**Mr. W. B. McKinley**, president of the Illinois Traction System, Peoria, Ill., which operates numerous lighting properties in Illinois, Kansas, Iowa, Nebraska and Missouri, and who on Nov. 3 was elected Congressman from the eighteenth Illinois district, contemplates an extended South American trip on the first of the year.

**Mr. C. L. Daugherty**, formerly engineer in charge of the electrical equipment of the Great Northern Railway, has been appointed assistant general manager of the St. Petersburg (Fla.) Electric Light & Power Company and of the St. Petersburg & Gulf Railway Company. The post is a new one and does not occasion any change in the present organization of either of the companies.

**Lieut.-Col. Chester Harding**, Corps of Engineers, U. S. A., has severed his connections with the Public Utilities Commission of the District of Columbia, Washington, to accept the detail as engineer of maintenance of the Panama Canal. He has been succeeded as commissioner by Major Charles W. Kutz, Corps of Engineers, U. S. A., who has been elected chairman of the commission to fill the unexpired term of Colonel Harding.

**Mr. James C. Ernst** has been forced because of poor health to retire from active association with the South Covington (Ky.) & Cincinnati Street Railway Company, the Union Gas & Electric Company, Cincinnati, and the Columbia Gas & Electric Company, also of that city. Mr. Ernst is manager of the street-railway company at Covington, president of the Union Light, Heat & Power Company of the same city, and first vice-president of the Union Gas & Electric Company.

**Mr. William Mohr** has been appointed superintendent of lamps and lighting of Baltimore, Md., to succeed the late Robert J. McCuen. Mr. Mohr has been connected with the department since July 1, 1900, when he was appointed assistant superintendent by Mr. McCuen, and has been in charge since the death of his chief. Mr. Mohr was born in Baltimore June 4, 1865. Before entering the employ of the city he was in the brick-manufacturing business, from which he was forced to retire by the condition of his health. His early training in the business world was received as an employee of the Pennsylvania Railroad Company and the Baltimore & Ohio Railroad Company.

**Mr. W. H. McGrath**, who, as announced in last week's issue, succeeded Mr. A. W. Leonard as manager of the Puget Sound Traction, Light & Power Company, Seattle, Wash., and subsidiary companies on the election of the latter to the position of president, has been connected with public service properties for the last fourteen years. After graduating from Harvard in 1901 with an engineering degree, Mr. McGrath went with Stone & Webster and gained experience in every department of the Boston office work. In 1902 he was appointed electrical engineer for the company at Houghton, Mich., and became superintendent of the Houghton County Electric Light Company about 1903. In 1905 Mr. McGrath was made manager of the Houghton County Traction Company and the Houghton County Electric Light Company, both Stone & Webster properties. He served in this position until 1909, when he was transferred to Minneapolis as assistant to Mr. A. W. Leonard, at that time vice-president and manager of the Minneapolis General Electric Company. During some of the trying times of this company and until 1912, when Stone & Webster sold the property, which then was very successful, he held the position of assistant general manager at Minneapolis. In June, 1912, Mr. McGrath returned to Boston and took up expert work for Stone & Webster in connection with the examination, analysis and organization of new properties and for other interests, bankers, etc. In November, 1913, he was appointed assistant to the vice-president of the Puget Sound Traction, Light & Power Company, Seattle, which post he held till Mr. Leonard's election as president.



## Construction

### New England

**EASTON, MAINE.**—Within the next two months the Easton El. Co. expects to erect 1½ miles of transmission lines, for which material has been purchased. C. W. Spear is treasurer.

**MOUNT VERNON, MAINE.**—Arrangements are being made by R. H. Jacobs, owner of the local electric-light plant, to purchase energy to operate the local system. The power house was destroyed by fire some time ago.

**DERRY, N. H.**—Work has begun on the erection of a row of stores on Central Street under the direction of Rosecrans W. Pillsbury. A heating and lighting plant will be installed in connection with the building.

**SALEM, MASS.**—The contract for furnishing and installing about 5 miles of rubber-insulated, lead-covered cable of different sizes for the purpose of placing underground the city fire and police wires in the burned district has been awarded to the Standard Underground Cable Co. of Pittsburgh, Pa.

**PASCOAG, R. I.**—Bids will be received by A. H. Sayles, chairman Pascoag Fire District Electric Light Board, Pascoag, until Nov. 16, for furnishing and installing equipment and material necessary for electric transmission lines and substations throughout the districts of Pascoag and Harrisville. Plans and specifications may be obtained at the office of W. D. Thompson, engineer, 201 Devonshire Street, Boston, Mass.

**BRIDGEPORT, CONN.**—Work will soon begin on the installation of the ornamental lighting system in the business district, to cost between \$30,000 and \$40,000. The work will provide for the erection of 92 lamps of 800 cp erected on ornamental standards 15 ft. high. The lamps are to be installed by the United Illg. Co. of Bridgeport.

**HARTFORD, CONN.**—The contract for street-lighting, exclusive of the ornamental lamps in the business district, has been awarded to the Hartford El. Lt. Co. The new contract provides for replacing the tungsten lamps now in use with 125-cp nitrogen lamps and the arc lamps with nitrogen lamps of 600 cp fitted with holophane refractors.

### Middle Atlantic

**ALBANY, N. Y.**—The contract for construction of four stations on the Cayuga and Seneca Canal, near Waterloo, has been awarded to Lupfer & Remick, of Buffalo, at \$188,001. The buildings will be equipped with hydraulic and electrical apparatus for operation of lock gates, valves, capstans, lamps, heaters and lift bridges.

**BEDFORD HILLS, N. Y.**—Bids will be received by James W. Osgood Field, president board of managers State Reformatory for Women, Bedford Hills, until Nov. 21 for boiler-house equipment, underground feeders and ground for lamps at the New York State Reformatory for Women, Bedford Hills. Drawings and specifications may be consulted at the New York State Reformatory for Women, Bedford Hills; at the New York office of the Department of Architecture, Room 1224, Woolworth Building, New York, and the Department of Architecture, Capitol, Albany. Lewis F. Filcher is state architect.

**YORKTOWN HEIGHTS, N. Y.**—Bids will be received by James W. Osgood Field, president board of managers New York State Training School for Boys, 2 West Forty-fifth Street, New York, N. Y., until Nov. 19 for construction, heating, plumbing and electric wiring for seven cottages at the New York State Training School for Boys. Drawings and specifications may be consulted at the New York office of the Department of Architecture, Room 1224, Woolworth Building, New York, and at the Department of Architecture, Capitol, Albany. Lewis F. Filcher is state architect.

**KUNZTOWN, PA.**—At an election held recently bonds to the amount of \$24,000 were voted, of which the proceeds of \$23,000 will be used for enlarging the municipal electric-light plant.

**PHILADELPHIA, PA.**—The contract for electrical equipment, including installation of a universal clock system, controlled from a master clock in the basement, has been awarded to the United El. Co. of Philadelphia. Horace Trumbauer is architect.

**PHILADELPHIA, PA.**—The United Electric Construction Co. of Philadelphia has been awarded the contract for the electric wiring that is to be installed in the court of honor erected on Broad Street, Walnut Street to Spruce Street, in connection with

the convention of the American Federation of Labor.

**PITTSBURGH, PA.**—The finance committee of the Board of Education and the committee on property has recommended the purchase of the Logan High School, El. Co., of Pittsburgh, at \$36,172, be accepted for the installation of the electrical work in the Schenley High School; also the bid of the United El. Co. of Pittsburgh, at \$143,628, for heating and ventilating.

**WILLIAMSPORT, PA.**—The contract for lighting the streets of the city, the municipal hall and fire-engine houses has been awarded to the Citizens' El. Co. of Williamsport.

**REEDY ISLAND, DEL.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Nov. 30 for the installation of a heating and cooling system for the hospital building, isolation hospital and crews' detention station at Reedy Island, Del. For details see proposal columns.

**FROSTBURG, MD.**—The power plant of the Frostburg Illg. & Mfg. Co., which was recently acquired by the Hagerstown & Fredericksburg Ry. Co., of Hagerstown, is reported, will be enlarged with a view of supplying electricity in Westernport and Midland, Md.

**NORTH EAST, MD.**—The Town Commissioners have awarded a contract to the Gilpin Falls El. Co., of Elkton, for lighting the streets of the town for a period of five years.

**LOGAN, W. VA.**—The Logan County Lt. & Pwr. Co., it is reported, has awarded the contract for construction of central power station (100 ft. by 84 ft.), brick smoke-stack 100 ft. high, C. C. Multry, of Huntington, W. Va., has been placed for turbines with rating of 10,000 kw. and for 75 miles of 44,000-volt transmission line. The plant will be situated on the Guya River, opposite Logan, W. Va., at the Weller, Hibbs Building, Washington, D. C., is engineer.

**STAUNTON, VA.**—The Staunton Ltg. Co. has been granted permission to extend its transmission line along the Shenandoah Pike to the top of Two-Mile Hill to supply electricity to residences along the route.

**WASHINGTON, D. C.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Nov. 23 for furnishing lamp standards, lanterns and lamp brackets for buildings under the control of the Treasury Department, in accordance with drawings and specifications, copies of which may be had at above office. O. Wenderoth is supervising architect.

**WASHINGTON, D. C.**—An American consular officer in Spain reports that he has inquiries regarding electrical machinery, dynamos, etc., and an automobile to retail at approximately \$1,000. For further information address 14,335, Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., or branch office, Room 409, United States Custom House, New York, N. Y.

**WASHINGTON, D. C.**—An American consular officer in the United Kingdom has transmitted a report, together with blueprints from a firm in his district that is desirous of forming connections with American manufacturers of electrical supplies and steel water pipes. Copies of the full report and blueprints may be had on application to the Bureau of Foreign and Domestic Commerce, and its branch offices, referring to No. 14,363.

**WASHINGTON, D. C.**—An American consular officer in the United Kingdom has advised that a firm in his district desires to negotiate with American manufacturers of pocket and flashlight batteries, with a view of buying in considerable quantities. For further information address No. 14,321, Department of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., or branch office, Room 409, United States Custom House, New York, N. Y.

**WASHINGTON, D. C.**—A British firm informed an American consular office that it desires to secure agencies for American manufacturers of electric carbons, fans, electric insulating material, such as empire cloth, adhesive tape, mercantile electrical enamel, ironware, etc. For further information address No. 14,335, Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., or branch office, Room 429, United States Custom House, New York, N. Y.

**WASHINGTON, D. C.**—An American consular officer in Latin America reports that an importer in his district desires to establish a business connection with American manufacturers of electrical novelties, plated silverware and bazar novelties. Correspondence may be in English. For further information address No. 14,255, Bureau

of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., or branch office, Room 409 United States Custom House, New York, N. Y.

**WASHINGTON, D. C.**—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Nov. 24, for furnishing at the various navy yards and naval stations supplies as follows: Brooklyn, N. Y. Schedule 7529—1800 ft. extra-flexible, plow-steel cables (¾ in. in diameter, 500 ft. and 700 ft. long), one duplex feed pump (7500 lb. of water per hour), 350 boiler tubes (7 ft. long, 2 in. in diameter, 125 lb. sq. in.); Schedule 7534—miscellaneous composition condenser tubes (¾ in. outside diameter, 65 mils thick); Schedule 7535—1500 ft. 1½-in. outside diameter, 1530 seamless steel tubes (¾ in. outside diameter, 3 ft. 8 ¾ in. long); Schedule 7535—miscellaneous steel pipe, 1530 seamless steel tubes (¾ in. outside diameter, 8 ¾ in. long); Bids will also be received at the same place until Dec. 1, as follows: Brooklyn, N. Y., Schedule 7575—eight vertical, simplex feed pumps; Schedule 7559—2000 ft. 1½-in. outside diameter, 110-volt communication cable; Schedule 7564—5000 ft. two-conductor and four-conductor telephone cable; Schedule 7562—15 alternating-current, single-phase, 110-volt, 110-watt, 110-volt fan (12 in.); Schedule 7554—35,000 ft. 600-volt lighting and power wire; Schedule 7562—15,000 ft. 600-volt lighting and power wire; Schedule 7555—10,000 ft. 250-volt lighting and power wire; Schedule 7554—2500 lb. sheet copper. Washington, D. C., Schedule 7557—6000 ft. lead-sheathed, rubber-insulated cable, 1000 ft. telephone cable. Charleston, S. C., Schedule 7564—1000 ft. 110-volt possible ventilating sets. Philadelphia, Pa., Schedule 7557—15 miles 11-strand wire (United States Army field type); Schedule 7556—15 miles waterproof, copper-covered, 2½-in. diameter, 3535-hp or 3-hp gasoline engine. Annapolis, Md., Schedule 7535—one electrically driven engine lathe. Bids will also be received until Dec. 8, as follows: Brooklyn, N. Y., Schedule 7558—Annual supply of desk and bracket fans. Applications for proposals should give the schedule desired by number.

### North Central

**GRAND RAPIDS, MICH.**—The contract for electric wiring in the new U. B. A. Hospital has been awarded to Roseberry-Henry El. Co., of Grand Rapids.

**NEWBURY, MASS.**—The Board of Public Works expects to erect within the next 30 days a brick and cement shavings bin, 600-ft. 16-in. pipe and blowing apparatus to transmit shavings from floating mill to power house. The board expects to purchase one 25-hp three-phase motor, one 5-hp three-phase motor, one 3-kw exciter, one 200-lamp transformer and 10 meters. S. R. Sprague is superintendent.

**CRENSHAW, OHIO.**—Bids will be received by the village of Crestline until Dec. 8 for furnishing and operating a complete electric-lighting system for the village of Crestline for a period of ten years. For details see proposal columns. H. Whitford Jones, of Cleveland, is consulting engineer.

**FINDLAY, OHIO.**—The Toledo, Bowling Green & Southern Trac. Co., of Findlay, has submitted a proposal to the City Council to install a new electric-lighting system. The company offers to furnish 415 lamps in place of the 219 now in use at an additional cost of \$250 per year. The plans provided for 22 lamps of 600 cp, 121 tungsten lamps of 250 cp and 142 tungsten lamps of 100 cp, to be erected in the residential districts. J. Smith is general manager of the traction company.

**GLENNVILLE (P. O. CLEVELAND), OHIO.**—A committee has been appointed by the East End Chamber of Commerce to investigate the cost and the advisability of installing an ornamental lighting system in the business district of Glennville.

**OAK HARBOR, OHIO.**—Bonds to the amount of \$4,000 have been issued for improvements to the lighting system.

**PERRYVILLE, KY.**—Within the next four months the Perryville El. & El. Co. expects to install two 80-hp boilers and a 50-ft. by 30-in. smokestack, made of 10-in. or 12-in. gage iron. Also to purchase lamps, the next two months will purchase electrical appliances, including washing machines, wiring supplies, etc. W. J. DeBaun is proprietor.

**WARSAW, KY.**—The City Council, it is said, is considering a proposition submitted by the Lawrence Electric Co. of Louisville to light the streets of the city with 40 arc lamps at \$1,000 per year.

**RICHMOND, IND.**—Within the next four months the Board of Public Works expects to purchase 300 arc lamps, 6000 ft. armored

cable and 300 lamp standards. C. A. Klein-knecht is superintendent.

**CARRIERS MILLS, ILL.**—The Carriers Mills Utilities Co., recently organized, is installing a distributing system in Carriers Mills. About 3 miles of wire will be required for the distributing system and about 200 meters will be used to start with. The street-lighting system will consist of about 20 incandescent lamps. J. W. Beaudry, Duquoin, is engineer in charge of the work.

**PEORIA, ILL.**—The board of school inspectors has awarded the contract for electrical work in the new Peoria High School to the Sanborn El. Co., of Indianapolis, Ind., at \$12,570.

**WEYAUWEGA, WIS.**—Improvements will be made to the plant of the Weyauwega El. Lt. Co., including the installation of a 15-hp generator, a few 10, 15, 25 and 30-kva transformer meters and street lamps. The property of the Weyauwega El. Lt. Co. was recently taken over by F. H. Josslyn, of Oshkosh, and LeRoy Herron, T. Olson, of Appleton, is engineer in charge of the work.

**HASTINGS, MINN.**—Within the next 30 days the Hastings El. Lt., Wtr. & Pwr. Co. expects to erect 10 miles of 33,000-volt transmission line from Hastings to Pine Bend to supply energy to operate the St. Paul & Southern Electric railway running from Inver Grove to Hastings. The company is installing a generator (directly connected) in its hydroelectric plant at Clifton to replace a belt-tied machine. S. F. Stewart is manager.

**HIBBING, MINN.**—Arrangements have been made by the water and light board of the municipal electric-light plant will supply electricity to Kistivik.

**GREELEY, IA.**—The municipal electric-light plant was recently destroyed by fire, causing a loss of about \$6,000. It is understood that steps have been taken to rebuild the plant.

**ROCKFORD, IA.**—Within the next 30 days the Rockford Lt. & Pwr. Co. expects to purchase a 50-hp to 100-hp oil engine. H. B. Matthews is manager.

**NEVADA, MO.**—The Fort Scott & Nevada Lt., Ht., Wtr. & Pwr. Co., of Nevada, expects to purchase within the next three months a new street-lighting system for the city. J. H. Dunkle is general manager.

**WEBB CITY, MO.**—A plan has been agreed upon by the Empire District El. Co. and a majority of the City Council which is to be submitted to the voters of Webb City, providing for the installation of an ornamental lighting system and the erection of an illuminated iron arch in the business district. The proposed plan would change the lighting system throughout the city.

**CLARKSON, NEB.**—Within the next 30 days the village of Clarkson expects to purchase some transformers; also to erect about 15,000 ft. of new lines and to install a new 10-in. well for water supply, with gasoline engine. L. J. Raubinek is superintendent.

**FRIEND, NEB.**—Within the next 30 days the city of Friend expects to close down the municipal generating plant and to purchase electrical energy from the Blue River Pwr. Co., of Seward, to operate the municipal electric system.

**HARVARD, NEB.**—The Harvard El. Co. expects within the next three months to purchase a 35-kw, 220-volt direct-current generating unit (directly connected). Both gas and steam engines will be considered as prime movers. A. W. Person is general manager.

**SOUTH OMAHA, NEB.**—The Omaha El. Lt. & Pwr. Co. has submitted a proposition to the City Council for a new contract for the city for a period of five years. The company reorganizes the present street-lighting system and agrees to install 265 additional street lamps and 44 ornamental lamps from O Street to J Street and Twenty-fourth Street, at no additional cost to the city. Wires for the ornamental lamps will be placed underground.

**HARTFORD, KAN.**—W. W. Finney, of Emporia, it is reported, has entered into a contract with the Emporia Ry. & Lt. Co., of Emporia, to furnish electricity in Hartford.

**LEAVENWORTH, KAN.**—The Board of Commissioners has adopted resolutions providing for the installation of additional lamp standards (carrying two-lamp clusters) between Third and Seventh Streets on Cherokee Street, between Third Street and Broadway on Shawnee Street, and from Seventh Street to Broadway on Cherokee Street.

**TOPEKA, KAN.**—Business men and residents of North Topeka have petitioned the mayor and board of commissioners to call an election to vote on the proposed installing bonds for the installation of a municipal electric-light plant in North Topeka.

## Southern States

**OMAHA, ILL.**—At an election held on Nov. 10 the proposed to issue \$100,000 bonds for the construction of a 100-ft. electric light plant was carried.

**NEWPORT, TENN.**—Bonds to the amount of \$25,000 have been voted, of which the proceeds of \$5,000 will be used to install a new electric lighting system.

**POLARVILLE, MISS.**—Within the next six months the city of Polarville expects to purchase about 200 meters. M. H. Hall is superintendent.

**MAITSHAW, ARK.**—Arrangements are being made by Johnson Brothers, recently granted a 40-year franchise to supply electricity in Maitshaw, for the installation of an electric-lighting system.

**NATCHITOCHE, LA.**—Within the next six months the city of Natchitoches expects to purchase one 15-hp electrically driven centrifugal pump, having a capacity of 300 gal. per minute for the municipal electric plant and water-works system; also within the next three months to purchase 50 electric meters, material for 1 mile of service line and transformers for same for East Natchitoches. Walter E. Aymond is superintendent.

**BILLINGS, OKLA.**—The contract for the construction of the proposed municipal electric-light plant and water-works system in Billings has been awarded to the Hunnrichow Construction Co., of Carmen, Okla., at \$12,000.

**CUSHING, OKLA.**—The Cushing El. Lt. & Pwr. Co. has entered into a contract with the Cushing Trac. Co. to furnish energy to the amount of 500 kw at 1500 volts for a period of ten years. The Cushing electric company has bids on a 500-kva generating unit, consisting of a generator directly connected to a Corliss engine, also necessary return-tubular boilers and other accessories, including switchboard, etc. The cost of the new equipment is estimated at \$30,000. The Cushing Trac. Co. has awarded contracts for grading its railway from Cushing to Drumright, a distance of 11 miles. H. Askin is secretary and general manager.

**YALE, OKLA.**—The city of Yale is contemplating the installation of a municipal electric-light plant and extensions to water-works system at a cost of \$15,000. Plans and specifications are being prepared by H. Askin, of Cushing, engineer.

**FORT WORTH, TEX.**—Steps have been taken by the business men and residents of the north side for the installation of an ornamental lighting system on North Main Street.

**FRANKLIN, TEX.**—The City Council is contemplating improvements to the electric-light plant and water-works system, to cost about \$15,000.

## Pacific States

**ELLENSBURG, WASH.**—Plans are being prepared, it is reported, by the Northern Pacific Ry. Co. for the installation of electric motor-driven equipment in its new coal bunkers now being erected in Ellensburg. Electricity will be used throughout the new bunkers which will serve the mountain division with fuel.

**SEATTLE, WASH.**—The city utilities committee of the City Council has recently introduced a bill into the Council appropriating \$10,000 for the lighting fund for the extension of the lighting service to Riverton, Tukwila and Foster.

**HUBBARD, ORE.**—The Portland Ry. Lt. & Pwr. Co., of Portland, it is reported, is planning to install an electric light and power system in Hubbard. Energy will be supplied from its plant in Salem.

**OCEANSIDE, CAL.**—The South Coast Land Co. is negotiating with the Oceanside El. & Gas Co. to extend its transmission lines to South Oceanside and Carlsbad, to which sections the company is carrying water for irrigation and domestic purposes.

**SAN FRANCISCO, CAL.**—Deeds for 18 rights-of-way near Merritt Island, below Embarcadero, have been filed by the Great Western Pwr. Co., of San Francisco, which indicates that the company contemplates including Yolo County in its territory.

**SAN FRANCISCO, CAL.**—Tentative plans have been submitted to the Board of Supervisors by James F. Whittlesey, an electrical engineer, for the construction of a plant for lighting and heating the Civic Center, at a cost of \$2,000. Plans are already being prepared and accepted for a heating plant, to cost \$75,000.

**BURKE, IDAHO.**—The Canyon Creek El. Lt. Co., of Burke, expects to purchase within the next three months 100 meters and tungsten lamps to the amount of \$12,000.

**SHOSHONE, IDAHO.**—Plans are being considered by the Board of City Trustees to replace the present arc lamps with new incandescent lamps of 100 cp.

**PHOENIX, ARIZ.**—The City Commission is contemplating establishing a municipal electric-light and power plant.

**DOOLEY, MONT.**—Preparations are being made by O. B. Haven and Frank Courtney, both of Antelope, for the installation of an electric-light plant in Dooley. The company, it is understood, is in the market for electrical machinery.

**GERALDINE, MONT.**—Preparations, it is reported, are being made by W. L. Kemper, of Great Falls, for the installation of an electric light and power plant in Geraldine. Mr. Kemper, it is understood, is in the market for electrical and generating equipment.

**LAHONTON, NEV.**—The contract for construction of the 60,000-volt transmission line of the Nevada Pwr. Co. from Lahonton to the Rochester district, a distance of 81 miles, has been awarded to J. W. Finch & Co., of Riverside, Cal. The contract also covers the installation of four substations and complete local distributing systems in as many towns.

## Canada

**VANCOUVER, B. C.**—The Nairn Falls Pwr. Co., Rogers Building, Vancouver, has applied for a license for the storage of 100,000 acres of water of the 800 River, which flows into the Green River, a mile south of the southern end of the Lillooet land-recording district. The water will be used for power purposes.

**TILLSONBURGH, ONT.**—The electrical plant of Barker Brothers was destroyed by fire on Nov. 3, causing a loss of about \$10,000.

**WALKERVILLE, ONT.**—The by-law authorizing the purchase of the street-lighting system for 1914 has been passed by the ratepayers. The Council has decided to extend the distribution system on a number of streets now without electrical service.

**ST. MALO, QUE.**—Tenders will be received at the office of the commissioners of the Transcontinental Railway at Ottawa, Ont., until Dec. 1, for furnishing and installing boilers and engines, feed-water heaters, steam engines or turbines, generators, switchboard and wiring in the "Leonard" locomotive and car shops plant of the National Transcontinental Railway at St. Malo, in accordance with plans and specifications on file in the office of the commissioners. Plans may be seen and form of tender and specifications may be obtained at the office of W. J. Press, mechanical engineer, Ottawa. Separate tenders to be submitted for each type of equipment. P. E. Ryan is secretary.

## Miscellaneous

**PANAMA.**—Bids will be received at the office of the general purchasing office of the Panama Canal, Washington, D. C., until Nov. 20, for furnishing steel cable, track bolts, brass condenser tubes, etc. Blanks and general information relating to the circular (No. 878) may be obtained from the above office or from the offices of the assistant purchasing agents, 24 State Street, New York, and 114 Broadway, New York Building, New Orleans, La., and 1086 North Point Street, San Francisco, Cal. Major F. C. Boggs is general purchasing officer.

## New Incorporations

**HAMILTON, ILL.**—The Quincy & Hamilton El. Ry. Co. has been incorporated by C. D. Warren, C. H. Petsch and W. H. Orr of Hamilton. The company is capitalized at \$25,000 and proposes to operate an electric railway from Quincy to Hamilton.

**HARRISBURG, PA.**—Charters have been granted to the Charlestown and Schuylkill Townships Electric Companies. J. C. Murtagh is one of the incorporators.

**RIO GRANDE, TEX.**—The Rio Grande El. Lt. & Pwr. Co. has been organized with a capital stock of \$7,500 for the purpose of constructing and operating an electric-light plant in Rio Grande. Machinery for the proposed plant has been ordered. John Thaison, of Rio Grande, has been appointed manager.



# Weekly Record of Electrical Patents

## UNITED STATES PATENTS ISSUED NOV. 3, 1914.

[Prepared by Robert Stuart Allen, 16 Exchange Place, New York, N. Y.]

- 1,115,480. ARC-LIGHT CARBON; H. Ayrton, London, Eng., Assignor, East. App. filed March 1, 1912. Negative carbon comprising a hard core with a softer nose, readily combustible shell and a film of incombustible volatilizable metal on said shell.
- 1,115,488. INCANDESCENT LAMP; E. P. Beckwith, Garrison, N. Y. App. filed Jan. 22, 1912. The conducting holder is insulated from the filament at the supporting points of contact therewith.
- 1,115,494. TRAIN-CONTROLLING DEVICE; A. L. Bower, Boyertown, Pa. App. filed Aug. 7, 1909. Automatic stopping device stops train only after a predetermined period, thereby allowing engineer opportunity to stop it himself.
- 1,115,511. SAFETY DEVICE FOR PUMP GOVERNORS; P. L. Crittenden, Edgewood, Pa. App. filed Oct. 9, 1912. Unloading or starting device; prevents undue load on motor at starting.
- 1,115,512. ELECTRIC HEATER FOR CARBURETORS; A. C. Dam and C. H. Kirby, New York, N. Y. App. filed April 21, 1913. Ring-like electric heater suspended within the mixing chamber.
- 1,115,519. METHOD OF STRENGTHENING RECEIVER SHELLS; J. B. Edwards, Chicago, Ill. App. filed March 9, 1910. Perforated sheet-metal insert in body of shell.
- 1,115,520. RECEIVER SHELL; J. B. Edwards, Chicago, Ill. App. filed Feb. 10, 1912. Sheet-metal insert is exposed at large end of shell and threaded to take the ear-cap.
- 1,115,530. RADIODYNAMIC DIRECTIONAL-CONTROL SYSTEM; J. H. Hammond, Jr., Gloucester, Mass. App. filed Dec. 15, 1913. Indicates position of a torpedo or other body on a chart by pointers controlled by radiodynamic means.
- 1,115,541. STACCATO MECHANISM FOR MUSICAL INSTRUMENTS; R. Hope-Jones, North Tonawanda, N. Y. App. filed Dec. 27, 1910. For automatically producing staccato effects upon the pipes of an organ.
- 1,115,545. THERMOSTATIC VALVE MECHANISM; L. P. Hynes, Chicago, Ill. App. filed Jan. 15, 1912. Valve is operated by expansion of a fluid heated by an electric heater.
- 1,115,553. LIGHTNING ARRESTER; W. Leibert, Mount Carroll, Ill. App. filed Oct. 13, 1913. Operates by electromagnetic action to ground the discharge and short-circuit the instruments protected.
- 1,115,580. SHORT-CIRCUIT DETECTOR; J. K. Rush, Syracuse, N. Y. App. filed Nov. 18, 1910. For call bell, gas-lighting and the like systems.
- 1,115,607. THERMOSTATIC CIRCUIT CONTROLLER; G. E. Spear, Amesbury, Mass. App. filed April 10, 1911. For steam and hot-water heaters and furnaces.
- 1,115,625. METHOD OF PRODUCING CONTINUOUS OR CONSTANT ELECTRIC DISCHARGES IN GASES; C. F. R. Von Koch, Stockholm, Sweden. App. filed March 20, 1911. Supplies gas to the discharge gap in a heated condition.
- 1,115,631. TRANSMITTING ALTERNATING CURRENT THROUGH A VAPOR; E. Weintraub, Schenectady, N. Y. App. filed March 23, 1910. Vapor rectifier.
- 1,115,647. RESISTANCE UNIT; A. A. Ziegler, Boston, Mass. App. filed March 16, 1914. Readily removable coil; for railway signaling and like purposes.
- 1,115,654. ATTACHMENT PLUG; F. C. De Reamer, New York, N. Y. App. filed April 15, 1913. Two-part plug.
- 1,115,668. SIGNAL; F. W. Harrington, Sebastopol, Cal. App. filed June 11, 1913. Intermittently delivers loose fusible flash elements between the free ends of two terminal contacts.
- 1,115,671. ELECTROLYTIC APPARATUS; A. Herrmann, Leipzig-Gohlis, Germany. App. filed April 23, 1914. Trolley electrode with non-conductive edge portions.
- 1,115,712. AUTOMATIC ALARM; C. C. Miller, Summit Hill, Pa. App. filed Jan. 15, 1913. Low-water boiler alarm.
- 1,115,720. SWITCH KEY; F. E. Munsell, Hamilton, Mo. App. filed June 2, 1913. For telephone switchboards; readily removable without unsoldering or unscrewing connections.
- 1,115,724. DYNAMO-ELECTRIC MACHINE; J. D. Niles, St. Charles, Ill. App. filed Feb. 4, 1914. Prevents field distortion.
- 1,115,729. MAGNETO DRIVE FOR INTERNAL-COMBUSTION ENGINES; J. A. Ostenberg, Campbell, Cal. App. filed Nov. 24, 1913. For producing spark of sufficient intensity to start and for automatically retarding timing.
- 1,115,738. PORTABLE BURGLAR ALARM; E. Randenbom, New York, N. Y. App. filed Aug. 8, 1912. Has a control lever which is tied to the door or window, etc.
- 1,115,739. AUTOMATIC TELEPHONE-EXCHANGE SYSTEM; F. N. Reeves, Newark, N. J., and A. E. Lundell, New York, N. Y. App. filed May 10, 1913. Economizes in the use of the trunk lines.
- 1,115,811. ELECTRIC SYSTEM; E. A. Halbleib, Rochester, N. Y. App. filed March 19, 1913. For lighting and starting purposes in automobiles.
- 1,115,812. ELECTRIC SYSTEM; E. A. Halbleib, Rochester, N. Y. App. filed March 19, 1913. Special generator for starting and lighting.
- 1,115,823. APPARATUS FOR THE PRODUCTION OF HIGH-FREQUENCY OSCILLATING CURRENTS; A. A. Jahnke, Point Richmond, Cal. App. filed July 11, 1912. For wireless work; operates from a direct-current supply.
- 1,115,830. BURGLAR ALARM; J. Jones, Jr., New York, N. Y. App. filed Jan. 13, 1912. Carried by door.
- 1,115,835. ELECTRIC CONTROLLER; A. Kimble and J. D. Niles, St. Charles, Ill. App. filed April 21, 1913. For variable-speed motors.
- 1,115,840. MAKE-AND-BREAK MECHANISM FOR ELECTRIC CIRCUITS; R. C. Lanphier and C. W. Struck, Springfield, Ill. App. filed July 1, 1912. Electric motor.
- 1,115,847. GAS FIXTURE; H. Lyon. App. filed April 7, 1910. Push-button control for lighting and extinguishing.
- 1,115,848. CONTACT OILER; P. G. Macgregor, New York, N. Y. App. filed Dec. 19, 1913. For oiling the contacts of a street-car controller.
- 1,115,868. ANTISEPTIC TELEPHONE MOUTHPIECE; I. S. Rosenblatt, San Francisco, Cal. App. filed Feb. 11, 1913. Tubular piece of solid antiseptic material carried by a shell seated in transmitter mouthpiece.
- 1,115,874. ELECTRIC-LAMP SOCKET AND CONNECTOR; J. C. Stearns, Worcester, Mass. App. filed March 23, 1912. For "Edison" lamps used on automobiles.
- 1,115,879. ELECTRIC BURGLAR-ALARM SYSTEM; P. Van Der Kooij, Cleveland, Ohio. App. filed Oct. 6, 1913. Closed circuit, and has an improved door switch permitting authorized persons to enter and leave without giving alarm.
- 1,115,902. DETECTOR; A. J. Coughenour, Fort Leavenworth, Kan. App. filed Jan. 24, 1914. Crystal and contact point universally adjustable in respect thereto.
- 1,115,921. MAGNETO GENERATOR; L. J. Wilson, Chicago, Ill. App. filed May 17, 1911. Magnet and distributor construction.
- 1,115,925. PORTABLE RECORDING VOLTMETER; W. E. Goodyear, Naugatuck, Conn. App. filed Nov. 30, 1906. For either alternating current or direct current.
- 1,115,939. SAFETY DEVICE FOR AUTOMOBILES; G. H. Holcomb, Wenatchee, Wash. App. filed Dec. 26, 1912. Lock for ignition circuit.
- 1,115,943. METHOD OF AND APPARATUS FOR ELECTRIC WELDING AND ARTS LIKE PRODUCED THEREBY; O. C. Knipe, Palo Alto, Cal. App. filed Dec. 20, 1912. Heats along annular areas and preferably in the presence of a neutral or reducing gas.
- 1,115,947. DYNAMO-ELECTRIC MACHINE STRUCTURE; J. C. Lincoln, Cleveland, Ohio. App. filed Jan. 30, 1911. Built-up assemblage of the field and frame structure.
- 1,115,948. METHOD OF AND MEANS FOR CONTROLLING ALTERNATING CURRENT MOTORS; C. E. Lord, Norwood, Ohio. App. filed Aug. 27, 1906. Particularly for mill and hoisting motors.
- 1,115,965. TELEPHONE SYSTEM; F. R. Parker, Buffalo, N. Y. App. filed Nov. 24, 1906. Has improved line and supervisory signal devices.

- 1,115,977. SELECTIVE SIGNALING SYSTEM; H. O. Rugh, Sandwich, Ill. App. filed March 15, 1910. Plurality of substations selectively controlled from a main station; has improved substation selector mechanism.
- 1,116,000. BONDING DEVICE FOR RAILS; A. A. Ziegler, Boston, Mass. App. filed June 23, 1913. Bond-wire loop is supported in grooves in the fishplate.
- 1,116,007. ELECTRIC-SIGN SYSTEM; H. L. Burns, Newark, N. J., and S. E. Williams, Jr., New York, N. Y. App. filed Aug. 24, 1909. Controlled by keyboard to flash different symbols.
- 1,116,013. PAPER CONDENSER; W. L. Casper, Brooklyn, N. Y. App. filed Aug. 2, 1913. Coiled strips of foil and paper sealed in cases.
- 1,116,020. ELECTROMAGNETIC COIL; E. H. Colpitts, Elizabeth, N. J. App. filed March 25, 1909. Toroidal core with windings arranged in mutually non-inductive groups.
- 1,116,056. ANTENNA STRUCTURE ON AEROPLANES FOR WIRELESS SIGNALING; W. Hahnemann, Kiel, Germany. App. filed Feb. 14, 1913. Mast on top of machine supports the wires.
- 1,116,090. FLEXIBLE CONDUCTOR; D. T. May, New Boston, N. Y. App. filed April 27, 1912. Telephone switchboard cord.
- 1,116,111. STATION FOR THE TRANSMISSION AND RECEPTION OF ELECTROMAGNETIC WAVE ENERGY; R. Pfund New York, N. Y. App. filed Nov. 1, 1913. Transmitter is located at the top of the tower.
- 1,116,116. OPERATION OF ELECTRICAL MACHINES OF THE INDUCTION TYPE; W. A. Price, Newcastle-upon-Tyne, England. App. filed Nov. 6, 1911. Reversing commutator interposed between induction motor and direct-current mains and regulatable gearing between rotor and rotary member of commutator.
- 1,116,130. ELECTRIC CAPACITIVE INDUCTIVE COIL; J. Schiesler, Vienna, Austria-Hungary. App. filed Nov. 23, 1910. Inductive coil and spiral condenser plates adjustable relative to each other.
- 1,116,183. RECEIVER FOR WIRELESS TELEGRAPHY; E. Weintraub, Schenectady, N. Y. App. filed July 24, 1905. Converts oscillations into unidirectional impulses and transmits these to a mirror galvanometer.
- 1,116,228. SAFETY ELECTRIC CIRCUIT SYSTEM; W. Langen, Hagen, Germany. App. filed April 24, 1914. Key-operated bolt controls ignition circuit.
- 1,116,262. ELECTRICAL SWITCH AND VALVE-CONTROLLING DEVICE; E. N. and E. A. Frary, South Deerfield, Mass. App. filed Aug. 18, 1910. For automobile gas lamps.
- 1,116,276. AUTOMATIC ALARM; H. Hoffman and G. C. Eastin, Mount Sterling, Ky. App. filed Sept. 9, 1913. For traveling bags.
- 1,116,283. ALTERNATING-CURRENT TRANSLATING DEVICE; L. F. Howard, Edgewood Park, London, Eng. App. filed Dec. 1, 1907. For railway signaling systems.
- 1,116,303. ARC EXTINGUISHER; F. M. Locke, Victor, N. Y. App. filed March 27, 1912. Formation of arc sets off an explosive which extinguishes the arc at the high-tension insulator.
- 1,116,309. DUPLEX WIRELESS TELEGRAPHY; G. Marconi, London, Eng. App. filed May 1, 1912. Combines aerials at receiving station in a certain manner.
- 1,116,320. RAILWAY-TRAFFIC-CONTROLLING APPARATUS; B. F. Oler, Elmhurst, N. Y. App. filed March 1, 1913. Co-operating magnetized cores of trackway and train.
- 1,116,324. MEANS TO PREVENT THE UNAUTHORIZED USE OF EXPLOSIVE ENGINES; A. D. Perkins, San Francisco, Cal. App. filed Aug. 25, 1913. Unauthorized attempted use cuts off ignition and sounds an alarm.
- 1,116,327. PLAYING APPARATUS FOR MUSICAL INSTRUMENTS; B. C. Reed, Dalton, Mass. App. filed Aug. 23, 1910. Electric player piano.
- 1,116,339. ELECTRIC WATER HEATER; H. G. Weeks, Chicago, Ill. App. filed Dec. 14, 1911. Coil surrounds upright heating chamber.
- 1,116,348. CIRCUIT-BREAKER; E. W. Stull, Wilkensburg, Pa. App. filed May 29, 1911. No-voltage device for use on railway systems employing high and low voltage at different points.

# Electrical World

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No. 21

## Mr. Wilson on the Railroads

President Wilson is again in his ideal mood when, in a letter to Secretary McAdoo, he discusses business and the railroads. He has not hesitated on other occasions to speak a word for the distressed railroads. If he appears to have less assurance in his tone this time, it is probably because of uncertainty whether the Interstate Commerce Commission will share his views. After telling how business problems have been met by Congress, he adds: "No doubt, in the light of the new day, with its new understandings, the problems of the railroads will also be met and dealt with in a spirit of candor and justice." The shade of hesitancy in these words is one that is shared generally by thoughtful observers of business and the times. If the Interstate Commerce Commission will do so, it can act as courageously as the President has spoken. He is not afraid of the political results of a reminder to the country, and inferentially to the commission, that the railroads are in need. The Interstate Commerce Commission is presumably a non-political body. A majority of its members were appointed by preceding Presidents, so that it is not answerable, even by courtesy, to the present Executive. It is answerable, however, to the people of the country, and if it does not deal with the grave problem confronting it in a fair spirit the people will hold it responsible for the consequences. No business man of real worth will fail to hope that the President's optimistic remarks regarding recent legislation, and especially the Federal Reserve Bank law, will be borne out by an abundant harvest of prosperity. It must be recognized, however, that that legislation, with whatever it means in good or ill, has been enacted. It is historical. The railroad problem is still before us and growing in seriousness.

## The Small Electric Sign

The field of usefulness of the small electric sign grows steadily, and the low cost of operation, the attractive appearance of well-designed equipment of this sort and the unusually effective display secured commend it to the central station seeking to extend its service by small as well as by sizable increments. What the porch lamp has become to the residence street the small electric sign may become in those fields where condensed information, striking directions to those using buildings or narrow thoroughfares, and safety warnings are desirable. Even the bungalow in the suburban district has found the small electric sign bearing the name of the home a useful guide to the visitor at night. For calling attention to the location of physicians' offices, night

bells, emergency entrances of hospitals, fire-alarm boxes and countless other conveniences and necessities of civilized life apparatus of this kind has no superior. It is surprising how small a connected load in watts will serve the purpose in such equipment, which, when multiplied throughout extended areas, will furnish a demand upon the central station of the long-hour and highly desirable type. There is an immense field of application here which has barely been entered.

## Testing Instrument Transformers

Owing to the high voltages and powerful currents that are commonly met with in alternating-current central-station practice, it becomes frequently necessary to resort to instrument transformers as intermediaries between the system to be explored and the measuring instrument. By this means voltmeters, ammeters and wattmeters not adapted for direct insertion in a tested system may be used advantageously by indirect connection through instrument transformers. It then becomes necessary, however, to know the essential characteristics of the instrument transformers, in order to allow correctly for their effects. Under service conditions instrument transformers in good order exhibit two characteristics essential to their operation, namely, their ratio and their phase angle. The determination of these characteristics is an important task in alternating-current testing laboratories, and various methods are utilized for this purpose. In the article by Dr. P. G. Agnew, on page 1004, there is described a method of testing by employing watt-hour meters. A standard instrument transformer of known characteristics is selected as approximating to the instrument transformer to be tested. The two are then connected to like watt-hour meters, with auxiliary excitation, in such a manner that the registrations of the two meters in a given time permit evaluating the characteristics of the tested transformer in terms of the known characteristics of the standard transformer. It is pointed out in the article that this method is inferior to existing null methods in elegance and precision, but that it can easily be carried out, requires relatively simple apparatus, comparatively little technical skill, and yet is capable of giving satisfactory results in regard to precision. The method is seen to depend on the watt-meter principle, with the power supplied from an auxiliary source, for the purpose of the test. This is one of a variety of ingenious applications of the watt-meter principle to alternating-current measurements, and it deserves to be noticed by testing observers in alternating-current systems.



### Photometry of Gas-Filled Lamps

Every photometrist who has tested the gas-filled tungsten lamp has encountered a series of problems of no mean difficulty. The troubles introduced by the new lamp are of three distinct sorts, each in its way exasperating and requiring special study. First of these is the color difficulty which always appears in the photometry of lamps operated at various degrees of efficiency. The color of the light from the gas-filled lamp, while in itself by no means pure white, is much whiter than that of any of the incandescent lamps which preceded it, and hence in comparing it with a carbon-filament standard or an ordinary tungsten standard there is an outstanding color difference which is somewhat troublesome for the photometrist. We are inclined to think that a sufficient degree of accuracy can usually be obtained by ordinary photometric methods, but for high precision the use of screens as suggested by Dr. Clayton H. Sharp in a paper read before the New York Section of the Illuminating Engineering Society is probably preferable. Of the two possible arrangements, one filtering out some of the red of the ordinary standard and the other reducing the blue component of the gas-filled lamp, we quite agree with Dr. Sharp that the latter is practically preferable.

A second difficulty encountered in dealing with the gas-filled lamp is the great irregularity of the distribution of the light in azimuth owing to the irregular contour of the filament. This difficulty is small in ordinary incandescent lamps and can be overcome readily by rotating the lamp while under test. With the gas-filled lamps the variations are so great that no practicable speed of rotation avoids the difficulty. The scheme used by Dr. E. P. Hyde, of placing behind the lamp two mirrors at an angle of about 120 deg. in order to observe simultaneously the light directly from the lamp in one direction and that from its images in two other directions, reduces this difficulty to a minimum, at the cost of a mirror correction, but with a comparatively low speed of rotation the flicker becomes inconsiderable and another one of the troubles can thus be successfully dodged.

Still a third difficulty comes from the effect of rotation and position on the light of the lamp. The remedy here is to rotate the lamp slowly in the position in which it is to be used. After all this is accomplished there is still trouble in estimating the spherical reduction factor of the lamp, by reason of the effect of small differences in the contour of the filament and the unequal blackening in various portions of the bulb during the life of the lamp. It is somewhat difficult to determine the ratio between the measured horizontal candle-power and the spherical candle-power, which determines the real output of the lamp. For this reason and on account as well of the material difficulties in the ordinary photometry of this source we are very strongly in favor of Dr. Sharp's suggestion that the lamps should be rated on the mean spherical candle-power basis, and preferably in lumens per watt. The mean spherical rating, which can very easily be determined in a sphere

photometer, has been recognized for some time as the most logical basis of comparison for lamps giving very different flux distribution. It has in fact repeatedly been recommended and tentatively adopted by various technical bodies, and the only thing which seems to have stood in the way of its introduction is a certain amount of commercial inertia attributable to the fact that most lamps heretofore in use have given their maximum flux near the horizontal. As the older types of lamps are tending to pass out of use and more or less extended surface sources are becoming common, there seems no reason why we should not pass at the earliest possible moment to the proper scientific rating on the basis of lumens rather than candle-power, either apparent or real.

### Hydroelectric-Plant Auxiliaries

The year 1914 will be long remembered by those who are operating hydroelectric plants, particularly in the eastern part of the United States, on account of the severe and long-protracted drought. Even in places where there is reasonably good storage the remarkably small flow of the streams has rendered it difficult to maintain full service, and where there is little or no storage steam auxiliaries have been called into requisition to a most unusual extent. In many cases there has been involved long-continued use of uneconomical auxiliaries designed to meet the requirements of brief and occasional use. The returns for the current season will furnish abundant food for reflection for all those interested in hydroelectric affairs. The special bearing of the situation is upon the economics of auxiliary steam plants, which are too often built as cheaply as possible and of size insufficient to take care of the load during a protracted term of scant water. To insure full reliability it is necessary to reckon on a plant large enough to supply economically the hydraulic deficit over a considerably longer period of scarcity than is generally assumed. During this year the low-water period has extended so late into the season as to coincide with the period of rapidly increasing load, and the deficit to be supplied has been enormous.

In designing an auxiliary steam station it is necessary to arrange not only to be able to cope with the longest recorded period of low water but to do so when that period coincides with the time of heavy load. If one examines the hydraulic record of a given stream, he will find a certain average low-water period which may be expected every year during the dry months. He is also likely to find once in a decade a single year, or perhaps two or three, in which the minimum is extraordinarily low, maybe not more than one-half or one-third of the ordinary minimum. A steam auxiliary must take care of this condition whenever it occurs, and to be reasonably sure of safety one should consider the chance of extraordinary drought at an unusual period of the year. In other words, the auxiliary must be planned to cover not only average low-water conditions but the most extraordinary of which the records of runoff or rainfall give any reasonable hint. More-

over, such an auxiliary should be planned to operate economically during the longest low-water period to which any clue can be obtained. All of these conditions point to the wisdom of installing a better plant than is commonly dedicated to such service, both in equipment rating and in operating efficiency. A most valuable body of evidence for future guidance would be formed by records of the experience of those who have suffered during the present season.

### The Mayors on Public Utilities

At the conference of American mayors in Philadelphia last week widely varied shades of opinion were expressed on the great public utility issues of the day. The program was made up mainly by and for mayors. The policy of home rule of utilities—that is to say, local instead of state regulation of privately owned plants—proved to be, in at least several cases, only a frankly admitted disguise to cover a real policy of public ownership and operation. However, the fact that various speakers advanced municipal ownership as the remedy for all the ills complained of is not to be taken as the final word of the conference on this important question. The recommendation finally adopted by the conference, that no general conclusion be formulated upon this "abstract question" but that cities should be given the power to municipalize, represents the sober, dominating judgment of the controlling majority. This conclusion binds only those who are in favor of it. The effect, if any, that it will have in the future cannot well be foretold; but it is certainly a distinct departure from the policy of public ownership and operation, regardless of risk, cost or disaster, to which some of the speakers would gladly have committed the entire gathering. What brought about this note of conservatism in the final definite expression of opinion it is not easy to determine. If heeded, the facts given out of the experience of some speakers would exercise a deterring influence. The words of Mr. Erickson about the unsatisfactory municipal operation found in Wisconsin were impressive. The fair address of Mr. Winchester, who has spent his life, absolutely free from political interference, in the management of the South Norwalk municipal plant, is testimony of a kind that nine-tenths of the mayors know they could not get in their own politically ridden cities. Speculate as we may about causes, we cannot doubt that the final adopted conclusion represents firm conviction on the part of the influential mayors that the day of general public ownership is not here, that the day of private ownership with public regulation is here, and that the best use of the cry of public ownership is as a weapon to force companies to give good service and low rates.

On the subject of local versus state regulation the conclusions of the mayors are somewhat non-committal, although tending, as was to have been expected, toward home rule. "No man," said Mr. Guernsey, "should act as a judge in his own case." Yet that is precisely what the mayors who favor home rule want to do. They

either do not see the manifest impropriety of deciding their own case or, seeing it, they are determined to do it any way. The demand for home rule is a demand for control. Under this plea the cities, comprising the users of the service, want to say what rates they should pay. This puts the producer wholly at the mercy of the kindly good will of the user. With human nature still frail, with individuals still seeking political advancement and ready to take advantage of a helpless public utility corporation, can anyone doubt that the result of a general policy of this kind would be gross unfairness to many utilities? The old policy of barter for franchises has been succeeded by a better one of rate and service adjustment as the state commissions find conditions justify. The mayors who want both to make the rate and use the rate forget that no successful method has yet been devised of keeping your cake and eating it too.

It is to be noted also that the recommendations declare that municipally owned utilities should be subject to local control only. If the municipally owned utilities are in competition with privately owned utilities and the privately owned utilities are subject to state regulation, what is fair for them is fair for the municipally owned utilities. If it is facts that are wanted, we are of the opinion that, as a rule, they will be brought out more clearly by the elaborate regulative methods of the state commission than by the average municipal system of accounting and report. If the municipal plant is free to discriminate in rate-making, why should the private plant be restricted in that pernicious but business-getting practice?

The constructive work done by the conference, which is intended to yield permanent results, is the approval of the Utilities Bureau as an agency of the cities in the settlement of questions arising with the companies. The position flamboyantly taken by some of the speakers is that this bureau will do for the cities what various associations have done for the companies, that one will be met by the other. Whether this is to be taken as a tribute to or a criticism of the associations is not a serious matter. Just what the mayors mean by a combination of "specialized experts which private interests" "mass in defence of one another" we do not know, but it sounds very formidable and, if true, it is perfectly reasonable that they should oppose to it the "skill, experience and resources of the united cities of the country," assuming, of course, that they do not waste those resources. If when the mayors talk this way they have in mind the associations of public utilities of all kinds throughout the country, they over-color the picture. The proceedings of these associations, as almost any current issues of the *Electrical World* show, are full of papers and discussions that promote good service and efficiency. They are not at all the proceedings of a band of pirates stealthily come together to prey and despoil. In the main the associations are fine instruments of progress. If the Utilities Bureau of the mayors can do as much as the associations have done to upbuild, it will exert a wholesome influence.



# The News of the Week

## Activities and Events in the Electrical Field— Reports of Meetings—Commission Findings, Etc.

### Philadelphia Rate Case

The hearing of the case started by the city of Philadelphia in regard to rates of the Philadelphia Electric Company began before the Public Service Commission of Pennsylvania in Harrisburg on Nov. 17. Among those who testified were Messrs. William Draper Lewis, counsel for Director of Public Safety Cooke of Philadelphia, William Hancock and William H. Ball, chief of the Bureau of City Property, the complainants, and George H. Morse, electrical engineer, of Wheeling, W. Va. On Nov. 18 Mr. Morse and Mr. Judson C. Dickerman, of the Bureau of Gas, of Philadelphia, testified. The hearing will be resumed later.

### Meeting of Investment Bankers

The Investment Bankers' Association of America held its third annual meeting at the Bellevue-Stratford Hotel, Philadelphia, on Nov. 12 and 13. Among the reports of committees was one by Mr. John E. Oldham, of Boston, on public service corporations. The list of addresses included "An Equitable Solution of the Public Utility and Conservation Problems," by Mr. Andrew J. Frame, president Waukesha (Wis.) National Bank, and "The Modern Gas Company as a Security for Bonds," by Mr. Rufus C. Dawes, president Metropolitan Gas & Electric Company, Chicago. Mr. A. B. Leach, of A. B. Leach & Company, New York, was elected president for the ensuing year.

### Cooper Hewitt Wireless System

Dr. Peter Cooper Hewitt, inventor of the mercury-vapor lamp, rectifier, etc., announces that he has about perfected a variation of the vacuum rectifier which will many times multiply the possibilities of wireless telegraphy and telephony. The receiving apparatus is already completed, and the final touches are now being put on the transmitter. The same receiver is used for both wireless telegraphy and telephony and the inventor prophesies that when the transmitting apparatus is completed it will be possible to telephone directly to Europe. This he attributes to the capability of the instrument to pick up even the faintest current.

### Meeting of Electrical Committee of N.F.P.A.

The biennial meeting of the electrical committee of the National Fire Protection Association will be held in New York next March. Suggestions for amendments to the National Electrical Code, in order to be included in the bulletin or suggestion, must be in the hands of the committee not later than Jan. 15. It is recommended that these suggestions be specific and that where a change is desired in a rule or section of a rule definite wording for such change be given, together with the reasons why the change is recommended. As heretofore, the meeting will be open to all interested, and such persons will not only be welcome but are urged to be

present and give the committee the advantage of their experience and advice. Mr. Ralph Sweetland, 141 Mil Street, Boston, is secretary of the electrical committee, and to him suggested changes should be addressed.

### Cincinnati Decision Favors Competition

Judge Gorman, of the Common Pleas Court of Hamilton County, Ohio, has refused the petition of the city of Cincinnati to prevent the Diamond Light Company from laying its wires under or stringing them over the streets and alleys.

The court held that abutting property owners have the use of the streets for anything they see fit, so long as they do not interfere with them as streets, and may lay wires under them or string wires overhead if they reach an agreement among themselves to do so. Having this right, they may delegate it to others, with the provision that all work done must be according to the requirements made by the city.

It was held further by the court that a monopoly of the business of furnishing energy for light and commercial purposes cannot be given to one individual corporation and that competition can enforce its right notwithstanding the wishes of the city in this respect.

The city wants to make a new contract with the Union Gas & Electric Company at a reduction of rate and sought to protect that company through this suit in the belief that its rights were being encroached upon.

### Program Arranged for Jobbers' Meeting

Elaborate arrangements are being made by the electrical fraternity in Birmingham for the entertainment of the electrical supply jobbers, etc., who will attend the quarterly meeting of the Electrical Supply Jobbers Association at the Tutwiler Hotel, Dec. 8, 9 and 10. On Dec. 8 there will be the regular registration in the morning followed by meetings of both the central and eastern divisions of the Electrical Supply Jobbers Association at 11 o'clock. There will be an open-meeting welcome from Mayor George P. Ward of Birmingham at the Tutwiler Hotel at 2 o'clock, followed by general meeting of the jobbers at 3. For the evening of Dec. 8 a theater party has been arranged for the ladies, and a cabaret and smoker will be tendered by the Newspaper Club on the same night to the men. On Dec. 9 a golf tournament has been arranged at the Rock Springs Golf Club in the morning for those not attending the jobbers' meeting, and at 1 o'clock in the afternoon a barbecue will be given, followed by a party for the ladies at 3. That night there will be ball and reception tendered by the Birmingham Country Club. The following day the ladies will be entertained at a tea at the Southern Club and will pay a visit to the twenty-second floor of the Press Club. Early in the afternoon a ladies' luncheon will be served at the Country Club. The jobbers will hold their regular meeting during the morning, and at 2:30 p. m. Dec. 10 a train will, through the courtesy of the Tennessee Co.

Iron & Railway Company, leave the Louisville & Northern station for a trip to the iron and steel mills. The work of entertainment is in the active charge of Mr. Oscar Turner, of the Turner Electric Supply Company.

### U. S. S. "California" to Be Driven by Motors

The Secretary of the Navy has authorized the installation of a steam-turbine electric propelling plant on the superdreadnaught *California*, which will be built at the Brooklyn Navy Yard. The installation is made on the recommendation of Rear Admiral R. S. Griffin, engineer-in-chief of the navy, and although this type of power plant has already been installed in the naval collier *Jupiter*, the superdreadnaught *California* will be the first electrically driven warship ever built. The decision to install the new system aboard the battleship was decided on after an exhaustive study of the performance of the *Jupiter*, which was the first deep-sea vessel of any type to be fitted with electric motors.

### N. E. L. A. Commercial Section Membership

Mr. John F. Learned, Chicago, chairman of the National Electric Light Association's Commercial Section membership committee, has divided the work of the committee into four sections. The divisions together with their officers, are: Eastern section, vice-chairman, Mr. L. D. Gibbs, 39 Boylston Street, Boston; Western section, vice-chairman, Mr. S. V. Walton, 905 Market Street, San Francisco; West Middle section, vice-chairman, Mr. F. D. Beardslee, Twelfth and Locust Streets, St. Louis; Middle East section, chairman, Mr. John G. Learned, 72 West Adams Street, Chicago.

A chairman has also been appointed for each state. Already the efforts of the committee are beginning to show returns. It is anticipated that there will be a great number of applications for membership in the Commercial Section on or about Jan. 1, 1915, since after that time the Commercial Section membership dues to the amount of \$2.50 will be waived.

### Pioneer Spirit in Electric-Vehicle Industry

At the monthly meeting of the New York Section of the Electric Vehicle Association of America, Nov. 17, Mr. R. M. Lloyd addressed the assembly on "The Influence of the Pioneer Spirit on Electric-Vehicle Progress." Mr. Lloyd's remarks were chiefly reminiscent and included a recital of his experiences in connection with some of the first American storage-battery companies. The growth of the industry was at first retarded because of expensive litigation and rivalry among the various battery companies. Finally, in 1894, the battery companies merged. About 1895 a number of electric cabs were introduced in New York and they proved very popular. The demand for electric vehicles increased steadily, but unfortunately it was soon realized that many improvements would be necessary before electric cars could successfully compete with other types of vehicles. Mr. Lloyd designated the period from about 1900 to 1908 as the dark age of the electric-vehicle industry. Since 1908 many developments have taken place, and the electric car, Mr. Lloyd asserted, has again come into its own.

In the discussion following Mr. Lloyd's address the various speakers devoted their remarks chiefly to incidents and personal experiences in regard to the first electric cars. Mr. G. H. Duck averred that in some re-

spects the electric-vehicle industry, particularly in reference to salesmanship, is still in the pioneer stage. He declared that the electric vehicle was too often compared with the gasoline car. Each, he stated, has a field of its own. Messrs. D. C. Fenner, F. F. Philips, W. C. Andrews, F. N. Carle, F. B. Neely and W. W. White also spoke.

### Work of the Illuminating Engineering Society

At a meeting of the council of the Illuminating Engineering Society held Nov. 12 in the offices of the society, 29 West Thirty-ninth Street, New York, the committee on lighting legislation presented an interesting report on the laws of several states pertaining to lighting. The committee has had collated the laws relating to lighting now on the statute books of the states of New York, Pennsylvania and Connecticut. A model lighting law, however, was thought impracticable at the present time. Nevertheless, as a step forward toward meeting the situation, it was decided to formulate a "lighting code" on school lighting and another on factory lighting. For more than a year the committee on popular lectures and a number of sub-committees have been gathering data and information which are being put in the form of six popular lectures on lighting. One lecture will deal with the general principles of illumination; the other five will be devoted to the subject of residence, office, industrial, store and school lighting respectively. In all the lectures, which are to be made available for presentation before public and other meetings, the principles of good lighting to be imparted will be reduced to a simple and attractive form.

During the past year the committee on education has undertaken to ascertain the status of illuminating engineering in schools and colleges throughout the country and to foster the establishment of such courses as will ultimately lead to the degree of illuminating engineer.

The committee on progress will prepare a report to be submitted at the next annual convention of the society. The report will review the year's progress in the field of illumination and will be based largely on a summary of the literature published in this country and abroad.

Mr. S. G. Hibben was appointed a director to fill the unexpired term of Mr. F. A. Vaughn, who resigned on account of his election to the vice-presidency. Mr. Alten S. Miller was appointed a director to succeed Mr. V. R. Lansingh. Including these, three changes have been made in the board of directors since the annual election. Mr. C. A. Littlefield resigned as director of the society to become general secretary to succeed Mr. Joseph D. Israel, who was appointed a director to succeed Mr. Littlefield.

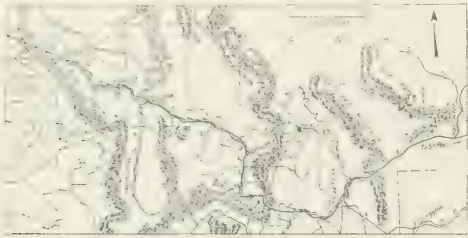
### Electrification of Milwaukee Railroad

The Chicago, Milwaukee & St. Paul Railway, through Mr. C. A. Goodnow, assistant to the president, has closed a contract with the General Electric Company for the equipment to electrify the first 113-mile section of its main-line Puget Sound division in the Rocky Mountains, between Three Forks and Deer Lodge, Mont. The direct-current system, with a trolley pressure of 3000 volts, will be employed. It is estimated that the labor and equipment for the first 113-mile division will cost about \$3,000,000, and that the complete electrification, 440 miles, will cost \$12,000,000. Work on the overhead construction is to be started as soon as field crews can be organized. Practically all poles are already on the ground, and the overhead-line material is available for use as needed. The contract calls for delivery of the first



substation equipment on May 1, 1915, and the first locomotive Oct. 1, 1915. The first electrified division will be ready for operation, it is expected, by Jan. 1, 1916.

Hydroelectric energy to operate the electrified road will be supplied under long-term contracts from the systems of the Montana Power Company, Butte, Mont., and the Thompson Falls Power Company, as already



SECTION OF MILWAUKEE RAILROAD TO BE ELECTRIFIED

noted in these columns. For the complete electrification power will be delivered to the railroad system at seven points between Avery and Harlowton. The electrified section crosses three mountain ranges and at the summit of the Rockies reaches an elevation of 6322 ft. above sea level. The highest grade to be ascended is 2 per cent.

## GOVERNORS DISCUSS WATER-POWER

Conference of State Executives Urges State Control of Public Lands and Natural Resources and Protests Against Policy of Power Withdrawals

Led by Gov. William Spry of Utah, who read a paper on "State Control of Natural Resources," the Governors' Conference in session at Madison, Wis., on Nov. 11 discussed topics of federal ownership of large tracts of public lands in Western states and the exemption of these lands from furnishing tax revenues to the state governments, the federal leasing of water-powers with right of withdrawal, and the state control of natural resources under conditions of commission regulation similar to those now imposed by utility commissions.

"Conservation" was roundly scored by Governor Spry and other speakers, who declared that the conservation agitation was originated in selfishness by self-appointed guardians of the nation's resources, and that the effect of this policy has been to retard seriously the development of the West. Although the first "conservation congress" of a few years ago was called ostensibly to prevent waste of natural resources, said Governor Spry, it actually developed into a spectacular and wordy exploitation of calamitous and misleading figures and information predicting the early bankruptcy of the nation's natural wealth.

### Harm Done by "Conservation"

As a result of the unnecessary alarm thus caused, valuable rights were withdrawn by the government after insufficient field investigation. This has interrupted the development of the West, and at present the cry is even going up for government ownership of all water-powers.

The policy of the federal government in respect to leases and withdrawals is a narrow one, for, though protecting the interests of generations unborn, it omits fulfillment of its obligations to the people who are carrying on pioneer development to-day. The issue raised by federal ownership of land and resources, declared

the speaker, is not a political question, for both parties have given the states similar treatment in this direction. But unless a more liberal policy is adopted, predicted Governor Spry, the contention may reach proportions now unguessed and of greater danger to the harmony and union of the states than any influence at present felt. Natural resources form the capital of the states, and the capital of both state and nation is seriously impaired when the use of the states' natural resources is restricted. The matter of who shall control and dispose of natural resources is, however, a minor one compared with the need for at once placing these resources in the hands of those who will develop their usefulness and to the best advantage. The West asks no favoritism or advantage, said the Governor in closing, but it demands equal opportunity with its older sister states in handling the matters of its lands and natural resources.

### Private Ownership Preferable from State's Standpoint

In discussing Governor Spry's address, Gov. S. V. Stewart of Montana said that in preference to federal ownership the state should even favor ownership of property by private corporations, for this would at least render the property subject to taxation by the state. Public utilities, he pointed out, are now being regulated by commissions in most of the states, and such a system of regulation applied to natural resources would prevent abuse of monopoly. In this solution of the difficulty by regulation the problem of natural resources, he insisted, seems to have been approached and solved from a new angle. Where the leasing system has been assented to it has been accepted only on the theory that it is better to have water-powers leased and developed than to keep them stored up and useless.

Gov. A. O. Eberhart of Minnesota testified to the difficulty in getting Western representation on the conservation-congress program. The state should undertake no business, he said, which can be transacted efficiently by private interests, and similarly the federal government should exercise no function which can be properly discharged by the state governments. State regulation of public utilities has been found effective and when all states have such regulation no reason will remain, said Governor Eberhart, why their own resources should not be turned over to the states for proper control and use.

### Methods of Government Officials Criticized

Gov. Joseph M. Carey of Wyoming characterized the statutes of the Western States as liberal, but he criticized some of the construction methods employed by the government. Irrigation ditches, for example, he charged, are constructed so expensively by the government engineers that the settlers who gain through the use of the ditches cannot afford to pay the heavy cost involved.

Gov. E. M. Ammons of Colorado said that approximately 5 per cent of the water-power of his state is now developed. He protested against the difficulties which, he said, have been thrown in the way of those who seek to construct storage reservoirs and water power plants on the upper headwaters of Colorado streams by federal authorities who have declared in explanation that such construction would interfere with the operation of water-power sites lower down. These arguments Governor Ammon characterized as absurd since the power possibilities of any stream would be improved rather than injured by its control to uniform flow. With the aid of state commissions having supervision of water-power subjects, the Governor declared that the greatest use might be made of state water powers, instead of the least, as at present.

## CORONA FROM DIRECT-CURRENT CIRCUITS

Experimental Investigations with Small Wires Subjected to Constant Pressures up to 15,000 Volts—Plotting Motor-Service Curves

Subjects relating to the plotting of speed-time and distance-time curves and corona produced on high-potential direct-current circuits were discussed at the three hundred and first meeting of the American Institute of Electrical Engineers held in New York City, Nov. 13.

### Plotting Motor Curves by Graphic Method

Mr. E. C. Woodruff described a very simple method of obtaining speed-time and distance-time curves without employing the usual step-by-step process, which involves tedious calculations. The graphic method, which is a modification of that brought out by Mr. C. O. Mailloux in 1902, consists of plotting "service characteristics" on the same sheet with speed-current and traction-current curves in such a way that time and distance increments can be measured directly with a pair of dividers.

Among those taking part in the discussion of this paper were Messrs. Selby Haar, C. O. Mailloux, M. W. Akimoff, F. Castiglioni, Paul M. Lincoln, N. W. Storer, F. E. Wynne and E. E. Kimball.

Mr. Mailloux declared that the most difficult part of plotting service curves consists of determining the point at which a change in grade or degree of curvature is to be encountered. In his opinion the integrator furnishes the simplest method of plotting such curves. To show the adaptability of this instrument he described its use in practice in detail. He pointed out that the accuracy with which curves can be plotted graphically depends upon the formulas used for train resistance, upon the scale used and the precision of the methods of integration.

A written discussion prepared by Mr. Akimoff was next read in which the author proposed using an archoid to represent the peculiarities of starting motors, locomotives, engines, etc. The proposed curve, while it cannot be employed universally, may be of considerable use in practice in designing and testing machinery.

Mr. Castiglioni described an ingenious practical method of plotting curves which involves the use of speed-distance curves, these being used in determining the proper point at which to cut off the velocity-time curve, and incidentally to determine the distance traversed by the car.

In another written discussion prepared by Mr. Wynne the author expressed the belief that the step-by-step method of calculating and plotting speed-time curves together with the use of a planimeter is more rapid than any graphical method where not more than three curves have to be made for a given weight per motor.

Mr. Kimball gave an illustrated talk in which he showed how closely the ordinary railway motor curve approaches a simple exponential function. He also explained how a slide rule can be used when a motor curve is not available.

In the absence of Mr. Stanley P. Farwell, his paper was presented by Mr. F. W. Peek, Jr.

### Corona from Direct-Current Circuits

Experimental investigations with corona around small wires subjected to constant pressures up to 15,000 volts direct current were dealt with in a paper entitled "The Corona Produced by Continuous Potentials," by Mr. Stanley Farwell. The wire and coaxial cylinder method was employed for most of the experiments, but parallel wires were used for a few. Relations were brought out which exist between critical voltage, glow voltage, dis-

charge current, diameter of wire, polarity of conductor, humidity, temperature and atmospheric pressure. Conductors having positive polarity were found to give continuous glow, while negatively charged conductors were surrounded with bead-like corona, the number of beads being a function of the voltage and size of the wire. A short arc in the circuit superimposes a high-frequency current on the direct current. Moisture raised the starting point of the positive corona discharge and acted in the reverse manner for the opposite polarity. Rising temperature had the expected effect of increasing the discharge current. Owing to ionization of the atmosphere at high potentials a conductor carrying a pressure above the critical voltage was observed to raise the air pressure in an inclosing vessel. Corona was also found to be accompanied by mechanical effects, both conductors being deflected in the same direction and subjected to circular vibration.

### Discussion

A lengthy discussion ensued in which the following took part: Messrs. L. W. Chubb, A. E. Kennelly, Paul M. Lincoln, Max von Recklinghausen, L. T. Robinson and Selby Haar.

Mr. Chubb called attention to the commercial value that a study of direct current would have on electrical precipitation and the fundamental study of the electron theory and effects of ionization. He also pointed out that the concentration of the direct-current corona into beads or regularly spaced brushes on negative direct-current conductors corresponds with the negative spots in mercury-arc tubes, and that the glow on the positive conductor corresponds in a way with the luminosity around an anode which is being bombarded with electrons.

Mr. Lincoln said that if the energy loss in conductors is a function of the frequency it would appear that there would be no loss at zero frequency, which is not brought out by the tests described in Mr. Farwell's paper.

Mr. von Recklinghausen described luminous effects appearing in mercury-vapor lamps and compared them with the corona discharge from direct-current conductors. Although the loss of energy by corona discharge has limited the voltage of alternating-current circuits to a great extent, the speaker did not believe that this loss would limit the voltage of direct-current transmission as the loss is negligible.

Mr. Robinson expressed the belief that as the critical voltage has a definite value with direct current it can be used for the measurements of high potential.

In closing the discussion, Mr. Peek said that as the starting of corona discharge depends on the maximum voltage, it is evident that a direct-current transmission circuit can be operated at 141 per cent of the voltage of an alternating-current circuit before a corona will appear. One great advantage in favor of direct current, however, is that the insulation will not break down so quickly on a direct-current circuit as on an alternating-current circuit having the same effective voltage. The loss in a direct-current circuit is less than one-quarter of the corresponding loss in a sixty-cycle alternating-current circuit having the same maximum voltage. Attention was called to the fact that if a voltage surge passes through a wire there should be enough time to produce successive collisions, resulting in complete ionization or saturation of the surrounding air. So with transient potential surges there should be considerable corona discharge. If the time required for the surge potential to reach its maximum is about one two-millionth of a second, the starting voltage is approximately double the normal value, but if the time is increased to one two-hundred-thousandth of a second the starting voltage is increased only to the extent of 25 per cent.



## PHOTOMETRY OF GAS-FILLED LAMPS

### Effect of Lamp Rotation on Candle-Power—Elimination of Flicker—Use of Color-Correcting Filters

Problems in conducting photometric tests on gas-filled lamps and solutions thereof were considered briefly in a paper entitled "The Photometry of Gas-Filled Incandescent Lamps" presented by Dr. Clayton H. Sharp on Nov. 12 before the New York Section of the Illuminating Engineering Society. It was pointed out that an amber color-correction screen placed in front of a high-efficiency lamp during photometric tests has the advantage of reducing by absorption the intensity of the light to be measured instead of that of the standard or weaker source. The disadvantage of using a screen in the position mentioned is that the coefficient of absorption of any selective filter varies with the color of light it transmits. As gas-filled lamps designed for different currents do not emit lights having corresponding spectral values, selective filters used with them cannot be assumed to have constant absorption coefficients. This objection is not encountered when a blue color-correction screen is placed in front of the comparison lamp as the light emitted thereby does not vary in spectral value. The most practical way to calibrate light filters, as suggested in this paper, is to take the average of readings made by a large number of skilled observers under different conditions as to illumination, type of photometers, etc. Dr. Sharp stated that the Bureau of Standards is at present establishing a series of standard filters in conjunction with leading photometric laboratories in this country.

In testing gas-filled lamps there are limitations to the speed at which the lamp can be rotated about its vertical axis to determine the mean horizontal candle-power. When rotated slowly these lamps appear to flicker considerably owing to the arrangement of the filaments, and hence errors in photometric setting become large. By increasing the speed of rotation considerably, however, other difficulties arise. To minimize flicker without introducing other objections the Electrical Testing Laboratories has adopted the expedient of placing behind the lamp two mirrors at an angle of 120 deg. with each other. The photometer screen is set permanently quite far from the mirrors, which are large, and readings are obtained by moving the comparison lamp. With this arrangement the lamp can be rotated slowly without producing flicker.

The speed of rotation also affects the energy consumed and the candle-power of a gas-filled lamp, but the variations do not appear to follow any definite law. With the tip upward during rotation the variations are considerably larger than when the tip is downward. In general, the mean horizontal candle-power is increased, for 400-watt lamps as high as 14 per cent when the speed is increased from 60 r.p.m. to 240 r.p.m. and less for more highly rated units. Lamps should therefore be tested with the tip downward. Multiple lamps give higher mean horizontal candle-power per watt when rotated at high speeds, while series or constant-current lamps show small or negative increase in specific output. The observed variations were attributed to changes in convection, radiation and flux distribution due to the mechanical distortion of the filaments.

Small differences in the arrangement of the filaments affect the spherical reduction factor of gas-filled lamps considerably, and hence the mean horizontal candle-power is an imperfect measure of the total luminous output. The reduction factor is also affected by the deposit of volatilized tungsten on the neck of the lamp during operation, the mean horizontal candle-power decreasing much more slowly than the mean spherical candle-power. Sagging of the filament also causes

variations to appear in the spherical reduction factor.

Because of the characteristics mentioned in the foregoing paragraph it was recommended that the specific output of gas-filled lamps be expressed in lumens per watt, with the hope that other classes of illuminants will be similarly rated in the future. In the closing paragraphs of the paper a two-meter integrating sphere which is equipped for the convenient introduction and removal of gas-filled test lamps was described. It was declared that with this apparatus measurements have been taken at the Electrical Testing Laboratories as rapidly and conveniently as with the ordinary bar photometer.

### Discussion

Among those taking part in the discussion of Dr. Sharp's paper were Messrs. S. L. E. Rose, Norman Macbeth, W. H. Rolinson, T. H. Amrine, J. B. Taylor, G. M. J. Mackay and Preston S. Millar.

Mr. Rose pointed out that the objection to rating the specific output in flux per watt is that the mean horizontal candle-power cannot be computed accurately therefrom, owing to the gradual change in the reduction factor. Mr. Macbeth called attention to the importance of color value in matching fabrics and said that the flux per watt is a much more desirable value on which to base useful life than the mean horizontal candle-power per watt, which has been used with most illuminants heretofore. Mr. Amrine pointed out that the variations in candle-power of gas-filled lamps at high speeds of rotation are probably due to changes in convection and radiation, since removing the inert gas from the bulbs and producing a vacuum has been shown to reduce these effects considerably. Mr. Mackay said that tilting a gas-filled lamp filament causes it to become hotter and emit more light on one side than on the other, showing that variations due to rotation may also be accounted for by displacement of the filament. Mr. Millar called attention to the fact that gas-filled lamps cannot be constructed as accurately as vacuum lamps and that the distribution of light emitted by similarly rated units may differ considerably. He also pointed out that the useful life of a lamp when based on the mean horizontal candle-power is about twice as long as when based on the total flux.

### Color-Correcting Filters

Following the discussion, Dr. Sharp lectured on commercial daylight-lighting equipments and gave data thereon. Booths containing illuminants equipped with color-correcting filters were exhibited to show their relative characteristics in bringing out the colors of similarly dyed ribbons. Among the illuminants displayed were illuminating-gas units, an intensified arc unit, a carbon-dioxide tube and gas-filled lamps. Curves were shown comparing the spectral distribution from these units with blue-sky light. The amount of luminous energy lost in the color filters varies from 64 to 94 per cent.

Mr. Taylor emphasized the need of having the walls, ceiling and woodwork of rooms of the proper color if satisfactory results are to be obtained from daylight-lighting equipments. Mr. Macbeth suggested that the Bureau of Standards adopt a standard light spectrum with which to compare all lights. Mr. Rolinson questioned whether it would not be better to use other than daylight for matching colors, in answer to which Mr. Macbeth said that it is possible to match colors under all lights but they cannot be identified equally well in all. Mr. C. O. Bond suggested that the New York Section of the Illuminating Engineering Society maintain light-comparison booths permanently in which new lighting units can be hung for the inspection of illuminating engineers or other persons interested.

# Conference of Mayors on Public Utilities

**Meeting in Philadelphia Attended by Executives of Many Leading Cities, Who Listen to Discussion on Local or State Regulation, Public Ownership, Holding Companies and the Public Welfare and Other Issues**

The conference of mayors held in Philadelphia last week was attended by the mayors of forty-nine cities. There were also present a number of other officials of cities, representatives of civic clubs and associations, representatives of several of the state public service commissions and members of the Uniform Electric Rate Association.

Starting with a reception at the Bellevue-Stratford Hotel on the evening of Nov. 12, the time of the delegates was kept fully occupied until the end of the concluding session on Nov. 14. On the general reception committee were the names of many prominent Philadelphians, including officials of the local public utility companies. The reception, at which the mayors were welcomed by Ex-Governor Stuart of Pennsylvania and Mayor Blankenburg of Philadelphia, was attended by many men prominent in the banking, civic and industrial life of the city.

In the business sessions, which began on the morning of Nov. 13 and were concluded on the evening of the following day, the formal papers presented were grouped in accordance with subjects prearranged in the program and there was little departure from the arrangement announced in advance. Time was allotted arbitrarily to the different speakers, and there was little opportunity for general discussion. Mayor Blankenburg was the first presiding officer, and when he was called away Dr. Ernest S. Nichols, president of Dartmouth College, presided during the remainder of the first business session. It was at this session that the chairman was directed to appoint a committee on recommendations which did the definite work of the convention. It was at this session also that Mr. Louis D. Brandeis appeared instead of taking part in the discussion of "Holding Companies and the Public Welfare" which was arranged for the evening of Nov. 14. The real subject of the discussion of Mr. Brandeis was the new Utilities Bureau, of which he is one of the trustees. This bureau was proposed at the same time that the movement for the conference was started.

It was at the afternoon session on Nov. 13, devoted to "The Regulation of Utilities," that the discussion began to get warmer in the direction of closer regulation, home rule and public ownership and operation. The tendency in this direction was strengthened by the remarks of Mayor Harrison of Chicago, who presided.

At this session the members of the committee on recommendations were announced by Mayor Blankenburg, as follows: Newton D. Baker, Mayor of Cleveland, chairman; Richard D. O'Brien, Director of Utilities, Seattle; Theodore Theime, Citizens' League of Indiana, Fort Wayne, Ind.; Frederic W. Donnelly, Mayor of Trenton, N. J.; John P. Mitchel, Mayor of New York; Charles E. Merriam, alderman, Chicago; Milo R. Maltbie, Public Service Commission, First District, New York; John M. Eshleman, Railroad Commission of California; H. S. Hocken, Mayor of Toronto; F. C. Thomson, Mayor of Chattanooga.

The proceedings were diverted a little from the main subject of discussion at this session by remarks from Messrs. Percival R. Moses, of New York, and H. W. Ashley, of Toledo, who presented and discussed the point of view of the Uniform Electric Rate Association.

Pamphlets issued by this association were distributed.

The evening session on Nov. 13 was held at the Central High School under the auspices of the American Academy of Political and Social Science and was devoted to "Local and State Regulation of Municipal Utilities." The presiding officer was Mayor Mitchel of New York, who was not extreme in his expression of views but presented a policy balanced between state and local control. Of the four speakers, Mr. Erickson, of the Wisconsin commission, stood most strongly for state regulation because the facts brought out by his experience point to the desirability of that policy.

The discussion on "Municipal Ownership and Operation" at the morning session on Nov. 14 was not, as might have been expected, wholly against private ownership and operation. Mayor Baker of Cleveland, and afterward Mayor Curley of Boston, presided at this session.

After the lunch tendered by business men of Philadelphia at the Wanamaker store, brief talks were made at a somewhat informal meeting, over which Mr. Charles A. Prouty, director of the division of valuation of the Interstate Commerce Commission, presided. Among those who spoke briefly were Messrs. M. N. Baker, of the *Engineering News*; Felix Frankfurter, professor of law of Harvard University; F. C. Henderschott, of the New York Edison Company; Mayor Seger of Passaic, N. J., and Mayor Nevin of Easton, Pa. The last-named speaker said that it should not be forgotten that public service corporations made cities what they are to-day. During this meeting Mayor Baker of Cleveland, chairman of the committee on recommendations, presented the report which is published elsewhere in this issue. It was adopted without discussion.

The final session, devoted to "Holding Companies and the Public Welfare," was held at Witherspoon Hall under the auspices of the American Academy of Political Science. It lost some of its impressiveness, so far as the mayors were concerned, by reason of its unfortunate position in the program on Saturday evening at the conclusion of all the proceedings. Secretary of the Interior Lane, who was expected to preside, was not present, and Dr. Carl Kelsey, acting president of the American Academy of Political and Social Science, opened the meeting. A strong presentation of the case of the public utility holding company was made.

According to the list given out, mayors of the following cities were registered: Boston, Philadelphia, New York, Chicago, Cleveland, Sea Isle City, N. J.; Evansville, Ind.; Middletown, N. Y.; Hoboken, N. J.; Kalamazoo, Mich.; Trenton, N. J.; Camden, N. J.; Grand Rapids, Mich.; Rochester, N. Y.; Mount Vernon, N. Y.; Providence, R. I.; Cambridge, Mass.; Perth Amboy, N. J.; Fort Wayne, Ind.; Montclair, N. J.; Ocean City, N. J.; Toronto, Ont.; Wilmington, Del.; Scranton, Pa.; Fall River, Mass.; South Bend, Ind.; Toledo, Ohio; Lebanon, Pa.; Yonkers, N. Y.; Elizabeth, N. J.; Detroit, Mich.; Easton, Pa.; Fort Worth, Tex.; Norfolk, Va.; Akron, Ohio; Allentown, Pa.; Canton, Ohio; Chattanooga, Tenn.; Chester, Pa.; Cincinnati, Ohio; Denver, Col.; Erie, Pa.; Harrisburg, Pa.; Holyoke, Mass.; Minneapolis, Minn.; Newark, N. J.; Passaic, N. J.; Poughkeepsie, N. Y., and Reading, Pa.



## Recommendations on Vital Points Formally Adopted by the Mayors

We congratulate the cities and people of America upon the candor and fearlessness with which their representatives have in this conference faced the problem of the relation of the public to public utilities. The conference has been helpful in its interchange of opinion and experience, and especially in its development of the idea of the community of interest among the cities. With that made plain, we can now proceed to a program of inter-city helpfulness which must be the permanent outcome for good from the conference.

We recommend: That no general conclusion be formulated upon the abstract question of municipal ownership, but, rather, we express our judgment to be that municipalities should be given in all instances the power to municipalize public utilities, the expediency of its exercise being at any time and place, and with regard to any particular utility, a matter for local determination.

That we make no general determination as between state board and local or home-rule regulation of public service corporations. That we do, however, declare that the franchise-making power should in all cases be local, that municipally owned utilities should be subject to local control only, that in large cities local regulation is plainly to be preferred, and that in all cases the principles of home rule should be preserved by at least leaving it to the people of a city of whatever size to determine whether they desire to act for themselves or to call in a state board, if one exists, either to regulate

or to aid the local authorities in regulating privately owned local utilities.

That we indorse the idea of the establishment of the Utilities Bureau, as a nation-wide inter-city agency for bringing the combined ability and experience of all our cities to the service of each city which may face a public utility problem. Through it we meet the combination of private interests with a combination of public interests, and to the specialized experts which private interests thus mass in defence of one another we oppose the skill, experience and resources of the united cities of the country.

We recommend that the trustees of the Utilities Bureau proceed to its further organization, outlining a plan by which its support may be assured and its services made available. In this connection we suggest for the consideration of the trustees that an office be provided, records kept, experts be employed, and that cities which can legally do so contribute on some equitable basis to the expense of the bureau, in excess of its earning, when in the service of cities actually using its facilities in the solution of particular problems.

We vote our hearty recognition of the high public service performed by Mayor Blankenburg in calling this conference; to Mayors Mitchel, Harrison, Shroyer and Baker, for their sympathetic assistance to him; our appreciation of the gracious hospitality of the city of Philadelphia, and our thanks to the American Academy of Political and Social Science.

## Relative Merits of Local Municipal and Broader State Regulation

### Mr. Erickson on State Regulation

Mr. Halford Erickson, member of the Railroad Commission of Wisconsin, presented a paper on "State and Local Regulation." He said that if in pointing out a few facts and conditions that may tend to throw light upon the question he should seem to favor state regulation, it is because the facts as he has found them point in this direction.

While state regulation as it is known to-day, said Mr. Erickson, has its shortcomings and often fails to give general satisfaction, it has on the whole been fairly successful. It has led to general improvements in the service and to more equitable and on the whole lower rates. The conditions and tendencies in the public utility field, however, which have brought about state regulation are still present and bid fair to remain so for some time. The public utility field, for instance, is still a legitimate field for private initiative and investments. There is also a marked tendency therein toward centralization in ownership and operation. Electrical and other utilities, while in a sense firmly established, are still subject to upheavals which flow from inventions and from the competition of new sources of supply, and the risks involved therein are considerable.

That the necessity for regulation is not obviated when the utilities are owned and operated by the municipalities is quite clear from such experience as the Wisconsin commission has had in the matter, Mr. Erickson said. Such utilities furnish no better service than privately owned or operated utilities. In fact, it is often a great deal worse. Municipalities are, as a rule, slow in responding to new discoveries and improved methods, and they often fail to list and supervise their meters and other equipment properly. While some municipalities furnish good service, the service in the great proportion of them is, on the whole, on a

lower level than is the case for privately operated plants.

When it comes to rates the situation from municipally operated utilities is no better. When the commission first entered upon its duties, it found the State literally streaked with unjust discriminations of all kinds, and these discriminations were as flagrant in municipally operated as in privately operated plants. While the rates charged by the municipally operated plants are often relatively low, this is not often due to low cost production of the service, but largely because in one way or another upkeep and other costs are shifted from the consumer as such to the taxpayer as such.

Replies received to a circular letter sent to all utilities in the State operating electric, gas or water departments indicate that nearly 40 per cent of such departments operate beyond the boundaries of a single city. Replies were received covering 277 such departments, and of these 106 were not confined to a single municipality. Among these 106 were many of the larger utilities. In Wisconsin one power company operates in seven cities and villages and in the intervening towns. Each of three other companies of this kind operates in from three to twelve cities and villages and in the towns through which they pass. One company operates in more than twenty cities and villages as well as in towns between them. In Michigan the Commonwealth Power Company supplies twenty-one cities and villages and the Grand Rapids-Muskegon Power Company supplies fourteen. The Iowa Railway & Light Company supplies gas, electric or electric railway service in forty-eight cities and villages. The Central Illinois Public Service Company has properties in more than 100 cities and villages. Suppose that each of these cities and villages started out to regulate this company or so much of it as was within its limits, 100 different regulative bodies controlling the same corporation or its branches. Local control would be running riot.

### Dr. Maltbie on Local or State Control

Dr. Milo R. Maltbie, member of the New York Public Service Commission, First District, in his discussion on "Local and State Regulation of Municipal Utilities" said that every attempt at a practical solution of the problem must recognize certain facts. First, every generation is apt to have its own ideas of the scope and distribution of governmental powers. Second, economic and social conditions are shifting constantly. Third, there has been a steady expansion in the field of operation of a single utility. Fourth, effective regulation of such large utilities is difficult and expensive. Overestimating the importance of these facts, there are those who urge that all control should be transferred from local authorities to the state board; that our great cities, which have a larger population than some states, should be ousted from all supervision over their utilities, and that even the franchise-granting function be taken from them. Between this extreme and complete local regulation there is a middle ground, for certain functions can be exercised more effectively by a state board and others more wisely administered by local authorities. If municipal authorities have been corrupt and if the power to grant or withhold franchises has been abused, the remedy is not state centralization but reform of local conditions, and we have progressed too far in this direction to take a backward step.

Control over the issuance of securities by public service corporations, Dr. Maltbie said, should be lodged in a state authority. As the corporation is chartered by the state and as it must act as a unit, and as securities are issued, not by an entity having a local situs but by one having a state-wide existence, it is obvious that from a logical and from a practical point of view the regulation of securities is a function belonging to a central authority whether exercised by a state legislature or by an administrative board. Supervision of accounts and the filing of reports are also matters which should be under state supervision for similar reasons. While it is not impossible for municipalities to regulate rates and while there have been many instances where this power has been wisely and frequently exercised by municipalities, it will be found increasingly difficult, and if it is not now it soon will be necessary in most instances for the state authorities to control rate regulation. In the meantime and while state commissions are perfecting their methods and organization it is not advisable to deprive every local authority, and particularly the large cities, of all control over rates.

There are extremists, said Dr. Maltbie, who advocate that to state commissions should be given power to determine what rates should be charged by municipalities operating their own utilities and what principles shall be followed in rate-making. This is another radical infringement of the home-rule principle and would virtually prevent a municipality from dealing with its utilities upon a public-health or common-good basis and require it to raise funds as prescribed by a state board.

Dr. Maltbie said that the most practical plan which has occurred to him is for local authorities to continue to exercise the control now vested in them by statutes and city charters but to provide that in case of conflict between different local regulations or between local and state regulations the action of the state regulatory body should be controlling.

### Mayor of Reading on Local Regulation

Mayor Ira W. Stratton of Reading, Pa., said that while the aim of commission government is to centralize and to concentrate power and authority the pendulum can be made to swing too far in that direction and the matter be overdone. That has been the case in Penn-

sylvania. Mayor Stratton said that he had no grievance against the individual members of the commission, their character, integrity and honesty of purpose. He does not believe that the commission would intentionally use the vast power at its command to the detriment of the municipalities of the State, but no necessity exists for conferring it upon them and the act should be modified very materially.

### Mayor Mitchel on City Needs

Mayor John Purroy Mitchel of New York spoke of the new Utilities Bureau as a clearing house of information.

The old hostility toward the companies has very largely waned, and this has been helped by the decided change in the managerial policy of the corporations. The companies have sought to give good service rather than otherwise. People are no longer willing to accept poor service. In every great city public opinion expects very high-grade service and clean, efficient and straightforward management. In case such service is not forthcoming the public is prepared to provide it through public ownership. Public ownership is a reserve power of which the companies are conscious.

What the cities want, Mayor Mitchel continued, is a high quality of service at just rates providing a fair return and providing for the upkeep of the property. The public cannot mulct the public service corporation of just profits and expect efficient management. There must be fair wages, good service and wholesome management. After that rate reductions and revenues for the benefit of the city treasury can be considered. Mayor Mitchel said that New York is not advocating a change from private to public ownership, but is advocating the policy of rigorous control of management which it has had for the last seven years. New York has benefited from the work of the Public Service Commission as much indirectly as directly. The presence of the commission and the temper of the public that it represents have brought about a great change in the attitude of public service corporations. The city now looks forward confidently to the time when the subway and elevated lines will revert to it.

"Some of us," said Mayor Mitchel, "have thought that the Public Service Commission has lacked aggressiveness. We do not feel that it is a part of us, that it is in close enough touch with what we are doing. I felt this so much that I organized a department of public utilities in the city's law department which is intended to represent the people of New York City in their regulative cases and hearings before the commission." Mayor Mitchel said that he also had thought of a plan to establish a local commission which should voice the interests of the people in the locality.

### Professor Merriam on Local Regulation

Prof. Charles E. Merriam, professor of political science at the University of Chicago, in speaking of the passage of the Illinois Public Utility Commission act by the Legislature of 1913, said that through that act the city of Chicago was made the victim of as daring a raid as was ever made by a pirate crew. The bill was passed, he declared, in the interest of the public service corporations. Cities should possess the power to regulate public service corporations which are largely local. They should be given the option of whether or not they shall retain the control over all utilities operating within their borders. There is nothing to prevent cities from securing the best advice to guide them in their regulation of local utilities. The city of Chicago has ample funds for the proper regulation of public service corporations, and it would be entirely feasible for it to have a staff of experts.



## Various Practical Utility Problems Affecting Companies and Consumers

### Mr. Guernsey on State Regulation

Mr. Nathaniel T. Guernsey, general counsel of the American Telephone & Telegraph Company, New York, in talking of "Regulation of Municipal Utilities," said that what the public wants and demands is, first, good service; second, the widest possible extension of this service, and, finally, a fair price. From the standpoint of the utility, if it is to fulfil these public requirements, two things are absolutely essential. The first is that there be a return from its operation sufficient to attract constantly the new capital which is continually necessary. To-day and in the near future public utilities, for the money which they require, must compete not only with all normal demands, but with the enormous abnormal requirements due to the war. The second essential is that freedom in the transaction of business which is necessary to progress and to efficient, economical operation, and that this freedom be not unduly restricted by attempts at so-called regulation, which are not in fact regulation, but are efforts to control the details of management and operation.

Regulation, Mr. Guernsey added, costs money. It is not an overstatement to say that millions of dollars are being spent every year for this purpose in the United States. In the ultimate analysis this burden inevitably falls upon the public. It is an item in the cost of the service. To make regulation a benefit to the community and to justify the enormous expense which it imposes upon the public several things are necessary: (1) The regulatory body must be composed of men of unquestioned integrity and force of character. (2) The men composing the regulatory body must have not only the capacity but also the business and special training necessary to the proper determination of the important and intricate questions which are presented to it. (3) The regulatory body should be composed of men who are free from other interests and engagements which would tend to prevent their giving to the performance of their duties the time which is requisite if sound results are to be obtained.

If these general considerations are sound, the conclusion is inevitable that the regulation of municipal utilities should be not local but in the hands of the state commissions. No man may or should sit as a judge in his own case.

The idea seems to be more or less prevalent, Mr. Guernsey added, that the function of regulation is to decrease prices and impose burdens upon the public utilities. Every burden upon a public utility is a burden upon the public, which in the final analysis must pay the bills. If the burden brings with it a benefit that is worth to the public what it pays for it, the public can afford it. Otherwise it cannot. Rates cannot be indefinitely reduced by regulation. The downward tendency in rates that has been constant in recent years has been partially met by economies that have been brought about through efficiency in management and operation; but there is a limit to what may be accomplished by such economies, and if this limit has not already been reached it will be soon. Neither by regulation nor by anything else can the public buy service for less than it is worth. To attempt to do this is to invite bankruptcy. The matter of the regulation of municipal utilities is still in the development stage in this country. If this development is to result in successful regulation, something that will contribute substantially to the welfare of the public as a whole, this must be accomplished through the co-operation of the public and the public utilities with a frank recognition of the principles discussed. It should result in good will, decreased cost and increased efficiency.

### Mr. Brandeis on the Utilities Bureau

Mr. Louis D. Brandeis, of Boston, said that in order to ascertain the facts relating to cost of plant and cost of operation it is necessary to have comprehensive and accurate knowledge. For a long time there has been co-operation among the public utility interests through associations which have advanced in great degree the efficiency of operation. The cities, on the other hand, had no plan of co-operation and the proposed Utilities Bureau is not only a plan but an instrument of co-operation.

The objection to stock watering, Mr. Brandeis said, is not at all that men who engage in these enterprises get a large return. Those who in public utility risks hold that a proper return is a fair return compared with other lines of business are right. Risk and ability should receive that return which is a fair reward. It is for the public interest that it should have that return, that interest and ability should be rewarded. The objection is not that men should not obtain a large return—in many instances they have not received such a return—but that stock watering hides the facts as to the investment. Men have resorted to it many times to mislead the public. They have mistrusted the public. They have believed that the public would not regard the actual investment and risk. Mistrust rather than a desire to mislead underlies stock watering.

Mr. Brandeis discussed the protest against interlocking directorates, which he said also tend to obscure facts. If the man that buys money for a public service corporation is a banker himself, the same individual is dealing with himself in two capacities. The public has not the ordinary assurance that the best trade is made. The same man as banker sells money to himself as a public utility corporation manager; then he buys from himself as owner or manufacturer apparatus which is used; then he contracts with himself as a construction company; then he contracts with himself as a supply house; then he may sell to himself as a manufacturer or other concern service which the corporation was organized to give.

No man, said Mr. Brandeis, can serve two masters properly. It is in the interest of truth that we must demand that interlocking directorates and every conflicting interest must vanish. There are other reasons why this practice must be abolished. It is in the interest of efficiency, not only in buying and trading but of efficiency generally. The only justification for the existence of directors is that they shall direct, not manage, but intelligently and absolutely fairly advise and criticize. No man can have the necessary varied knowledge of facts in many enterprises. The New Haven situation was brought about, not by improper motives to any extent in the men who presided over its operations, but mainly through ignorance. There is a limitation placed by nature on the time that can be allotted to any corporation by one individual.

### Municipal Lighting Rates

Mr. Ray Palmer, commissioner of gas and electricity, Chicago, Ill., read a paper on "Municipal Lighting Rates." He said that the two principal factors discouraging municipal ownership of public utilities in our cities to-day are bad politics and the relatively high union scales paid municipal labor compared with that of the low scale paid utility corporation labor for the same class of work. When the results of bad politics are eliminated by non-partisanship elections and a fair living scale of wages is established and regulated in all classes of labor the municipality will be placed on the same operating cost basis of utility serv-

ice as the corporations, with the advantage of low interest charges on the investment. Until such time as this is accomplished municipal ownership will seldom be economical or practical for the public taxpayer.

Mr. Palmer then described what has been done in municipal street lighting by the city of Chicago in conjunction with the Sanitary District.

The first and most important step to be taken to utilize properly all the good rate regulation work and improvements which have been accomplished in various cities is that of close co-operation, said Mr. Palmer, between the various cities in conjunction with concerted action for fair and reasonable utility rates such as the conference of mayors contemplates. The second step should be the organization of national committees which will work under the direction of the trustees of the Utilities Bureau.

### Transit Problems in Philadelphia

Discussing "Philadelphia's Transit Problem," Mr. A. Merritt Taylor, director of the department of city transit of Philadelphia, described the program providing for the construction of subway and elevated railway lines by the city at a cost of \$46,000,000, and the equipment and operation thereof by the company in common with its existing systems.

"We recognize," said Mr. Taylor, "the importance of co-operation between the city and the company in establishing these new facilities in a manner calculated to best serve the public. We also recognize the importance of protecting against destructive competition capital which has been invested in the existing system. Philadelphians stand for a 'square deal' between the city and vested interests. We recognize the vital importance of honestly protecting capital invested in Philadelphia to the extent that it shall produce an attractive return for reasonable service rendered to the

public. In the case of our local railway system a contract was entered into in 1907 between the city and the company. With the terms of this contract in force as a basis, it is the policy of the department of city transit in establishing the high-speed lines under the terms of the co-operative program to protect the company to the extent of its annual net earnings gained prior to the operation of the municipally owned lines regardless of the amount of capital actually invested in the property.

"We want Philadelphia to stand out as a safe place for the investment of capital for public service. The capitalists of this country are going to invest their money in communities where capital is justly treated and permitted to earn attractive returns and are not going to invest capital in communities where its security is impaired and its productiveness is unduly curtailed by unreasonable legislation, regulation or competition."

### Dr. D. F. Wilcox on "Fundamental Planks"

Speaking on "Fundamental Planks in a Public Utility Program," Dr. Delos F. Wilcox, of New York, declared that public utility investments should be placed upon a non-speculative basis and their security should approximate that of municipal bonds.

Dr. Wilcox said that cities should assume that all the well-established utilities will be publicly owned sooner or later, private capital being entirely excluded from the public streets, except as it is loaned to the city. While the development of interurban utilities, the extension of utility service to rural regions and the grouping of a number of cities in relation to a single source of supply often present serious obstacles in the way of separate operation by or for each distinct political unit, Dr. Wilcox assumes that the most appropriate governmental agencies for the operation of these utilities will be developed as the need arises.

## The Regulation of Public Utilities as Seen from Different Points of View

### Professor Bemis on State Commissions

Prof. Edward W. Bemis, member of the Board of Supervising Engineers, Chicago Traction, said efforts were made everywhere by utilities to secure regulative acts. Home rule seems to have been checked. On the other hand, the California commission has been organized and manned so magnificently that cities are surrendering all their power to it. State commissions are existent in most states, and, said Professor Bemis, "we accept it even though seeking, as in Chicago, to secure separate regulation. We accept it as something that the country will try out for some years to come."

### Constructive Policy for Public Service Corporations

"A Constructive Policy for Public Service Corporations" was the title of a paper by Mr. Charles Day, of Messrs. Day & Zimmermann, Philadelphia.

The contributions of the engineer-manager are second in importance only to those of the engineer. These men must harvest the full benefits of which the modern steam power plant is capable. The next step is ways and means of bringing together the trained power-plant employees and the methods in accordance with which the plant must be operated. Maximum power-plant efficiency, however, is not assured through superlative service upon the part of the power-plant operatives alone. Many conditions must be taken into account which originate outside the station. The last and most important principle which has contributed to the splendid efficiency attained in connection with the generation and distribution of electrical energy dictates that the burden of power-plant operation rests in the final analysis upon the management, not upon the power-

plant employees. The new policy not only makes high internal efficiency imperative but it also requires that convincing proofs of such results should be available to the public service commissions.

### Local Control of Utilities

"How Shall We Control Our Public Utilities?" was the subject of the discussion of Mayor Carter H. Harrison of Chicago. He said that state control is better than no control but that local control is better than state control. It may not be scientific to let each community grapple with its own problems, but that is the method that finally brings results. In the early days when the infant utility was taking a chance of possible failure the investor was entitled to extra return for the hazard. To-day these utilities are entitled to a fair profit and no more.

Personal responsibility will weigh more heavily on a mayor than upon a governor, who is responsible to a larger constituency all of whom are not interested in each decision. Mayor Harrison declared that the personnel of the Public Utilities Commission of Illinois is satisfactory and that all regulation must be reasonable. The most valuable commodity the utility possesses is the right to use the streets. Great good would come from public ownership. Let a municipality operate all its utilities and self-interest will induce each citizen to take a more active part in the affairs of local government. The first requisite of public ownership is a rigid civil service that appoints, holds and promotes absolutely on merit. Without it public ownership would be a public disaster; with it public ownership would be made a great blessing to every community.



### Mr. Eshleman on Regulation

Mr. John M. Eshleman, president Railroad Commission of California, in his paper on "What Regulation Must Accomplish if It Is to Be Permanent," said that a public utility is essentially a monopoly, but as an individual is powerless to protect himself against the abuses to which a monopoly might subject him, there must be state regulation to protect the individual. Those who are in charge of regulation should bear in mind that there is one form of competition from which a public service monopoly is not free, and that is the competition for money.

In looking toward the future, Mr. Eshleman believed that the government would go into the public utility field when the advantages of so doing were not overbalanced by the disadvantages. He was not convinced that the private owner had clearly proved that private ownership was always better than public ownership.

## Public Utility Holding Companies and Their Connection with Public Welfare

### Mr. Homer on Holding Companies

Mr. Francis T. Homer, of Bertron, Griscom & Company, New York, in his address on "Holding Companies and the Public Welfare," said that the most serious charge brought against holding companies generally, and therefore including public utility holding companies, is that they afford a most convenient means for overcapitalization. That public utility holding companies, like those in the industrial and railroad field, are susceptible to this abuse cannot be denied. But, on the other hand, they do not offer the same opportunity for overcapitalization because the history of investment in public utility corporations has been one of almost uniform growth in the volume and security of earnings and not one of large fluctuations. Overcapitalization of the operating company in itself is not facilitated in any manner by the instrumentality of the holding company. Public utility holding companies do not result in the centralization of large power for their officers and directors, for the reason that they are usually so financed as to provide them with only such an amount of working capital as can be profitably employed in temporarily financing the subsidiaries, so that in adverse times the bonds and preferred stock of the subsidiaries need not be sacrificed, and so that even in good times the disposition of the securities of the subsidiaries can be postponed until the investment made therein is demonstrative of the increasing earning power of the subsidiaries and the higher grade of credits which its underlying securities should command.

Mr. Homer said that the holding companies can command capital when the separate operating companies could not do so through the sale of their common stock for the reason that conditions local to any one operating company may destroy the earning power of its common stock temporarily, and that this risk makes the investment in such stock more or less speculative, whereas it is unlikely that such reverses would undertake in the same year all or even a considerable part of twenty or thirty operating companies.

Public utilities being actual natural monopolies, for the unobtainable actual competition the holding company substitutes comparative competition in every department of the operating companies. The average of operating economy and efficiency is materially greater in the public utilities which are subsidiaries of large holding companies than in the isolated, unaffiliated companies locally owned and controlled. The advantages arising from uniformity of accounting, from the purchase of material and supplies in volume and the greater credit of the holding company are self-evident.

### Cities and Local Regulation

Mr. S. P. Jones, secretary of the Voters' League, Minneapolis, Minn., made an address on "What Certain Cities Have Accomplished Without State Regulation." While admitting that state regulating commissions have been of substantial service to communities struggling with public utility problems, he said that the bald fact yet persists that it is in cities that have worked out their own salvation that the largest degree of success in rates and service has been achieved. Success in this field, however, cannot be wholly expressed in terms of rates and service. These are emphasized first, for they are the things in utility regulation that appeal most strongly to the public. The greater results are seen in the educational effect upon the community and the preparation it furnishes for the time when public utilities must and will be taken over for community operation.

Of approximately \$4,000,000,000 of securities invested in street railways, 81.4 per cent are organized into or affiliated with holding companies. Of the \$2,100,000,000 of securities outstanding in the electric light and power business, 82.5 per cent are organized into or affiliated with holding companies. Of the \$1,300,000,000 of securities outstanding of gas companies, over 66 per cent are organized into or affiliated with holding companies, so that out of approximately \$7,500,000,000 of gas, electric and traction capital 78.5 per cent is now organized into or affiliated with about 140 independent holding companies whose securities are known and bought throughout this country and Europe. The last annual report of the comptroller shows that for the year 1913 the investment holdings of the national banks in public utility issues had increased nearly 20 per cent over their aggregate previous holdings, while their investments in railroad securities decreased over 6 per cent.

### Mr. Mathewson on Holding Companies

Mr. Charles F. Mathewson, of Krauthoff, Harmon & Mathewson, counsel for the Consolidated Gas Company, of New York, said that the great majority of public utility holding companies exist to meet a real need. They add immensely to the development and the efficiency of the service of public utilities and inure enormously to the benefit, not only of their immediate customers, but also of the entire communities in which such utilities are established. If, through the medium of a company holding scattered plants, the hazard of the investor is rendered less than it would be if his eggs were all placed in a single basket, he would be willing and could be compelled to accept a lower rate of return upon his capital.

Mr. Mathewson expressed the belief that the centralization of financing and management which is made possible by the holding company, or which is made possible by a centralized holding by any other method, is of vast and growing importance to the development of the company in the line of public utilities and the activities of the community which are dependent thereon or connected therewith. The element of destruction of competition which is said to lead to monopoly is not present; for scattered public utilities at different points never, or only in rare instances, could be competitors with each other. Moreover, being subject to state regulation, their charges to and treatment of consumers may be controlled for the public good, and in certain public utilities, at least, a regulated monopoly is more conducive to the convenience and good service of the public than any amount of competition.

The holding company, Mr. Mathewson concluded, has come to stay because it ought to stay, because it is an instrument of progress and efficiency and development and its elimination would be a misfortune whose consequences would be difficult to calculate, but certainly immense.

### Mr. Goodrich on Holding Companies

Mr. James P. Goodrich, director of the National City Bank, of Indianapolis, Ind., said that so far as the existence of public utility holding companies is concerned, no possible objection can be urged. Competition in public utilities is never desirable from the standpoint of either the investor or the public. Public utility holding companies enjoy wider banking facilities, and it will be conceded that in operating, managing and legal direction such companies possess certain advantages. By the policy of checking one plant against another the

properties are keyed to the highest point of efficiency.

No holding company, Mr. Goodrich declared, ought to be permitted to acquire only a controlling interest in operating property and manage the whole company in the interest of that controlling share. Holding companies should try to acquire the entire stock interest in the property. They should be required to do so. The fact that holding companies do not have to apply to regulating bodies in connection with the issue of securities is desirable for promoters but cannot be for the advantage of the public or investors.

The speaker had no sympathy with the cry against big business. Public utilities are not entirely financed and they must be kept on good terms with private investors. The failure of regulation must be deferred until municipal affairs are better. Public opinion, however, must require the regulation of holding companies as well as operating companies.

## Discussion on Municipal Ownership and Operation of Utilities

### Mr. Rosecrantz on Municipal Accounts

Mr. Clarke M. Rosecrantz, a member of the firm of Sullivan & Cromwell, New York, general counsel for the Milwaukee Electric Railway & Light Company, said he had yet to find any instance where an examination of the accounts of municipal utilities will show that their rates have been less than those of privately operated utilities without showing a deficit when proper charges incident to the cost of service were made. If insufficient rates are charged, Mr. Rosecrantz declared, "the non-users must make up the deficit, and their proportion of that deficit will be included in their tax bills. If the public operation of utility companies is likely to be successful, we ought to be able to find without any difficulty that those which have for many years been owned and operated by municipalities have been economically and efficiently operated. The history of our city management shows that the contrary is the fact."

### Mayor of Cleveland on Public Ownership

Mayor Newton D. Baker of Cleveland, who, as presiding officer, opened the session on "Municipal Ownership and Operation," said that the movement for municipal ownership is the direct effect of the misconduct of public service corporations. He said that some years ago practically every state legislature and practically every city council had been either corrupted or was under very grave suspicion. In large part these conditions have disappeared.

### Mr. Winchester on Municipal Plant

Mr. Albert E. Winchester, manager and superintendent of the municipal plant at South Norwalk, Conn., said in speaking of the origin of the plant that the private company seemed to feel too fully in control of the local field to realize the need of giving heed to the growing seriousness of the situation about its service.

Mr. Winchester said that when he was asked to give a decision on the question of public ownership in instances approaching in similarity of conditions those that South Norwalk had to face it was in favor of municipal ownership, but in many other instances it has been emphatically the other way. Even if service deteriorates, every possible effort to induce a remedy should be made before public replacement is considered. The South Norwalk plant is on splendid terms with the great broad-minded, progressive corporation that has succeeded its one-time vindictive enemy and co-operation reigns where bitter opposition used to control. Neither directly competes with the other. The municipal plant supplies certain districts of the city and a large territory roundabout.

From the beginning South Norwalk's public builders have been protected from politics. The officials are nominated by agreement between the political parties upon a non-partisan basis. The political paths of the employees are unasked and unknown. Mr. Winchester, who has been in charge of the plant from the beginning, said: "Why not submit to the fact that both private and municipal ownership survive and, each having honest adherents, agree that both have legitimate fields to fill?"

### Congressman Crosser on Public Ownership

Congressman Robert Crosser of Ohio said that in every other kind of business than public utilities there is competition. The question is whether the monopoly should be supplied by the municipality or a private company. Public ownership will purify politics by freeing the public from control by corporations. The speaker said he wants cheaper and better service, but above all he wants to have the cities purified.

### Talk of Mayor Hocken of Toronto

Mayor Hocken of Toronto spoke of the "Operation of the Toronto Hydroelectric System as a Public Enterprise." He said that the results so far had been entirely satisfactory. In the initial operation more than the usual difficulties were experienced. Mayor Hocken said that the existence of the plant had not been destructive to the commercial competitor because the potential opportunities for business were so great that few companies enjoying monopolies realized their opportunities.

### Mr. Koiner, of the Pasadena Plant

Mr. C. Wellington Koiner, manager of the municipal works department of Pasadena, Cal., spoke of the operation of the municipal lighting plant in that city. He does not believe that the plant should be operated for revenue. If the municipality had the entire field to itself without competition from a private company it could reduce its rates still further.

### Municipal Ownership Abroad

Mr. Frederick C. Howe, Commissioner of Immigration, New York, made an address on "Municipal Ownership—The Testimony of Foreign Experience." Electrical plants, Mr. Howe said, are municipalized to a greater extent than gas plants in England. The reason for this, he declared, is that very few electrical franchises were granted by England until electrical central stations had been established firmly in America and Germany. As many tramways had been taken over then by English communities, the people wanted to co-ordinate the properties.



## Current News Notes

**MILWAUKEE EFFICIENCY SOCIETY.**—Dr. Nelson M. Black, of Milwaukee, addressed the Milwaukee Efficiency Society Nov. 12 on the topic "The Human Eye, and Protective Measures for Keeping It in Working Condition." The necessity of proper lighting was emphasized.

**TO URGE ELECTRIC PARCEL-POST DELIVERY IN CHICAGO.**—The luncheon meeting of the Chicago Section of the Electric Vehicle Association of America, Nov. 10, was given over to a discussion of electric-vehicle delivery in parcel-post service. The Chicago contracts for post-office haulage expire next spring, and it is planned to bring before the local postal authorities without delay the advantages of electric delivery. Mr. W. J. McDowell is the present chairman of the Chicago Section E. V. A.

**WESTERN SOCIETY OF ENGINEERS.**—"The Coon Rapids Low-Head Hydroelectric Development on the Mississippi River Near Minneapolis, Minn.," was the subject of a paper by Mr. J. W. Link, hydraulic engineer for H. M. Byllesby & Company, presented before the Western Society of Engineers, Chicago, Nov. 16. Mr. Link described the hydraulic and structural features of the development, which utilizes a head of 17.5 ft. A total rating of 11,000 kw has been provided for, and power is transmitted to Minneapolis at a pressure of 13,200 volts.

**THE ECONOMICS OF INCREASING LAMP EFFICIENCIES.**—On account of a dinner and entertainment of the Chicago Electric Club on Monday evening, Nov. 23, at the Hotel Sherman, the joint meeting of the electrical section of the Western Society of Engineers, the Chicago Section of the American Institute of Electrical Engineers and the Chicago Section of the Illuminating Engineering Society has been postponed to Tuesday evening, when it will be held in the rooms of the Western Society of Engineers. The general subject for discussion will be "Electric Lighting—A Factor in Civilization."

**MEETING OF BROOKLYN COMPANY SECTION, N. E. L. A.**—Mr. Elbert Hubbard was the speaker at the November meeting of the Brooklyn Company Section of the N. E. L. A. held in Association Hall, Nov. 10. Mr. Hubbard spoke on co-operation and, needless to say, held the interest and enthusiasm of his large audience throughout. The address followed the lines of his speech before the Commercial Section at the Philadelphia convention last June. The other feature of the evening was a paper by Mr. James L. Wiltse on "Modern Street Illumination." The membership of the section is rapidly approaching 1000.

**ELECTRICALLY EQUIPPED APPARATUS FOR PHOTOGRAPHING RAPIDLY MOVING OBJECTS.**—Motion-picture apparatus requiring 100,000 electric sparks a second for exposing the films has been perfected recently for taking pictures of objects moving with bullet-like rapidity. It is declared that seventy-two pictures were taken of a revolver bullet while moving 10 in. Pictures of a bullet passing through a piece of wood showed a curious phenomenon. The wood showed no signs of stress until the bullet had passed completely through it when splinters appeared, the stick began to split and finally fell in pieces.

**MEETING OF EMPIRE STATE ASSOCIATION.**—The next midyear meeting of the Empire State Gas and Electric Association will be held in Albany on Dec. 10 and 11, beginning with a session at 2 p. m. on Dec. 10. The delegates will dine together informally on the same evening. There will be two sessions on Dec. 11. The principal subject for discussion at the afternoon session on Dec. 10 will be the handling of complaints of service and bills. Discussion of this question may continue until the session of Friday morning, but it is planned to have at least one session which will be open for any matters that members care to bring up.

**AMERICAN PHYSICAL SOCIETY.**—Among the papers to be read at a meeting of the American Physical Society to be held in Chicago on Nov. 27 and 28 are several of particular interest to electrical engineers. Two papers by Prof. F. C. Brown and two by Prof. L. P. Sieg will deal with the properties of selenium. Prof. Daniel L. Rich will present a paper entitled "Spark Discharges Between Unlike Metals." Radiation and temperature characteristics of tungsten will be discussed by Dr. A. G. Worthing. Prof. E. H. Williams will discuss the magnetization of an iron-cobalt alloy. Prof. A. D. Cole, Columbus, Ohio, is secretary of the society.

**EDUCATIONAL COMMITTEE OF THE N. E. L. A.**—A meeting of the committee appointed to further the relations of the National Electric Light Association and the educational institutions was held in New York on Nov. 16. Mr. John F. Gilchrist, vice-president Commonwealth Edison Company, Chicago, chairman of the committee, presided. There were present also Messrs. W. L. Abbott, C. L. Edgar, H. H. Scott, Arthur Williams, H. H. Norris, H. C. Clifford, O. C. Ferguson, M. C. Beebe, C. F. Harding, C. F. Scott, P. M. Lincoln and G. D. Shephardson. The meeting was called for the purpose of considering details of the four phases of work recently outlined for the committee and delegated to sub-committees on lectures, courses and curriculums, employment of graduates and undergraduates, and supplying information to economic departments. These sub-committees presented informal reports, and as a result of the discussion it is decided to make a canvass of leading central-station men to determine the general results of technical education as they relate to the central-station industry.

**OFFICERS AND PRIZE WINNERS OF THE COMMONWEALTH EDISON SECTION, N. E. L. A.**—The election of officers of the Commonwealth Edison Section of the National Electric Light Association, as announced at the section meeting Nov. 12, resulted as follows: President, Mr. George B. Foster; vice-president, Mr. J. T. Mountain; secretary, Mr. R. H. Williams; treasurer, Mr. W. A. Fox. Following an address by Mr. Samuel Insull, awards were extended to the men adjudged the successful competitors in a prize-paper contest. Forty papers had been presented, dealing with different phases of the main topic, "How the Commonwealth Edison Company Works." The winners were Mr. E. W. Jones, the Insull medal and a forty-dollar merchandise certificate; Mr. J. T. Mountain, twenty-dollar merchandise certificate, and Mr. W. G. Kelley, ten-dollar merchandise certificate. Prizes in the semi-annual award by the company for meritorious suggestions were given to Messrs. E. C. Pitchard, \$50; P. F. Williams, \$40; M. J. Morrical, \$30; E. J. Reilly, \$20; A. F. Schuster, \$5, and F. J. Boerner, \$5. The association now has 1665 active members.

## Hydroelectric Development on Bishop Creek, Cal.—VI

**Power house and equipment of station No. 6 of the Nevada-California Power Company—All water leaving station used for irrigation purposes. By C. O. Poole**

**I**N Part V of this article the intake dam of station No. 6 was described. Fig. 50 is a general view of the intake station, while Fig. 52 shows the design of the gravel trap installed in the pipe line.

### Power House and Equipment

The power house is of reinforced concrete 31 ft. by 48 ft. and is equipped with a 20-ton traveling crane.

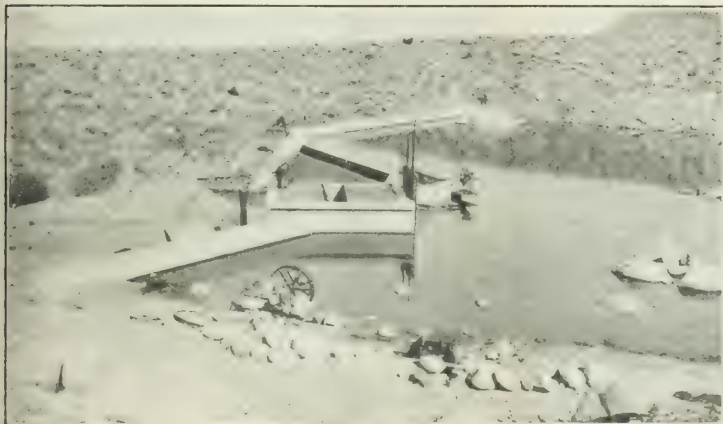


FIG. 50—VIEW OF INTAKE STATION NO. 6

The pressure pipe divides into two branches just outside the station and enters below the floor line by two 36-in. branches through 32-in. gates. The water is led to each waterwheel through two nozzles, there being two wheels, one overhung on each end of the generator shaft. The wheels are of the Pelton-Doble tangential type and drive an Allis-Chalmers 2000-kw, 164-r.p.m. generator wound for 2200 volts, three-phase, sixty cycles. The water is controlled by stream deflectors operated by a Lombard-Doble governor. All the deflectors are operated together by means of rocker shaft and crank arms. Each of the four nozzles is fitted with hand-operated needles which can be set in any position required, and an indicator on each needle gear shows the position of the needles. There is one 60-kw Allis-Chalmers exciter driven by a Pelton-Doble waterwheel and also a 75-hp, 2200-volt induction motor mounted

on the same shaft. This motor is floated on the bus all the time. The needle of the wheel is operated by means of a sprocket chain from the switchboard. The switchboard consists of one generator panel and one exciter panel with indicating and registering instrument, synchroscope and Tirrill regulator. Fig. 51 is a view and Fig. 53 a plan of the station.

As all the water from the stream is used for irrigation

purposes after it passes this plant, it is quite necessary to keep accurate records of the stream flow. For this purpose a recording stream-flow gage has been designed, and one of these gages is placed on the tailrace of the plant and another in a rating flume placed in the creek bed alongside the tailrace just before the tailrace waters and the creek waters join. These two instruments record the total flow of the stream. Inasmuch as this instrument has been found quite satisfactory in service, a brief description of it is given: Fig. 54 is a general view of the instrument, which consists of an 8-in.-diameter brass drum revolved once in twenty-four hours by a clock and gear. A metal float operates a

vertical rack that engages a pinion which rotates a special logarithmic spiral or cam. The latter carries a pencil on a pivoted arm which makes a fine line on the chart that is laid off proportional to the Francis formula, so that the pencil line reads directly in second-feet. By

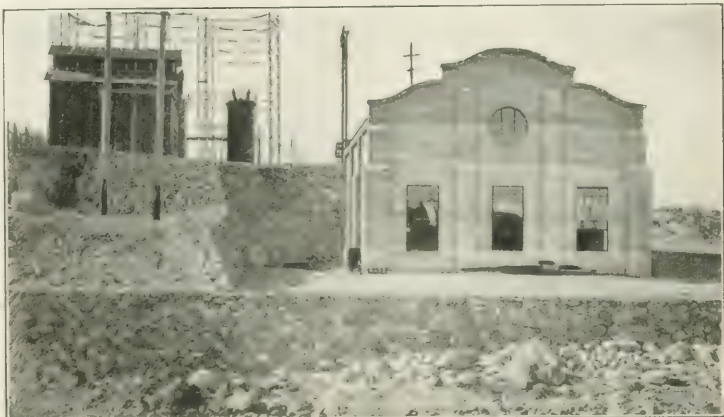


FIG. 51—VIEW OF GENERATING STATION NO. 6



means of a planimeter the area of the chart can be found in a few minutes' time, which multiplied by a constant gives the total cubic or acre-feet flow for the

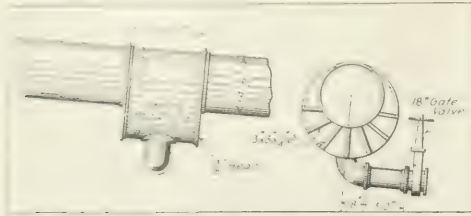


FIG. 52—DESIGN OF GRAVEL TRAP

twenty-four hours. The instrument can be adapted to a flume, tailrace or weir as desired. In addition to the registering drum, there is an indicating dial which tells

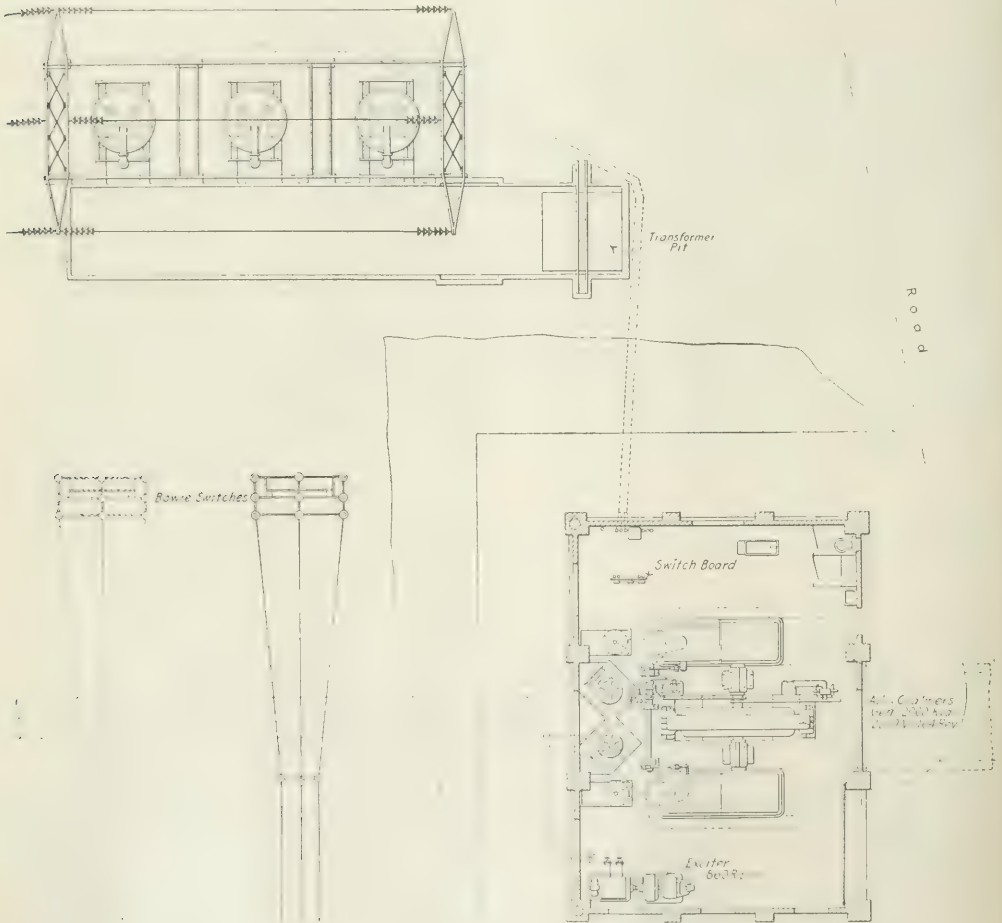


FIG. 53—PLAN OF STATION NO. 6

at all times the depth of water over a weir and the number of second-feet flowing. These recording stream-flow gages can be manufactured in small quantities for \$100 each.

### Transformers

The transformers for station No. 6 are three 750-kw outdoor-type, water-cooled units furnished by the Westinghouse company. They are wound for 2200 volts on the low-tension side with four  $2\frac{1}{2}$  per cent reducing taps. The high-tension side is wound for 87,000 volts delta and 150,000 volts star with four  $2\frac{1}{2}$  per cent reducing taps and a tap for 55,000 volts so as to fit in with the Nevada system. Fig. 55 shows these transformers set up together with the disconnecting switches and high-tension bus arrangement. The secondary bus consists of 1-in. copper pipe mounted on special insulators fastened to steel framework. A crane and pit are provided for overhauling the transformers, each transformer being mounted on wheels and arranged so that it can be placed on a transfer truck and brought over the pit. The line from the transformers leads directly on steel poles with suspension insulators to the control station, a distance of  $1\frac{1}{4}$  miles. The wires are No. 0

seven-strand copper and are spaced 10 ft. apart for 140,000 volts.

It is believed the development affords one of the best examples on record of the full utilization of the waters

of a mountain stream. The total difference in elevation from the spillway of the reservoir on the headwaters of the stream to the tailrace of station No. 6

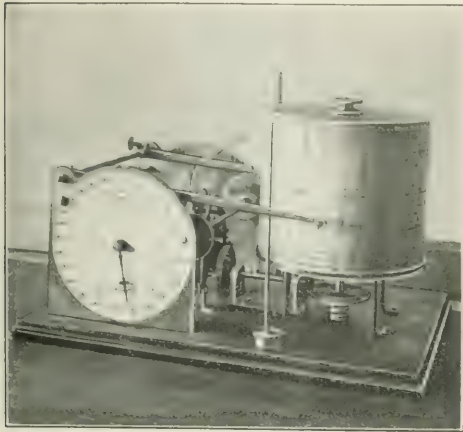


FIG. 54—RECORDING WATER GAGE

is 5070 ft. in a total distance of 15 miles, and all but 70 ft. of this is utilized or will be when stations A and No. 1 are completed as shown in the tabulation printed herewith.

The remaining instalments of this article will de-

RATING OF THE VARIOUS STATIONS

Plant	Head in Ft.	Kw Rating
A	630	2,500
1	950	6,000
2	950	6,000
3	750	6,000
4	1,053	6,000
5	410	1,500
6	257	2,000
Total	5,000	30,000

scribe the transmission systems of the Nevada-California and Southern Sierras companies, including the substations of the former company at Palmetto, Silver

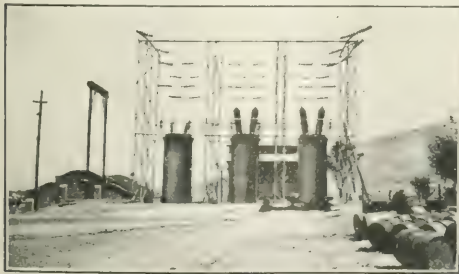


FIG. 55—OUTDOOR TRANSFORMERS AT PLANT NO. 6

Peak, Alkali, Goldfield, Tonopah, Millers, Manhattan and Rhyolite, and the control station of the latter company in Owens Valley, the San Bernardino steam plant and typical outdoor substations.

## DEVELOPMENT IN ELECTRICITY METERS

Report Presented at the Edison Companies' Convention Shows Much Progress in Standardizing and Perfecting Their Design

The report of the committee on meters presented at the recent convention of the Association of Edison Illuminating Companies, White Sulphur Springs, W. Va., contained a summary of the year's progress in the production of meters. The expiration of basic patents that had controlled the production of induction meters has placed the sale of that type of instrument on a competitive basis. The tendency now among manufacturers is to simplify and standardize the parts of alternating-current meters, so that a single design now suffices for single-phase and polyphase systems. While the designs and prices of standard commutator meters remain practically unchanged the price of repair parts has been advanced considerably. It was reported that Prof. Elihu Thomson has been developing a small commutator-type meter which will probably reduce the overhead cost of supplying electricity to small consumers. Shunt meters are now available from several manufacturers for integrating large amounts of power which formerly had to be measured by series instruments with limited ratings. Tests have been made of ampere-hour meters showing them to have a high degree of accuracy. About twelve central-station com-



SOME OF THE INSTRUMENTS WHICH WERE INVESTIGATED BY THE METER COMMITTEE

panies in this country are subjecting a new electrolytic meter to comparative tests to ascertain its adaptability to measuring small amounts of energy. The committee also reported that the Second District Public Service Commission of New York has withdrawn its order prohibiting the use of ampere-hour meters.

Working in conjunction with manufacturers, the committee has done considerable in standardizing design and construction details of meters. Further, a standard schedule of ampere ratings for watt-hour meters has been adopted, and efforts have been made toward improving the maintenance of meters. Probably 75 per cent more of the routine tests are now made on the one-man basis instead of by two-men teams, this procedure being made possible through the development of lighter testing equipment. Attention was called to the fact that the Bureau of Standards is now preparing a complete tabulation of existing state laws, public service commission rules and city ordinances relating to the supply of electricity. Prepayment meters are being made by some manufacturers. The committee has correlated many facts on the following topics: The duration of demand interval and period over which it extends; possibilities and limitations of different types of instruments for showing the correct demand factor; delivery of energy under maximum-demand contracts, and the diversity factors characterizing large and small systems.



# A Method of Testing Instrument Transformers

The use of induction watt-hour meters for determining the differences in ratios and phase angles between two "voltage" or two "current" transformers of the same range. By P. G. Agnew

ATTEMPTS to determine the constants of instrument transformers by using wattmeters or watt-hour meters in both the primary and secondary circuits have not met with much success. Modern transformers have such good characteristics that the small differences to be measured are more or less masked by the unavoidable errors of measurement. Moreover, such a method is not applicable to high voltage or large current ranges, which are commercially the more important.

Modern induction watt-hour meters can, however, be used to determine the difference in ratios and also the difference in phase angles either of two "voltage" transformers or of two "current" transformers, provided the two transformers are of the same range. If, then, the ratio and phase angle of one of the transformers are known, it may be treated as a standard transformer and the constants of other transformers determined in terms of the constants of the standard. Several modifications of the potentiometer method are available for the precise determination of ratio and phase angle, for the most part making use of laboratory instruments.\*

## Outline of Method

For voltage transformers an auxiliary current is passed in series through the current coils of the two meters, which are duplicates, and the voltage coil of each meter is connected to one of the transformers. If the meters were adjusted to precisely the same rate, the ratios of the transformers would be inversely proportional to the number of rotations of the meters in a given time. Practically the meters cannot be adjusted to precisely the same rate, but the difference in rates may be eliminated by interchanging the meters.

The difference in the phase angles may also be determined by changing the phase of the auxiliary current so that the meters are working on low power-factor, since this difference in phase makes the meters run at different speeds, as they are connected to one or the other of the transformers. From these data and a knowledge of the difference in ratios obtained at unity power-factor the difference in phase angles can be calculated. A diagram of connections for testing a "voltage" transformer by this method is shown in Fig. 1. The ratio measurement may be carried out with a single-phase source of supply. If a three-phase source is available, it is convenient to use a lamp bank for the auxiliary current, putting it on the same phase with the transformers for the ratio measurement and on either of the other phases for the phase-angle measurement.

Fig. 2 shows the arrangement of circuits for test-

ing "current" transformers. The use of the current and the voltage coils of the meters is inverted in respect to their use in the case of the "voltage" transformer. The primaries of the "current" transformers are in series, and the current coils of the two meters are connected alternately to the two transformers. An auxiliary voltage is applied to the voltage coils of the meters. Otherwise the tests are carried out in the same way as for the voltage transformer.

Let  $m_a, m_b$  = the rates of the two meters (the rate being the ratio of the recorded watt-hours to the true watt-hours).

$k$  = the disk constant of the meters (nominal watt-hours per revolution).

$R_1, R_2$  = ratios of transformers.

$\alpha_1, \alpha_2$  = phase angles of transformers (positive for the secondary leading opposition to the primary).

$a_1, a_2$  = number of turns made by meter A when connected to transformers Nos. 1 and 2 respectively.

$b_1, b_2$  = the same for meter B.

$\cos \theta$  = power-factor.

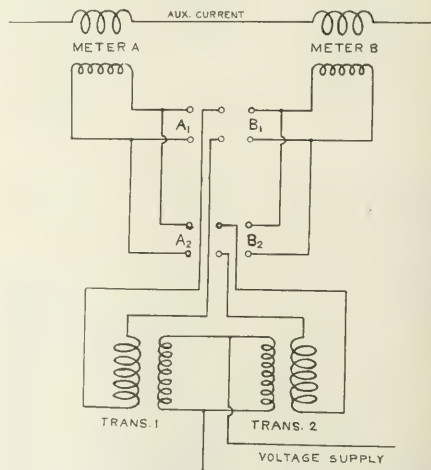


FIG. 1—DIAGRAM OF CONNECTIONS FOR COMPARING "VOLTAGE" TRANSFORMERS

Consider the case of a meter connected to a "voltage" transformer and working on low power-factor with a lagging current. In making  $t$  turns a meter records  $tk$  watt-hours. Taking into account only the rate of the meter  $m$  and the ratio of the transformer  $R$ , this gives for the energy represented by the primary voltage and

the auxiliary current  $\frac{m}{tk} R$ . But the meter is working

\*Agnew and Fitch, *Electrical World*, Vol. 54, p. 1042, 1909; E. Orlich, *Elek. Zeit.*, Vol. 30, pp. 435, 466, 1909; L. T. Robinson, *Trans. Amer. Inst. Elec. Engrs.*, Vol. 28, p. 1065, 1909; F. A. Laws, *Electrical World*, Vol. 55, p. 223, 1910; Sharp and Crawford, *Trans. Am. Inst. Elec. Eng.*, Vol. 29, p. 1517, 1910; Agnew and Sisbee, *Proc. Am. Inst. Elec. Eng.*, Vol. 31, p. 1267, 1912; Schering and Alberti, *Archiv für Elektrotechnik*, Vol. 2, p. 263, 1914. A method of testing voltage transformers adapted to central-station use and requiring only portable instruments has been described by Brooks (*Electrical World*, Vol. 62, p. 898, 1913.)

at a power-factor of  $\cos(\theta + \alpha)$  instead of  $\cos \theta$ , and hence the expression for the energy finally becomes

$$\frac{tkR \cos \theta}{m \cos(\theta - \alpha)}$$

or

$$\frac{tkR}{m \cos \alpha (1 - \tan \alpha \tan \theta)}$$

or, since  $\alpha$  is very small and hence its cosine may be taken as unity,

$$\frac{tkR}{m (1 - \tan \alpha \tan \theta)} \text{ approximately.}$$

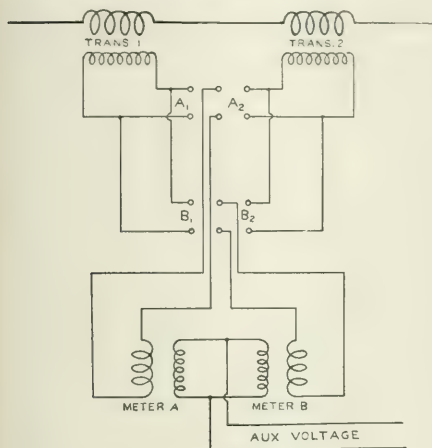


FIG. 2—DIAGRAM OF CONNECTIONS FOR COMPARING "CURRENT" TRANSFORMERS

Applying this to a set of readings taken by interchanging the meters on the transformers

$$\frac{a k R_1}{m_a (1 - \tan \theta \tan \alpha_1)} = \frac{b k R_2}{m_b (1 - \tan \theta \tan \alpha_2)} \quad (1)$$

$$\frac{a k R_2}{m_a (1 - \tan \theta \tan \alpha_2)} = \frac{b k R_1}{m_b (1 - \tan \theta \tan \alpha_1)} \quad (2)$$

from which it may easily be shown that

$$\frac{R_2}{R_1} = \sqrt{\frac{a_1}{a_2} \cdot \frac{b_2}{b_1}} \quad (3)$$

where the  $a$ 's and  $b$ 's are readings taken at unity power-factor, and that

$$\tan \alpha_2 - \tan \alpha_1 = \frac{1}{2 \tan \theta} \left( 1 - \frac{a_1}{a_2} \cdot \frac{b_2}{b_1} \cdot \frac{R_2}{R_1} \right) \quad (4)$$

where the  $a$ 's and  $b$ 's are now readings taken at low power-factor.

Equation (3) is the general formula for the ratio  $R_2$  in terms of the ratio  $R_1$ , and (4) is the general formula for the phase angle  $\alpha_2$  in terms of  $\alpha_1$  and the ratio of the ratios.

These formulas may easily be put into convenient form for slide-rule computation by making a few allowable approximations, giving for the difference in ratios expressed as a fraction of the ratio of the standard transformer

$$\frac{R_2 - R_1}{R_1} = \frac{1}{2} \left( \frac{a_1 - a_2}{a_2} + \frac{b_1 - b_2}{b_2} \right) \quad (5)$$

and for the phase angle

$$\alpha_2 \text{ (in minutes)} = \frac{3438}{\tan \theta} \left[ \frac{a_1 - a_2}{2 a_2} + \frac{b_1 - b_2}{2 b_2} \right] \quad (6)$$

Equations (5) and (6) are the working formulas for ratio and phase angle respectively and may ordinarily be used instead of the more exact formulas (2) and (3). The approximations involved will amount to less than 0.1 per cent in ratio for differences in the formula not exceeding 3 per cent, and to less than 0.01 per cent in ratio for differences not exceeding 1 per cent.

In equation (6), which gives the phase angle, the signs are correct for "voltage" transformers connected to meters working on lagging current and for "current"

DATA OBTAINED WITH METERS IN PARALLEL ON SAME LOAD

Run	Per Cent of Full Load	NUMBER OF TURNS	
		Meter A	Meter B
1	100	100	100.126
2	100	100	100.125
3	100	100	100.124
4	100	100	100.127
5	100	100	100.140
6	100	100	100.135
7	100	100	100.130
8	10	10	10.063
9	10	10	10.067
10	10	10	10.061
11	10	10	10.068
12	10	10	10.066

transformers connected to meters working on leading current. If the conditions are reversed, the plus sign before the bracketed expression should be changed to minus. However, it may often be more convenient not to depend upon this relation but to use the following facts as criteria to determine experimentally whether the transformer under test has a greater or a smaller phase angle than the standard transformer:

(1) Adding a non-inductive load to a "voltage" transformer always tends to lag the secondary voltage.

(2) Adding inductive resistance in the secondary of a "current" transformer tends to advance the phase of the secondary current.

### Experimental Results

Fig. 3 shows the results of the test of a 5500-to-110-volt transformer by means of two watt-hour meters and another transformer used as a standard, compared with the results of a precision laboratory method. The full lines represent the results of the laboratory method, and the isolated points those of the watt-hour meter method. Each point is the average of two runs of 100 turns each, and readings were taken to 0.01 turn.

Similarly, Fig. 4 shows the results of a comparison of the two methods for a 25-to-5-amp "current" transformer. Each point is here also the average of two runs of 100 turns each, excepting at the lower currents, where fewer turns were taken.

The meters used were of the type known commercially as  $K_2$ , the disks of which had been graduated in hundredths of a revolution.

It will be seen that the accuracy obtained is greater than is required in commercial power measurements. The method is easily capable of determining ratio to 0.02 or 0.03 per cent and phase angle to one or two minutes.

It has been found possible more than to double the speed of the meters by shunting the magnets by small pieces of soft iron and yet get equally accurate results. It is not generally realized that, under the very best con-



ditions, modern induction meters will repeat consecutive runs to a precision of about 0.01 per cent at full load. This is clearly shown by the table giving observations taken with the meters in parallel on the same load. The tenths of a division (thousandths of a revolution) were estimated in taking readings. The speed of

rent or voltage is required. This method should prove useful in checking the transformers used in the metering of large blocks of power, either single-phase or three-phase.

#### Miscellaneous Details

The use of two of the portable watt-hour meters so largely employed in meter testing is much more convenient than that of the house-type meters with graduated disks, as the trouble of counting turns is eliminated. However, for economy of time in testing "current" transformers rated at 5 amp secondary current a 5-amp watt-hour meter is preferable to one of a 10-amp range, as the length of time required for a test with a given accuracy is roughly only half as great. In general, a 1-amp or 2-amp range cannot be used on the light loads, as the impedance which would be introduced in the secondary of the transformer would be prohibitive. Of course, in the case of a voltage transformer the range is immaterial, as the current is an auxiliary one.

In testing "current" transformers it is very convenient to use as a source of current a step-down transformer giving only a few volts on the secondary but having ample secondary current-carrying capacity. But in such an arrangement if the resistance in the secondary circuit is very low the current may lag very appreciably behind the voltage. This will produce a small error in the ratio measurement, but such a condition is readily detected by the measuring instruments in the circuit. The best way to overcome this difficulty is by the use of a phase-shifting transformer as a source of the auxiliary voltage. Such a transformer is of very great utility for many other purposes, such, for example, as testing meters at low power-factor. If such a device is not available, the error may be eliminated by a process of successive approximation.

Care must be used to open the secondary circuit of a "current" transformer while current is passing through the primary, for if this be done the properties of the iron will be altered and the ratio and phase angle increased. In case a transformer is accidentally open-circuited, it may be brought back to its normal condition by carefully demagnetizing.

It is well to open both the current and the voltage circuits of the meters at the end of a run, as some meters are more apt to creep on current alone than on voltage alone.

It is important that the ratio and the phase angle of the standard transformer, whether of the "current" or "voltage" type, be determined under actual working conditions of load, including the meter. Multiple-range

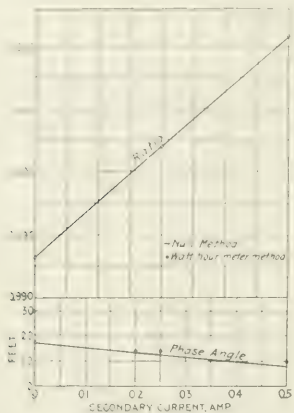


FIG. 3—RATIO AND PHASE ANGLE OF "VOLTAGE" TRANSFORMER

the meters had been increased to double normal value by shunting the magnets.

#### Over-All Corrections for Ratio and Phase Angle

There are cases in which it may be convenient to obtain a lump correction for both the ratio and the phase angle rather than to determine them and to correct for them independently. For example, in the case of a watt-hour meter and "current" transformer metering the energy supplied to an induction motor, if the standard transformer is inserted in series with the line and readings are taken at whatever power-factor the system is operating under, then one may consider  $R_s$  in either equation (3) or equation (5) as the combined or over-all power ratio of the transformer. To carry this out in routine work, it would practically be necessary to have a set of curves for the standard transformer giving this ratio calculated from ratio and phase angle for various power-factors. Yet, since these curves would be computed once for all for the standard transformer, it would obviate the necessity of going through a somewhat complicated computation for each transformer tested. Of course, a similar method could be developed for the case of the "voltage" transformer, but the complications involved would hardly make it worth while for that transformer alone. In fact, good "voltage" transformers, at least at sixty cycles, have such small phase angles that in most work the error introduced by them is no greater than the uncertainty due to other causes.

This process may be extended to the case in which both "current" and "voltage" transformers are used. For such a test one meter would be connected to both of the standard transformers (current and voltage), the other to both the transformers under test. Either equation (3) or equation (5) will in this case give the over-all power ratio of the two transformers under test ( $R_s$ ) for the given condition in terms of the corresponding over-all ratio for the two standard transformers ( $R_s$ ). This latter quantity could be taken from curves calculated for the two standard transformers, as mentioned above. Experimentally the process is simpler than would appear at first sight, since no auxiliary cur-

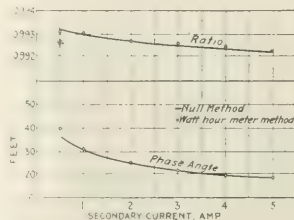


FIG. 4—RATIO AND PHASE ANGLE OF "CURRENT" TRANSFORMER

transformers are very convenient as standards, and good transformers have very accurately the same constants for the different series-parallel arrangements of coils. If the no-load ratio of a voltage transformer be required, it may be obtained very closely by adding a second or duplicate meter as load and then extrapolating to the no-load condition.

While the present method has neither the high precision nor the elegance of the null laboratory methods, it has ample accuracy for commercial requirements, it is independent of ordinary line fluctuations, and no specialized apparatus is required.\*

## A SPINNING COMPANY'S POWER PLANT

### Reciprocating Engine and Mixed-Pressure Turbine Installation with Special Cooling Tower and Synchronous Motor Equipment

The power plant of the Jenckes Spinning Company, of Pawtucket, R. I., illustrates the marked tendency that now exists in industrial generating station design toward the use of equipment combinations planned for economical service. This establishment produces fancy cotton yarns, dress goods and tire fabrics, besides other textiles. It employs 1200 operatives on day and night shifts and operates about 43,900 spindles. The machinery is both mechanically and electrically driven, the latter service requiring sixty-eight 550-volt, three-phase induction motors aggregating 1245 hp and seven 550-volt direct-current motors of 225 hp total rating.

Four Babcock & Wilcox boilers furnish steam, there being one 250-hp, one 500-hp and two 500-hp units installed. The 400-hp boiler is used only for heating. In the engine room are installed two Harris-Corliss simple engines exhausting into a 1000-kw mixed-pressure Curtis-General Electric turbo-alternator delivering three-phase energy at 600 volts; a 395-hp, 600-volt, three-phase General Electric synchronous motor, and a 250-kw, 550-volt direct-current generator. The engines are rated at 500 hp and 850 hp respectively, their cylinder dimensions being 24 in. by 48 in. and 30 $\frac{3}{8}$  in. by 60 in. The engines are belted to the line-shaft system of the mill, as are the synchronous motor and direct-current generator. The condensing equipment and a large cooling tower associated with it are of special interest and were furnished by the C. H. Wheeler Manufacturing Company, of Philadelphia. The accompanying sketch shows the general arrangement of apparatus.

The 250-kw direct-current generator is constantly operated from the line shafting. The generator of the mixed-pressure unit and the synchronous motor are run in parallel on the 600-volt, three-phase buses, and the synchronous machine operates either as a generator or as a motor, according to the load on the turbine. In the original plant three reciprocating engines were installed, but the present arrangement, by which the exhaust steam from two engines is utilized in a mixed-pressure turbine, practically doubles the output of the two engines now in service. The use of the synchronous motor in conjunction with the turbo-generator enables the latter to assist in driving the line shafting when the mechanical load is increased, and it provides a means of automatically increasing the load upon the engines and thus adding to the steam delivered to the mixed-pressure turbine when the alternating-current motor load rises above normal. The power-factor varies from 90 per cent to 95 per cent.

The engine exhaust, consisting of 10-in. and 12-in. pipes, is carried to a 4-ft. diameter by 5-ft. separating receiver in a 16-in. trunk line, and a pipe of the latter size is continued to the turbine. Just before the turbine is reached, a connection is made to a 16-in. Atwood & Morrell atmospheric exhaust valve set for 3 lb. The turbine operates at 1800 r.p.m. and delivers sixty-

cycle energy to the bus. It exhausts into a No. 58 C. H. Wheeler surface condenser through a 36-in. connection, an atmospheric connection being provided between the turbine and the condenser. The condenser is placed in the basement, and the vacuum is maintained by a 20-in. by 40-in. "Rotrex" wet and dry air pump directly driven by a 7-in. by 7-in. vertical engine. From the pump the condensate flows into a hot-well, whence it is forced through a feed-water heater into the boilers by a Deane 12-in. by 7-in. by 12-in. feed pump, the heater being of the Worthington closed type. Provision is made for introducing city water into the hot-well for make-up purposes and for the usual introduction of auxiliary exhaust steam into the heater. Condensation forming in the receiver between the engines and turbine is delivered to a sewer connection by a 4 $\frac{1}{2}$ -in. by 2 $\frac{3}{4}$ -in. by 4-in. Deane duplex pump.

The circulating water is supplied to the condenser upon the balanced water-leg principle, the cooling-tower supply and discharge pipes being parallel between the condenser and the tower. The tower is one of the largest in New England and is 90 ft. long, 20 ft. wide and 35 ft. high, weighing about 150 tons under actual working conditions. It is mounted upon the roof of the mill and has a total capacity of 5000 gal. per minute. It is supported at the ends and on one side by brick building walls carried above the roof level. Ten

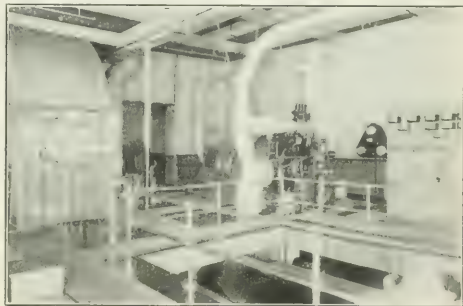


FIG. 1—ENGINE ROOM, JENCKES SPINNING COMPANY

10-in. lateral I-beams and two rows of 15-in. longitudinal I-beams are used in its support, and on the outer side the tower is braced by ten 6-in. by 7-in. wooden stanchions. The longitudinal I-beams are supported on cast-iron columns extended from the upper floor of the building and provided with special foundations. In the tower proper are a large number of wooden separators 8 ft. long and 1 $\frac{1}{2}$  in. square, set on the diagonal to interrupt the falling water and provide additional exposure to air currents. The circulating water is forced into the top of the tower by a 16-in. centrifugal pump directly driven by a 70-hp Terry steam turbine, but although the top of the cooling tower is about 100 ft. above the condenser, the pump is obliged to work only against the nominal head and pipe friction represented by the difference between the top and bottom heights of the tower, on account of the balancing secured between the supply and discharge pipes. These are each 15 in. in diameter. The piping is arranged so that if the turbine should be shut down the engines can be operated condensing.

The height of the water in the receiving tray at the bottom of the tower is indicated on a calibrated gage board in the engine room. The board carries a row of incandescent lamps which burn as the water reaches various stages, the lamps being thrown into circuit by brass contacts operated by a float carried in a wood-

\*A more detailed description will appear soon in the Bulletin of the Bureau of Standards, Reprint No. 233



incased copper cylinder at the tower level, the float being kept free from freezing in winter weather by a  $\frac{1}{2}$ -in. steam jet which plays upon it. In case of extreme low or high water in the tower tray the contacts cause an alarm bell to ring in the engine room.

Energy for exciting the turbo-generator and synchronous motor fields is normally derived from a 25-kw,

boilers were run at about 75 per cent of their rated capacity; on the night run at less than half their rating.

For the entire plant, the output averaged 2008.6 hp on the day run, 867.7 hp at night and 1578.7 hp for

DATA ON STEAM AND COAL CONSUMPTION

	Day Run	Night Run	72-Hour Run
Lb. steam per lb. coal.....	10.92	10.19	10.64
Lb. coal as fired per hp-hour for total plant.....	1.23	2.21	1.41
Lb. steam per hp-hour.....	13.50	22.40	14.97
Thermal efficiency in per cent.....	14.15	7.94	12.40
Useful electrical output in hp.....	1001.00	434.50	642.00
Total output of plant, including engines and generators in hp.....	2008.60	867.70	1578.70

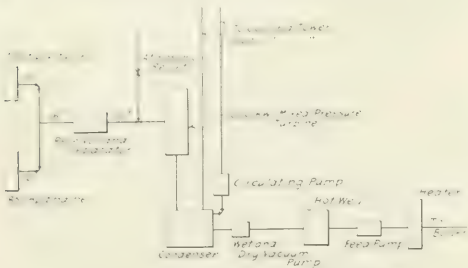


FIG. 2—DIAGRAM OF EXHAUST PIPING

125-volt motor-driven generator, a 15-kw Curtis turbine set being provided for starting and emergencies. The plant is equipped with a number of indicating and recording instruments showing, in addition to the usual steam-pressure and vacuum conditions, the temperature of the exhaust from the turbine and the temperature of circulating water going to and coming from the tower. Three Foxboro recorders are also in use to maintain records of the temperature of the field of the turbo-generator, temperature of feed water and the steam pressure. All feed water is measured by Venturi meters.

Through the courtesy of the company the following test data are printed. The runs were made under ordinary day and night loads and for seventy-two continuous hours. The coal had a heat of combustion as fired of 14,680 units per lb., showing 83 per cent carbon and 6.9 per cent ash upon analysis. On the day test, when the conditions were most favorable, 10.34 lb. of coal was burned per sq. ft. of grate surface per hour; on the night test, 7.95 lb., and on the seventy-two-hour run, 9.25 lb. The equivalent evaporation from and at 212 deg. per lb. of combustible per hour was

the seventy-two-hour run. The steam and coal consumptions were as shown in the accompanying table.

The operating cost at the plant per kilowatt-hour averages about 6 mills. The mixed-pressure turbine, cooling tower and condenser installation cost about \$65,000, and it is estimated that the economies gained

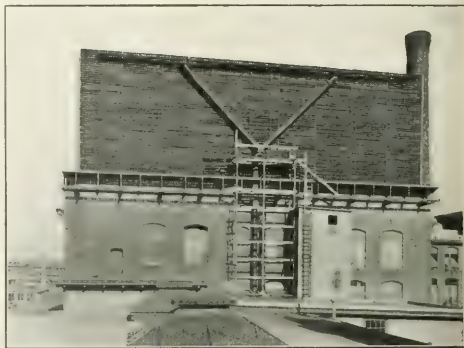


FIG. 4—COOLING TOWER, JENCKES SPINNING COMPANY

by its use will pay for the new equipment in less than three years. Mr. C. H. Giles, of Providence, R. I., was consulting engineer in connection with the plant betterments described, the chief operating engineer being Mr. Charles Tefft.

### Making the Customer a Party to His Own Complaint Search

By arranging an extra cord connection on its complaint-department telephone desk a Middle West utility company provides means by which the customer who telephones in a "kick" can listen to the various conversations all the time the complaint clerk is calling up different departments in search of the cause of trouble. In this way the complainant becomes a third party to the conversation and can interpose suggestions at any time if the statements of the complaint clerk as repeated are at variance with the facts or if additional information is needed. The scheme has also the additional advantage that the complainant is spared a tedious wait listening into a "silent" telephone receiver, while the investigation is being made. By following the course of his complaint as it makes the rounds of the various departments, the customer can be satisfied that his needs are being given prompt attention.

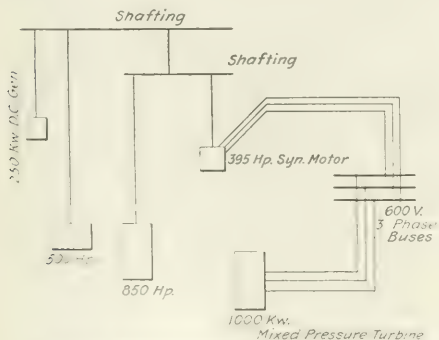


FIG. 3—ARRANGEMENT OF EQUIPMENT

respectively 12.33 lb., 11.34 lb. and 11.91 lb. The air required per pound of coal as determined from flue-gas analysis was 28.2 lb., representing an excess of 161.5 per cent over theoretical requirements. The thermal efficiency of the boiler plant was 75.4 per cent on the day run, 69.5 per cent on the night run and 72.8 per cent on the seventy-two-hour test. On the day test the

# Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods and Current Practice Among Successful Utilities

## Electricity Lights the Country Church

Churches even in towns of moderate size are not as a rule considered profitable customers for the central station on account of their low load-factor. Despite this fact, however, the Noblesville (Ind.) Heat, Light & Power Company has connected seven country churches to its extensive system of rural electric-service lines. In the contracts for service these churches are treated on the same basis as ordinary farm customers, and each is required to make a deposit of \$50 to cover one-fourth of the line construction expense. Later this deposit is returned to the church in electrical energy, no charge being made for service until after \$50 worth has been used. The illustration herewith shows one of these churches, a little white frame structure, more than 6 miles from the generating plant at Noblesville. The transformer serving this installation is placed on a



ELECTRICALLY LIGHTED CROSSROADS CHURCH IN INDIANA

pole across the road and is not visible in the illustration. The meter hangs under the porch roof so that the meter reader on his quarterly rounds does not need to enter the building.

## Load Curves Which Vary from the Average

An observant utility manager in the Central West has had plotted average energy-consumption curves for different types of customers. On the same sheet with each average curve there are added curves based on data of the individual customers making up the average. With these curves an opportunity is afforded for comparing each patron's consumption with the average. A parallel study of the curves and of the customers' installations generally brings out ideas for increasing the low points in each of the curves.

Taking hotels as an example, it may be found that the summer peak of a certain installation is far above normal. A study of the conditions existing at that hotel in the summer may point to ways for increasing the business of other hostleries and may also show how the winter business at the first hotel may be brought to a higher level.

## Nitrogen Lamps Displacing Gas at Worcester, Mass.

The Worcester (Mass.) Electric Light Company is meeting with success in displacing gas lamps of various types with gas-filled incandescent units. The two accompanying illustrations indicate the improvement effected in the factory of the Cranska Thread Company by the substitution of five 400-watt nitrogen-tungsten



FIG. 1—FORMER GASLIGHT ILLUMINATION

lamps for twenty-eight open gas jets long used to illuminate the first floor of the establishment. This section of the factory is about 50 ft. by 80 ft. in dimensions, and the gas-filled lamps are installed about 11 ft. above the floor and are equipped with metal reflectors. As a result of the improved illumination gained by the company, other manufacturers in the neighborhood are estimating on installations of nitrogen units in place of

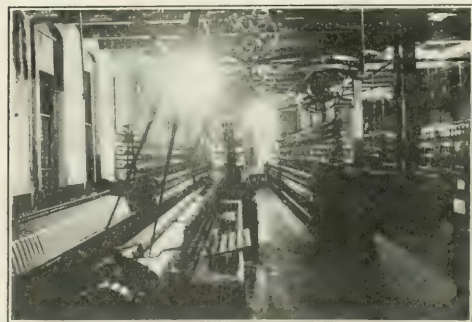


FIG. 2—NEW ELECTRICAL ILLUMINATION

carbon and ordinary tungsten lamps. The Worcester Electric Light Company is also introducing the nitrogen lamp, usually of the 400-watt size, into various large stores, notably shoe and furniture establishments, the semi-indirect system being recommended. Popular interest is rapidly growing with respect to this latest form of illumination.



### Reducing the Necessary Sales Effort

Salesmen soliciting house-wiring business frequently encounter a great deal of doubt and prejudice in the minds of the prospective customers concerning the accuracy and honesty of the meter which must accompany the installation. This is quite natural, or seems to be at least, for the salesman is asking the customer to buy a commodity which the latter does not understand, which is measured by a standard of which he has no knowledge and by instruments owned, controlled and kept in order by the agents of the seller. In fact, practically everything that accompanies the use of electrical energy is mysterious to the prospective customer, and it is little wonder that he hesitates to buy.

As a means of dispelling some of this suspicion and getting prospective customers to think and talk about things electrical as they should Mr. E. J. Condon, of the Indiana Utilities Company, Angola, Ind., suggested at the recent Indiana Electric Light Association convention that cards telling how to read an electric meter be mailed to prospective customers before solicitors were sent to call on them. These cards, he declared, are great prejudice eradicators and save the solicitors' time.

### Battery-Charging Load Desirable, Declares Philadelphia Company

Vehicle battery-charging loads are particularly desirable for central stations as they can be utilized to fill in valleys in daily load curve. Moreover, each battery

ducer than most other classes of business. The benefit which the Philadelphia company has derived either directly or indirectly from charging vehicle batteries is shown by the curves in Fig. 1, prepared by Mr. R.

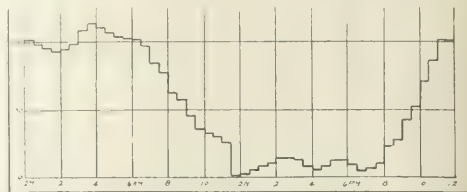


FIG. 3—BATTERY-CHARGING LOAD CURVE IN A PUBLIC GARAGE—PASSENGER CARS

Louis Lloyd, of that company. Load curves for truck and passenger vehicle charging in private and public garages respectively are also shown herewith.

### Reasons for Abandoning Appliance-Display Policy in Favor of Direct Sales

About a year ago the Utah Power & Light Company, of Salt Lake City, Utah, opened a new appliance display room and "electric shop" at 154 Main Street, Salt Lake City, to supplement the general offices of the company, which are less conveniently situated. At the outset the company did not plan to sell electric appliances at this new shop, but purposed to have devices there purely for display and educative purposes, intending to refer prospective purchasers to the electric supply dealers of the city who handle these appliances. Careful observation of the practical operation of this plan of conducting a demonstration room has convinced the company officials, however, that the results secured do not justify the expense of operating a demonstration on the elaborate scale that the company has provided for.

The sales force, for example, found it difficult to stimulate the interest of prospective purchasers as soon as the latter had learned that they could not purchase the appliances from the company. The sales people themselves could not go into a selling talk with the same spirit, knowing that they would be unable to derive the benefits of their enthusiasm by closing a sale.

#### Aim to Please Local Dealers

One of the reasons which originally led the company to adopt a non-sales policy was the desire to maintain the friendliness and co-operation of the local electrical supply houses. It was soon found, however, that one or two of the firms nearest the company's store were getting the principal benefit from its display, while the rest of the dealers were not deriving any direct benefit, the indirect benefits being also difficult to trace. Viewed from every standpoint, the company therefore felt that, in order to achieve the greatest results not only for itself but for the entire electrical industry in the territory it serves, there should be inaugurated a vigorous sales policy shaped along progressive business lines.

The matter was taken up with the various electric supply interests, and it was frankly explained that the plan was to continue to co-operate with the supply dealers, as has been done in the past, by maintaining such prices as would give a fair profit to both company and the dealers. Willingness was also expressed to purchase appliances through local jobbers when this could be done on equally advantageous terms. The dealers have viewed the matter broadly and have proffered their continued active co-operation and support as in the past.

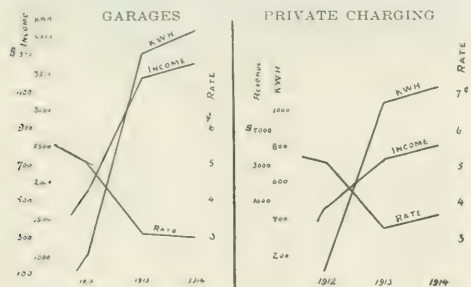


FIG. 1—CURVES SHOWING INCREASED INCOME EVEN WITH DECREASING RATES

load has a high load-factor. Reports from the Philadelphia (Pa.) Electric Company show a monthly average consumption of 102 kw-hr. per vehicle hp connected in public and private garages. One of this company's con-

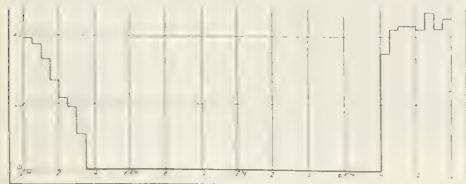


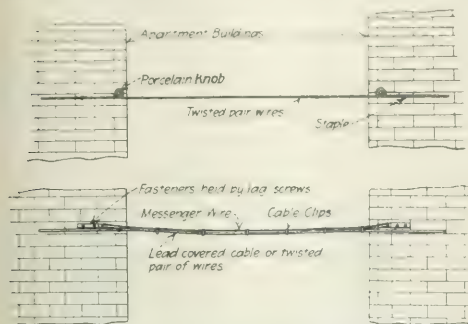
FIG. 2—BATTERY-CHARGING LOAD CURVE IN A PRIVATE GARAGE—TRUCKS

sumers declares that 199 kw-hr. is being consumed in his garage per month per hp connected. Whichever figure is assumed to be nearer the average value, it can be seen that battery charging is a better revenue pro-

## Illumination and Wiring

### Better Back-Yard Construction in Cities

As the business of supplying telephone and electric service grows and becomes more standard, it is interesting to note the sturdier and more sightly construction which replaces that used in former days. As typical of this gradual change, the methods of installing wiring on building exteriors is shown in the sketch



FIGS. 1 AND 2—OLD AND NEW WIRING METHODS

herewith. Formerly telephone wires extending along the rear walls of apartment buildings were held in position by insulating staples and porcelain knobs and sustained their own weight between adjoining structures.

Now, however, under similar conditions, a messenger wire solidly supported is swung between buildings, and the wire, or the small cable which is often used, is suspended by means of cable clips. Both of these schemes present a marked improvement over the older method wherein customers' service wires radiated from a pole top, and it is likely that lighting companies might modify and copy such telephone construction as this for back-yard work in cities.

### Sign Lighting at Bartlesville, Okla.

The accompanying illustration shows a night view of the main street of the little city of Bartlesville, Okla., in which the Washington County sign on the



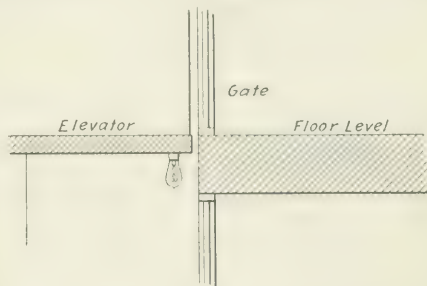
SIGN LIGHTING AT BARTLESVILLE, OKLA.

court house, which the Bartlesville Interurban Railway Company recently erected for the county, is plainly visible. The sign is made of 6-ft. letters and contains 384 10-watt lamps. It is 70 ft. long and 30 ft. high and is connected to the company's dusk-until-midnight flat-rate circuit, the cost being borne by the county. The illustration also shows two and one-half blocks of store

buildings on which there are thirty electric signs, all of which have been erected since the Doherty Operating Company took over the property eighteen months ago. Mr. C. W. Johnston is manager of the new-business department of the company.

### "Watch-Your-Step" Lamps for Elevator Thresholds

In the Monadnock Block, Chicago, the elevators have been equipped with safety lamps mounted just beneath



SAFETY LAMP FOR ELEVATORS

the car floors in such a way that the thresholds of the stationary gates reached by the car are illuminated as shown in the sketch herewith. The presence of the lighted rectangle warns the passenger to step across the opening between the car floor and the doorsill. If the car is above the level of the floor at which it is stopped the floor itself is lighted, but in any position the reflection of light from the doorsill gives ample warning to the passenger leaving the car. The lamps are operated continuously while the elevators are in service. Each lamp is a 16-cp unit mounted in a wall-type receptacle.

### Indirect Lighting for New York Bookstore

The lighting of Scribner's bookstore, New York, is accomplished by straight-filament tungsten lamps placed in cornice recesses on each side of the store. The ceiling is arched, the maximum height being 29



MODERN LIGHTING OF LARGE BOOKSTORE

ft. and the height to the base of the arch, or to the caps of the pilasters shown in the accompanying illustration, 22 ft. There are 186 ft. of reflectors, and they extend continuously on the long sides of the store except in the space occupied by the caps of the pilasters. The illumination is provided by 136 35-watt "linolite" lamps. At the rear of the store on the balcony level is

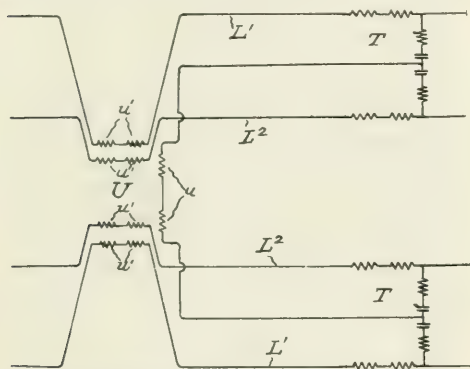


a picture gallery for the display of prints. The cover containing the upward diffusing reflector is also carried across this space. At the front of the store, owing to the metal and glass construction, a recess for the reflector has not been provided; an upward reflector, however, is attached to and made a part of the downward window reflector, and the resulting illumination in the window is considered very even. The lighting and reflecting equipment for this installation was supplied by the H. W. Johns-Manville Company, New York.

## RECENT TELEPHONE PATENTS

### Improvement in Loaded Lines

The so-called loaded lines—that is, lines provided with distributed inductance to decrease the attenuation—have been in successful use for a number of years. Nevertheless, improvements in the direction of flexibility and of transmission continue to be made. Some time ago means for phantoming such loaded lines were devised, the resulting phantom also being loaded. Now there has been patented a means for reducing the



MEANS FOR REDUCING REFLECTION LOSSES IN DUPLEX CIRCUITS

reflection losses where such a combination of loaded physicals and phantom is connected to a non-loaded or low-impedance circuit such as is used for terminating purposes.

The diagram shows the general plan,  $L^1$  and  $L^2$  being the loaded physical lines providing the phantom. It will be noted that the windings  $u$  are a bridge of the phantom and are of no effect on the physical lines as they are connected to neutral joints. On the other hand, windings  $u'$  are connected in the physical circuits. The windings at  $U$  are associated upon a toroidal core. Similarly each set of windings at  $T$  is upon a toroidal core. The windings in the physical circuits are made up of twisted pairs, and they are laid on the core in such relation to the bridged windings as to obtain the desired results. The coils act in effect as auto-transformers. This invention has been patented by Mr. Thomas Shaw, of Hackensack, N. J., who has assigned his two patents to the American Telephone & Telegraph Company.

### Automatic System

Mr. C. J. Erickson, of Chicago, has patented an automatic system adapted for party-line working. The circuits are arranged to prevent one station on the line from interfering with or knocking down a con-

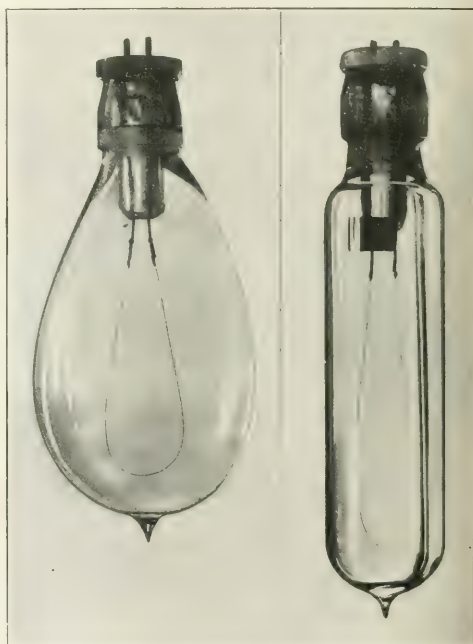
nection existing to another station on the same line. A locking relay is arranged at each station which operates whenever the hook switch is lifted while a connection already exists to that line. This locking relay prevents the sending of any interfering currents or making interfering contracts during its energization.

## Letter to the Editors

### Westinghouse "Stopper" Lamp

To the Editors of the Electrical World:

SIRS:—I am sending herewith some correspondence with reference to samples of the old "stopper" lamp. It occurs to me that you might find this sufficiently in-



WESTINGHOUSE "STOPPER" LAMPS OF THE KIND USED AT THE CHICAGO EXPOSITION OF 1893

teresting for notice or publication. The "stopper" lamps were got up by Mr. Westinghouse in order to meet the emergency due to the sustaining of the Edison all-glass-globe patent, and were used for lighting the World's Fair which was held at Chicago in 1893.

CHARLES A. TERRY,

Vice-president Westinghouse Electric & Manufacturing Company.  
New York, N. Y.

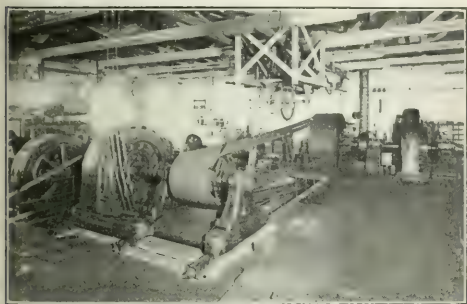
[The letters referred to indicate that the two "stopper lamps" illustrated herewith were recently found among the archives of the law firm of Sheffield, Bentley & Betts, to whom they were submitted by the Westinghouse company in 1892 for an opinion as to whether they infringed the Edison patent No. 223,898. When tested in October, 1914, at Bloomfield, N. J., the two lamps, now more than twenty years old, were found to have retained their vacuum, and although the vacuums could not be termed first-class, yet they are in serviceable condition.—Eds.]

# Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

## Rope-Driven Motor-Generator Set

In one of the older steam stations of the Portland Railway, Light & Power Company there were two machines driven by Corliss engines through rope drives. These machines were a 800-kw direct-current generator and a 750-kw alternator. They were not run, owing to the existence of sufficient energy available from hydroelectric plants and modern steam prime movers. Mr. E. D. Searing, in a contribution to the "wrinkles" presented at the recent meeting of the Northwest Electric Light & Power Association, said that when additional energy was required for 600-volt service from the station in which were these machines one of the engines was dismantled and the 750-kw alternator installed in



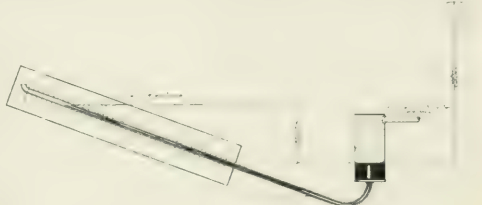
ROPE-DRIVEN MOTOR-GENERATOR SET

its place to act as a motor to drive the 800-kw direct-current generator, thus forming a rope-driven motor-generator set.

## Forebay Gage Level

In nearly all hydroelectric stations it is desirable to know the level of the forebay water, or, in the case of pumping stations, the head against which pumps may be working, and in many instances the possession of this information is imperative. A method of accomplishing this purpose was described by Mr. L. J. Pospisil, of the Washington Water Power Company, before the recent meeting of the Northwest Electric Light & Power Association. A column of mercury is arranged to balance the column of water brought in from the forebay to the mercury column through the pipe in which there is no flow. That there should be no flow in this pipe will be obvious when it is considered that only the static head is recorded, and should there be no flow, the velocity head producing such flow would not be registered. It will be noted that since the specific gravity of mercury is about 13.6, a variation of 1 ft. of water level will cause a corresponding variation in the mercury column level of  $1 \div 13.6$ , or 0.88 in. This variation is too small to permit of close reading, but if one of the mercury columns be inclined, so as to be on a slope, this variation is then increased to any amount desired, depending on the slope given to the column. Fur-

thermore, if one leg of the mercury column (the one to which the water level is connected) be enlarged so as to form a reservoir, then if the forebay level be in-

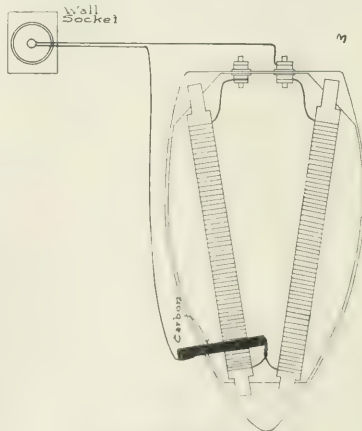


MERCURY FOREBAY GAGE

creased, the drop on that side will be small when it shall have forced enough mercury out into the smaller leg to form the new balance. The inclined leg containing the mercury column should be placed in a glass tube on which a scale suitably marked off as desired in feet or elevations can be placed and readings taken at any time. This scale should be initially calibrated either from actual levels in the forebay or by creating artificial water levels with forebay pipe connections, so that if the diameters of pipes both on the water and gage side as well as the angle of slope of the gage pipe are known the calibrations can be computed.

## Welding Small Connections

In making connections, especially in heating devices, subject to high temperatures it is out of the question to use solder, since the temperature reached in the de-



WELDING HEATING ELEMENTS

vice would cause the solder to run. A convenient arrangement for welding connections of flatirons or any other fine wires is shown herewith and was described



by Mr. G. S. Covey in the "wrinkles" presented at the Northwest Electric Light & Power Association. The ends of the wires to be welded are twisted together and the weld is completed by forming an arc, one electrode of which is the twisted connection and the other electrode a piece of carbon. The resistance of the heating unit in the iron shown is sufficient to limit the amount of current flow so that a short-circuit does not result.

### Cooling Water Used in Gas-Engine Manifolds

At Independence, Kan., where the central-station operators have had several years' experience with gas engines, they strongly recommend the practice of mixing flowing water with the exhaust flame from the engines in the manifolds. Not only does this plan prevent disastrous explosions in the muffler box but it also saves breakage of manifold pipes caused by expansion and contraction of the metal. At one time Mr. W. R. Morrow, manager of the Independence company, considered plans for heating the engine room with a hot-water system having its heating coils in the exhaust manifolds of the gas engines. But the project was never tried, as it was feared that the fuel saving effected would be more than offset by the damage which might occur from muffler-box explosions and broken manifolds.

### Home-Made End-Play Device

The accompanying sketch, contributed by Mr. L. R. Woodcock, of the Washington Water Power Company, to the "wrinkles" presented at the recent meeting of the Northwest Electric Light & Power Association, shows

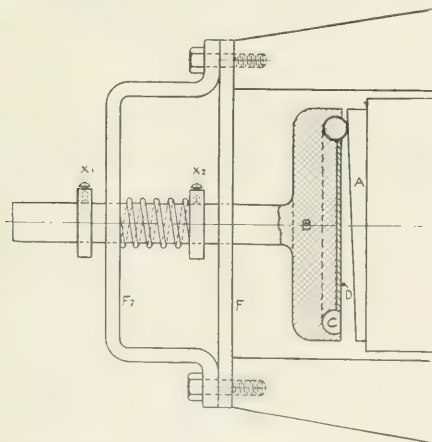


DIAGRAM SHOWING END-PLAY DEVICE OF HOME-MADE MANUFACTURE

a home-made end-play device that was applied to an old Edison bipolar machine and has been in successful operation for nearly two years. A disk of steel *A* is turned up so that its diameter is a little less than the diameter of the shaft of the generator. The thickness of the disk varies from 0.25 in. on one side to 0.5 in. on the other. Holes are drilled in the disk and countersunk, so that when it is screwed on to the end of the shaft there are no projections. The disk is tempered glass-hard. The collar *B* is turned to the same diameter as the disk with a spindle 0.75 in. in diameter and 5 in.

long, and in its face is cut a ball-race deep enough to take a 0.5-in. steel ball. A thin plate *D* is fastened to the face of the collar *B* to prevent the ball from falling out, and the spindle passes through the frame *F*, and *F*, which is made of heavy strap iron and attached to the end of the bearing. A heavy spring is placed around the spindle inside the frame, and the locknuts *X*, and *X*, regulate the distance of travel of the spindle and the compression of the spring respectively. When the machine is running the ball is pressed against the end of the shaft by the spring and the revolving shaft tends to carry it round, but on account of the varying thickness of the disk *A* the armature is forced to one side, when the ball gets between the thick part of the disk *A* and the collar *B*. After a short time the armature floats back and is again given another kick sidewise. The spring prevents the action from being too violent and rapid.

### Operating Centrifugal Pumps with Variable Delivery

BY A. PETERSON

The delivery of a centrifugal pump increases directly as the speed, while the head developed increases as the square of the speed. Therefore, if the pump is delivering through a purely frictional resistance, so that the head required increases approximately as the square of the delivery, practically constant efficiency will be shown at all deliveries and speeds. If the pump were originally selected to give its maximum efficiency at one given speed and delivery, it will give this maximum efficiency at all other speeds and deliveries. However, if the head is made up partly of static head and partly of frictional head, as in water-works service, this relation is disturbed, and the pump should be selected to give its highest efficiency at the normal head and delivery. It will then give comparatively high efficiency at other usual heads and deliveries, and if the efficiency characteristic is flat, the average efficiency will be high.

It is also feasible to have centrifugal pumps delivering to stand pipes or reservoirs maintain a good efficiency at different rates of deliveries by slightly varying the speed. The steam consumption of a steam turbine increases somewhat at a reduction in speed, although if the turbine normally is operating at its most efficient speed, the increase in steam consumption is very slight. The use of mechanical reduction gears makes it possible so to design the unit that the turbine will operate normally at its most efficient speed, so that wide variations in delivery can be obtained with practically constant duty.

### Bracing of Cross-Arms

Which is the correct way to brace cross-arms—to fasten the brace to the front or the back of the arm? If both methods are employed in approved practice, please state the advantages of each.

S. R. B.

Both methods of bracing are employed, but to give transverse as well as vertical rigidity to the arm the braces should be attached to the front; that is, the side away from the pole. With an arm braced in this manner there is less opportunity for it to twist when the loads on the pins or on opposite sides of the pole are unbalanced. Longer straps will, of course, be required for the front-attached brace than would be needed if they were fastened to the back of the arm. If transverse flexibility is not objectionable in a cross-arm, it may be braced from the back. The straps will consequently cost less as they do not contain as much material and do not have to be formed.

# Digest of Current Electrical Literature

## Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

### Generators, Motors and Transformers

**Large Induction Motors.**—G. MOORES.—The conclusion of his long article on some features of mechanical design of large induction motors. In the present instalment the author takes up stator windings, dealing with concentric windings, diamond windings and involute or butterfly windings. Rotor windings are finally considered.—*London Elec. Review*, Oct. 23 and 30, 1914.

**Wave and Lap Windings.**—In the "Question and Answer" department are discussed the conditions under which it is preferable to employ a wave winding rather than a lap winding for the armature of a four-pole motor.—*London Elec. Eng'ing*, Oct. 29, 1914.

### Lamps and Lighting

**British Arc-Lamp-Electrode Industry.**—A note pointing out that before the war the conditions were such as to enable Germany and Austria to supply electrodes for the British market at prices far lower than those at which they could be manufactured in England with profit. As the British electrode manufacturers fear that these conditions may prevail again, or at all events in a form only modified to a certain extent, after the war, there is a decided disinclination to make large extensions of carbon works on a permanent basis in England, or to establish new ones. Nearly \$2,500,000 worth of electrodes were exported from Germany during 1913, more than one-sixth of which were sold in Great Britain. From Austria-Hungary \$240,000 worth were exported, of which, however, \$107,500 worth were sent to Germany, leaving \$132,500 exported to other countries, of which \$46,000 went to Great Britain. So long as it is still impossible to manufacture in England sufficient electrodes for that country's own needs, it does not seem likely that it will start competing in foreign markets, unless, on further examination, the British manufacturers come to the conclusion that the increased production will put them in a position to compete with Germany for the export trade after the war is over. Two British companies have started the resumption of carbon manufacture, which they had given up years ago. Also a third small and independent carbon factory has been started.—*London Elec. Eng'ing*, Oct. 29, 1914.

**Moving-Lamp Photometer.**—C. C. TROWBRIDGE AND W. B. TRUESDELL.—A description of a modification of the ordinary photometer. The essential feature of the apparatus is a sliding carriage supporting one of the lamps, which may be set in to-and-fro motion at uniform velocity in the photometric axis. Comparisons of equal field intensity are observed while the lamp is in motion and are recorded by a simple mechanism. The purpose of the measurements was to ascertain the magnitude of errors occurring in photometric measurements in which one of the light sources is rapidly diminishing in intensity as in the photometry of phosphorescent gases and certain phosphorescent solids. The opinion was held that these errors might be of considerable magnitude, and this view was verified. The use of the moving-lamp device also gives some information on the rôle played by the fatigue of the retina of

the eye in photometric measurements in general. The errors in photometric measurements of phosphorescent decays may run as high as 15 per cent or more for rapid decay, and are apparently chiefly due to fatigue of the retina of the eye. The rôle played by the fatigue of the retina in photometry is shown and figures are given for this effect in the case of three persons, showing a marked difference of retinal fatigue.—*Phys. Rev.*, October, 1914.

### Installations, Systems and Appliances

**British Central Station.**—An illustrated description of the new central station in Basingstoke, a British borough of 12,000 inhabitants. There are two 150-hp Diesel engines, coupled to 100-kw, 460-to-500-volt shunt-wound generators of the interpolar type. The plant operates in conjunction with a 300-amp-hour battery. There is also a balancer to deal with 100 amp out-of-balance current and a 42-hp motor-driven booster for battery charging. For distribution use is made of the three-wire system with 460 volts across the outers.—*London Elec. Review*, Oct. 23, 1914.

**Circuit-Breakers.**—B. H. SMITH.—An illustrated description of a series-transformer tripping device for circuit-breakers.—*Elec. Journal*, November, 1914.

### Wires, Wiring and Conduits

**Testing High-Tension Cables.**—LEON LICHTENSTEIN.—The conclusion of his long illustrated paper on the testing of high-tension cables by direct current. The author describes the Delon portable rectifier plant used by the Siemens & Halske company for this purpose. Tests were made on the break-down voltage of paper-insulated three-phase cables. Six lengths were tested with alternating current and six with direct current. Each test lasted twenty minutes. The break-down emf for alternating-current averaged 50,600 volts and for direct-current 128,000 volts, so that the ratio is 2.53. The investigation is being continued, and the author expresses the hope that the difficulties involved in testing cables after they have been placed in the ground will be greatly reduced by the use of direct current.—*Elek. Zeit.*, Oct. 22, 1914.

### Electrophysics and Magnetism

**Mechanical Equivalent of Heat.**—ROBERT FREUND.—Weber formerly reported on a new method for determining the mechanical equivalent of heat from the heating of a metallic cylinder in a rotating magnetic field. There is a source of error in this method due to the fact that if the rotating field is not exactly circular (that is, if the magnetic vector varies in size while rotating), part of the heat-producing eddy currents do not contribute to the production of the torque. This source of error has been avoided in an arrangement devised by Tuma. The present author has made experiments with this arrangement and gives his results in this paper. The mean value of eight series of tests is 426.25.—*Phys. Zeit.*, Oct. 1, 1914.

**Mass and Velocities of the Alpha Particles from Radioactive Substances.**—SIR E. RUTHERFORD AND H. ROBINSON.—An account of an accurate determination of the deflection of the alpha rays in a magnetic and electrostatic field of known intensities by the photo-



graphic method. A thin-walled tube filled with emanation was used as a source of alpha rays. The value of  $E/m$ —the ratio of the charge to the mass of the alpha particle—was found to be 4820 electromagnetic units. This agrees within the limits of experimental error with the value to be expected from electrochemical data, namely,  $E/m = 4826$ , supposing that the alpha particle carries two unit charges. The value of  $E/m$  for the alpha particle from radium C is identical within experimental error with the corresponding value of the alpha particle from radium A and the radium emanation. The velocity of expulsion of alpha particles from radium C is  $1.922 \times 10^{10}$  cm per second. This is a value about 7 per cent lower than the previously accepted value. By using the known relation between the range of an alpha particle and its velocity the velocities and energies of the expelled alpha particle are calculated for all the known alpha-ray products. The results are given in a table. It is calculated that the heating effect to be ascribed to the kinetic energy of the alpha particles expelled from radium is about 7 per cent smaller than the value experimentally measured. It is consequently concluded that a small part of the heat emission from radium is to be ascribed to causes other than the energy of the expelled alpha particle. No evidence has been found that particles differing in mass or charge from the alpha particle are emitted from an alpha-ray tube.—*Philos. Mag.*, October, 1914.

#### Electrochemistry and Batteries

**Electric Furnace for Brass.**—An abstract of a paper by H. G. Dorsey presented before the American Institute of Metals. The Heiberger furnace did not prove a success on a commercial scale in the author's brass foundry. In a paper by H. W. Gillett and J. M. Lohr the melting losses in electric brass furnaces were discussed. Their experiments showed that the losses were reduced to one-half or one-third of what they would be in good practice with fuel-fired furnaces. "The advent of the electric furnace in the brass foundry will be slow but sure. However, it will never compete with fuel-fired furnaces where metals are now melted down without loss or with losses of less than 1 per cent. But where, as with many of the non-ferrous metals, the losses in melting are a large factor the electric furnace gives promise of effecting a saving. In fact, the electric furnace in brass melting is no longer a wild hope, but may be regarded as a certainty." A paper by G. H. Clamer and Carl Hering dealt with the use of the pinch-effect furnace for electric brass melting. E. M. Schmelz described an electric-furnace design of the Stassano type, so modified as to be of use for medium temperatures. In a paper by H. M. St. John electric brass melting from the central station viewpoint was discussed.—*Met. and Chem. Eng'g*, October, 1914.

**Industrial Electrochemistry.**—F. FOERSTER.—The conclusion of his paper read before the German Association of Electrical Engineers on industrial electrochemistry. In the present instalment the author deals with electric furnace work, especially the refining of steel, the manufacture of ferro-alloys, carborundum, graphite, calcium carbide and cyanamide. He finally refers to the fixation of atmospheric nitrogen and questions the economic soundness of the direct combination of nitrogen and oxygen by means of discharge through air, since the efficiency is as low as 3 per cent. The author assumes that 1,000,000 kw is now used for electrochemical work. Germany has no great water-powers but large lignite deposits. The author urges German capitalists to invest in large water-powers in other countries.—*Elek. Zeit.*, Sept. 24, 1914.

**Melting Ferromanganese.**—AXEL SAHLIN.—A (British) Iron and Steel Institute paper on the use of

liquid ferromanganese in the steel industry and the application of the Rennerfelt electric furnace for melting ferromanganese.—*London Elec. Review*, Oct. 16, 1914.

**Storage Battery Charging.**—A note on a recent British patent (No. 22,348, 1913) of H. J. Read and W. J. Bransom for a system for interrupting the charging circuit when a storage battery is fully charged. An ampere-hour meter acting through an overbalance mechanism and relays trips the circuit-breaker when a predetermined reading is attained.—*London Elec. Eng'g*, Oct. 29, 1914.

#### Units, Measurements and Instruments

**Friction Compensation in Ampere-Hour Meters.**—W. STRELOW.—One of the special problems of importance in the design of ampere-hour meters is that of overcoming the errors at low load by providing an efficient compensation for friction. For this purpose it is necessary to use an additional force. Fig. 1 shows the ar-

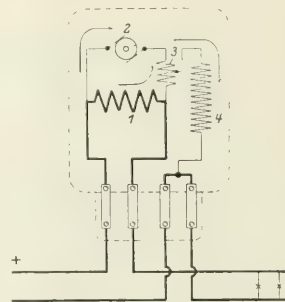


FIG. 1—WIRING ARRANGEMENT OF AMPERE-HOUR METER

range in which an auxiliary shunt current of 3 or 4 milliamp is used. A shunt of an ampere-hour meter for 10 amp is shown at 1, the resistance of 1 being 0.07 ohm. The armature 2 has a resistance of 4 ohms, and the additional resistor 3 has a resistance of 1 ohm, so that at full load of the shunt a current of 0.140 amp passes through the armature of the meter. The meter starts at 1 per cent of full load; that is, for a current of 1.4 milliamp the friction which prevents starting is overcome. According to the curve of the errors of an ampere-hour meter without friction compensation (curve a in Fig. 2) the error is —2.5 per cent at 10 per cent full load. It is —5 per cent at 5 per cent full load, and it is —10 per cent at 2.5 per cent of full load. A load of 2.5 per cent corresponds to an armature current of 3.5 milliamp. Since the error at this load is —10 per cent, 0.35 milliamp additional current is necessary to compensate this error. In order to change the error of —10 per cent into one of +10 per cent an additional current of 0.7 milliamp is necessary. This small current must be obtained from the network (220 volts). As shown in the illustration, the series resistor 4 is connected in an adjustable manner to some point in the resistor 3. The resistance of the series resistor 4 is 63,000 ohms for a voltage of 220, so that the current in it is 3.5 milliamp. The resistances of the armature (4 ohms) and shunt 1 (0.07 ohm) and additional resistor 3 (1 ohm) are such that when the end of the resistor 4 is connected to that end of resistor 3 which is near shunt 1 there are in parallel 5 ohms and 0.07 ohm, while if the connection is made to that end of the resistor 3 which is near the armature 2 there are in parallel 4 ohms and 1.07 ohms. In the first case an additional current of 0.07 milliamp and in the second case an additional current of 0.7 milliamp is obtained which flows through the armature. An additional arma-

ture current of 0.07 milliamp reduces the error from -10 per cent to -8 per cent, while an additional current of 0.7 milliamp produces an error of +10 cent and the curve of errors is then represented by curve *b*. Finally, if connection of the resistor 4 is made to the



FIG. 2—ERRORS OF AMPERE-HOUR METER WITHOUT FRICTION COMPENSATION

central point of the resistor 3, so that the additional current is 0.35 milliamp, the curve *a* is raised by 10 per cent at 2.5 per cent full load, by 5 per cent at 5 per cent full load, by 2.5 per cent at 10 per cent full load, so that the ampere-hour meter gives correct readings from 2.5 per cent of full load upward (Fig. 3). Without additional current the ampere-hour meter starts at 1 per cent full load (1.4 milliamp), and with the additional current of 0.7 milliamp it starts at 0.5 per cent of full load. Even if the voltage in the network should rise by 20 per cent, there would not be any danger

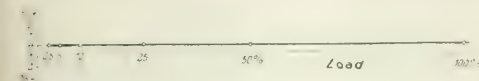


FIG. 3—ERRORS OF COMPENSATED AMPERE-HOUR METER

that the meter would run unloaded since the additional current is only 0.84 milliamp, while 1.4 milliamp is required for starting. This construction is used for instance, in double meters for three-wire installations, a shunt and an armature being placed in each outer conductor. Such a meter for  $2 \times 10$  amp and  $2 \times 220$  volts—that is, 4400 watts—begins to register at 11 watts (that is, at 0.25 per cent of the full load) and gives correct readings from 50 watts upward. The power consumption of the friction compensation is 1.8 watts.—*Elek. Zeit.*, Sept. 24, 1914.

**Testing of Potentiometers.**—FRANK WENNER AND ERNEST WEIBEL.—For precise measurements with a potentiometer the errors in the adjustment of the resistance sections or coils in the apparatus must be known. These errors can be determined by measurements of the resistances of the various sections, but without some systematic method of applying corrections they are not easily allowed for in the use of the potentiometer. It is convenient to express the relation between the known electromotive force, the unknown electromotive force, the readings and the corrections by the formula  $E = f[(e - a_1) + (e_1 - a_2) + \text{etc.}] / (1 + b + c + d)$ , where  $E$  is the value of the unknown electromotive force,  $f$  is the range of readings,  $e_1$  is the reading of the highest dial,  $e$  is the reading of the next highest dial, etc.  $c = (S - 2) \div s$ , where  $S$  is the value of the known electromotive force, and  $s$  is the reading of the known electromotive force dial or dials, and  $b$ ,  $d$ ,  $a_1$  and  $a_2$ , etc., are small corrections due to errors in the adjustment of the various resistance sections. The correction  $a_1$  depends only on the reading  $e$ ,  $a_2$  depends only on the reading  $e_1$ , etc.,  $b$  depends only upon the reading  $s$ , and  $d$  depends only upon  $f$ . A

table can therefore be constructed for each dial giving the corrections corresponding to each of its possible readings. Let  $R_1$  be the resistance in the potentiometer between the  $E$ -terminals and  $R_2$  that between the  $S$ -terminals. Then, if the total current is independent of the settings of the various switches or plugs,  $E = SR_1/R_2 = 11 + a_1 + a_2 + a_3 + \text{etc.} / 1 + b + c + d$ . Thus, if  $R_1/R_2$  is determined for the various readings of  $f$ , of  $e$  and of  $s$ , the corrections  $b$ ,  $d$ ,  $a_1$ ,  $a_2$ , etc., can be determined. In order to reduce the time required for making the measurements and to obtain the data in such form that the corrections can be more easily calculated, a special piece of apparatus was constructed and has been in use during the past two years. This apparatus, which is called a ratio set, furnishes a rapid and direct means for calibrating all types of potentiometers which have so far been submitted to the Bureau of Standards for test. It is equivalent to 211,110 resistance sections of 0.01 ohm each, connected in series and so arranged that a branch connection (either to battery or galvanometer) can be made between any two adjacent sections; or it is equivalent to a slide wire on which contact can be made at 211,110 points. The apparatus is made of 100 resistance sections, twenty of each of the following denominations: 100 ohms, 10 ohms, 1 ohm, 0.1 ohm, and 0.01 ohm. Five dial switches serve to shift the resistance sections from one side to the other of the branch connection, or to cut out sections on one side and insert corresponding sections into the other side. In use the ratio set is connected in parallel with the potentiometer to be tested in such a way as to form two arms of a bridge, while the potentiometer forms the other two arms. This arrangement constitutes a Matthiessen and Hockin bridge. The ratio set is adjusted so that a balance of the bridge is obtained for each setting of the dials of the potentiometer for which corrections are desired. The corresponding readings of the ratio set (when connected for known errors in its resistance sections) give data from which the corrections  $b$ ,  $e$ ,  $a_1$ ,  $a_2$ , etc., of equation (1) can be calculated. Certain adjustments are made so that the corrections are obtained almost directly from readings of the potentiometer and ratio set.—*Scientific Papers, Bureau of Standards, No. 223.*

## Book Review

PROCEEDINGS OF THE TWENTY-FIFTH ANNUAL CONVENTION OF THE NATIONAL ASSOCIATION OF RAILWAY COMMISSIONERS. New York: Law Reporting Company. 612 pages. Price, \$1.

The proceedings of the association, which consists of members of public service and railroad commissions of the various states and of the Interstate Commerce Commission, are important. The association meets annually and in a convention lasting for several days discusses many subjects which concern commissions and the corporations over which they have jurisdiction. While in the beginning the affairs of the association were devoted entirely to the steam railroads, the development of public service commissions later and the extension of jurisdiction to other classes of public utilities led to a change in the character of the program. The proceedings now are devoted in part to the affairs of other classes of public utilities and in part to the large questions of capitalization, rate of return, etc., which concern all classes of public service corporations equally. The proceedings show the tendencies in commission control and thought and contain much of interest to central-station companies and electrical concerns.



# New Apparatus and Appliances

An Illustrated Descriptive Record of Recently Developed  
Manufactured Products of Interest to Electrical Readers

## Fixture Studs

Sherardized stamped-steel fixture studs have recently been placed on the market by the National Metal Molding Company, Pittsburgh, Pa. The thickness of the metal (No. 11 B. & S. gage) is sufficient for tapping the hollow stems of the male studs to convert them into

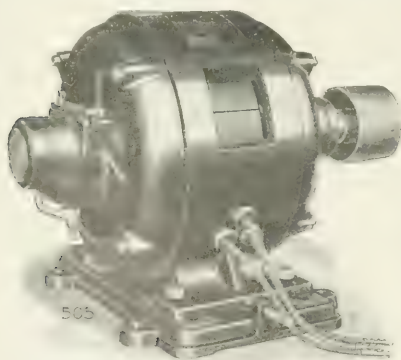


MALE FIXTURE STUD

female studs and for threading the female studs in case it is desired to change them to male studs. The studs are so shaped that the stems can be passed through the center knock-out holes of outlet boxes, thus insuring stability for heavy fixtures.

## Polyphase Induction Motor

Alternating-current motors designed for two-phase and three-phase service and built in sizes rated at from 0.25 hp to 7.5 hp have recently been developed by the Robbins & Myers Company, Springfield, Ohio. A cast-iron skeleton-type shell supports the stator. The end heads are cast separately from the frame and are machined to fit the frame. Soft-annealed-steel laminations held together by bolts are used in forming the stator. The rotor is of the squirrel-cage type, with a core built



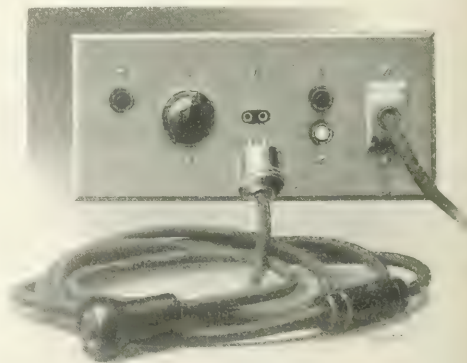
POLYPHASE MOTOR WITH SQUIRREL-CAGE ROTOR

up of steel laminations keyed to a cast-iron spider. The rotor bars are connected to the end rings, which are recessed to fit them, by double-rieveting and soldering. Bushed holes are provided in the frame for bringing out the terminals. The motors are equipped with sliding bases and cast-iron pulleys and also idler-pulley attachments or back gears if so desired.

## Silent-Call Signal System

A lamp-signal system for use in hospitals has been developed by the Bryant Electric Company, Bridgeport, Conn. By pressing a push-button at the bed incandescent lamps are lighted simultaneously at various points—outside the room or ward door, at the nurse's desk, in the diet kitchen, or elsewhere if desired. All the signal lamps incident to a given call remain lighted and cannot be changed until reset by the attendant at the calling station by the bedside where the call originated.

At the head of the bed or any other convenient point is installed the calling apparatus, which operates on the regular lighting circuit. In the accompanying illustration is shown a ward calling station equipped for sending signals of two kinds and for furnishing connection to portable electric devices. From the center of the calling-station plate a flexible cord, equipped with a special push-button, extends to the bed within reach of the patient. By pressing this button the red bull's-eye shown at the left of the extension is illuminated. The lamp in the corridor over the door and the other



WARD CALLING STATION

lamps connected to the circuit are also lighted at the same time. Still another lamp may be in an annunciator in the head nurse's room to indicate the number of the room from which the call originated. Upon reaching the patient the nurse releases the signal by pushing the control-switch button shown on the extreme left of the calling-station plate. By no other means can the signal be canceled.

The two-button switch at the right of the bed-cord extension may be used by the nurse to call a doctor or an assistant without leaving the patient. At the extreme right of the calling-station plate is a receptacle into which may be inserted a plug and cord extension for use with an examination lamp, reading lamp, electric fan, heating pad, or any other portable electric device. An interesting auxiliary of this system is an elapsed-time recorder which provides a graphic record of the time between the origin of call and the registration of a response.

### Electric Percolator Which Cannot Overheat

Some electric percolators have been found unsatisfactory because the heating unit burned out when there was no liquid in the pot. This objectionable feature has been avoided in the percolator shown in the accompanying illustration by equipping it with a fuse nut which will open the circuit if the pot is emptied. It is

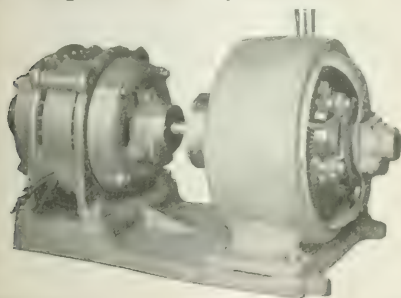


PERCOLATOR WITH AUTOMATIC CIRCUIT-BREAKER

declared that the appliance will percolate in less than one minute. It will hold three pints and is made of heavy copper which is nickel-plated. A positive-action percolator valve is employed which can be easily cleaned if it becomes clogged with coffee grounds. The device is manufactured by the Simplex Electric Heating Company, Cambridge, Mass.

### Motor-Generator Set for Motion-Picture Apparatus

A motor-generator set designed to operate on standard-voltage alternating current and to deliver direct-current energy at the proper voltage for the operation of the arc lamp of motion-picture projecting machines is being made by the Fort Wayne Electric Works of the General Electric Company, Fort Wayne, Ind. No resistance is placed between the generator and the lamp. The switchboard is made up in the form of a steel cabinet and contains the voltmeter and ammeter in the front and the field rheostat which is mounted on the back of the panel with the hand wheel showing in the front. All wires enter the cabinet through conduits. When the "compensarc," as the set is called, is used with two motion-picture machines the cabinet is equipped with a change-over switch. By means of this switch it



MOTOR-GENERATOR SET FOR MOTION-PICTURE MACHINE

is possible to warm the second lamp on direct current without interfering with the operation of the first arc lamp, and then when the projection of the first reel is finished to start the second immediately with the other machine. The motor-generator set is made in two sizes, one for the operation of a single lamp and the other for two lamps used alternately.

### Lineman's Kerosene Torch

A kerosene torch for brazing and sweating wires and cables, etc., has recently been developed by the Hauck Manufacturing Company, 140 Livingston Street, Brooklyn, N. Y. The tank holds 1 quart, and with a full flame

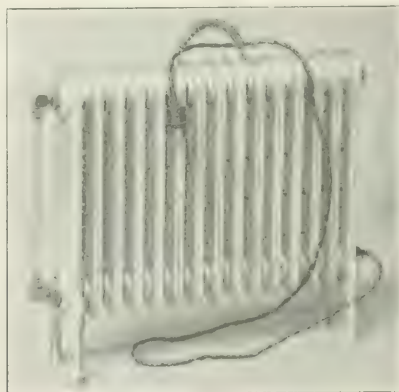


KEROSENE TORCH FOR LINEMEN

0.5 pint of fuel is used an hour. The full flame is 8 in. long. The size of the flame is regulated by a needle valve. The burner can easily be taken apart for cleansing purposes. The weight of the apparatus complete is 5 lb.

### Electric Steam Radiator

Illustrated herewith is a fifteen-section electric steam radiator which in appearance resembles the ordinary steam radiator operating from a central-boiler system. In the bottom waterway of the radiator is placed a tube in which is inserted another tube with a diameter 3/16 in. smaller than that of the larger tube. A resistance coil is placed in the smaller tube. From 1.5 quarts to 3 quarts of water are kept in the radiator. The water passes around the smaller tube through the larger one and is heated, about fifteen minutes being required for it to boil. It is necessary to renew the water every three months or so. Radiators of this type weigh from 30 lb.



ELECTRIC STEAM HEATER

to 80 lb., according to size, and, of course, are portable. An automatic device is provided with the heater for the purpose of regulating the temperature according to the degree of heat desired.

This electric heater is being placed on the market by the Electrical Steam Radiator Company, 644 Congress Street, Portland, Me.



### Rotary Air Compressor

A rotary air compressor in which the rotor and case of the machine both revolve at the same speed around separate centers was exhibited recently for the first time at the Allied Foundrymen's Association convention in Chicago. As the rotor and case revolve eight pockets between the rotor and the case, formed by rotor vanes



FIG. 1—ROTARY AIR COMPRESSOR AT FOUNDRYMEN'S SHOW

sliding in and out of radial slots in the case, alternately draw air in, compress it and discharge it through the hollow shaft. Each pocket is served by an inlet and out-poppet valve, the inlet valves being mechanically operated. The valve openings lead through chambers in the rotor to the inlet and discharge ends of the hollow shaft. Owing to the fanning action created by rotation of the case and on account of its large radiating area, it is unnecessary to provide water for cooling purposes. Because of the extremely small clearances and the slow movement of the sliding valve vanes, low power consumption and high efficiency are claimed for this appa-

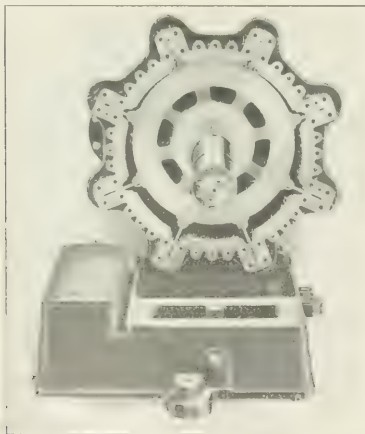


FIG. 2—SLIDING VANES AND AIR POCKETS

ratus, in addition to the qualities of compactness and tightness.

The machine exhibited weighs 1400 lb., occupies a floor space 46 in. by 28 in., is 35 in. high, and is able to deliver air at 275 deg. Fahr. when actually discharging 70 cu. ft. of free air a minute, against a pressure of 100

lb. per sq. in. The compressor is designed for direct motor connection or belt drive. The Wernicke-Hatcher Pump Company, of Grand Rapids, Mich., has developed and is marketing this machine. Some of the units are now in use among building contractors and in industrial plants, and all are said to be giving good service and marked satisfaction on account of the ease with which the compressor and its driving motor can be moved.

### Insulated Canopies

The canopies shown in the accompanying illustrations may be equipped with rings or hooks, as shown in Fig. 2, and they may be used with indirect, semi-indirect or pendent fixtures, arranged singly or otherwise. The canopy is of brass and is heavily reinforced for drilling

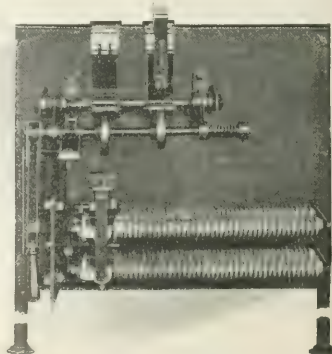


FIGS. 1 AND 2—BRASS CANOPIES

and tapping a number of outlets. It is made in two parts which are joined together by an insulating ring. A heavy steel plate is provided which is punched so as to be attached to any outlet box or ordinary metal, wood or plaster ceiling. The canopies are being made by the F. W. Wakefield Brass Company, Vermilion, Ohio.

### Starting Rheostat for Large-Sized Direct-Current Motors

Resistance starters of the graphite-compression type, designed for direct-current motors rated at 150 hp to 300 hp, have recently been placed on the market by the Allen-Bradley Company, Milwaukee, Wis. All the oper-



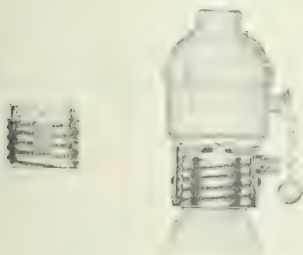
STARTING RHEOSTAT

ating parts are easily accessible, and there is nothing on the back of the panel excepting the busbars and line and motor connections. Only one operating lever is employed. This lever, by means of a cam arrangement successively actuates two clapper switches, one of which closes the motor circuit while the other shunts the re

sistance units out of the circuit after they have been fully compressed. The first clapper switch is equipped with auxiliary graphite arcing contacts. An automatic no-voltage release having its operating magnet connected in series with the shunt motor field and an overload release mechanism are also provided. In case field rheostats are used, instead of a no-voltage release, a relay system which short-circuits the field rheostat during the starting period is employed.

### Lock Socket

A locking device called the "arrolock" has been developed by the Arrow Electric Company, Hartford, Conn., for use with its brass-shell sockets. The device consists of a small set-screw which is placed against a



FIGS. 1 AND 2—CROSS-SECTION OF SCREW SHELL AND SOCKET

serrated, hardened-steel clamping piece which engages with the lamp base. A special key is used to operate the set-screw. The set-screw is insulated by the socket lining, which is between the screw and the clamping piece. In Fig. 1 is shown a cross-section of a screw shell and the serrated clamping piece which holds the lamp base in place. A cross-section of a socket with a locking device is shown in Fig. 2.

### Light-Weight Electric Delivery Vehicle

A low-priced 750-lb. electric delivery truck has recently been developed by the Ward Motor Vehicle Com-



750-LB. ELECTRIC DELIVERY TRUCK

pany, 101 Park Avenue, New York. The truck, which is shown herewith, is equipped with Timken axles, Westinghouse motor, shaft drive, wheel steer with column control and artillery-type wheels. The tires are 32 in. by 2.5 in. The truck is designed to operate 35 miles to 45 miles on one charge.

### Bell-Ringing and Toy Transformers

A small transformer for operating bells, buzzers, annunciators, spark coils for gas-engine ignition, etc., from an ordinary 110-volt, sixty-cycle lighting circuit is shown in Fig. 1. The windings are so arranged that the secondary terminals may be short-circuited without injury. The coils are inclosed in a cast-iron case and are sealed with a heat-resisting, moisture-proof compound. The case is mounted on a slate base. The primary terminals are 6-in. flexible leads brought out through porcelain bushings; the secondary terminals are of the binding-post type. The transformer is made in three sizes—one having two secondary terminals designed for a pressure of 8 volts, another with three secondary terminals designed for pressures of 6 volts, 8 volts and 14 volts, and another with three secondary terminals designed for pressures of 6 volts, 12 volts and 18 volts.

The toy transformer shown in Fig. 2 is designed to reduce the line voltage to a suitable value for operating small motors, cars, lamps, etc. The secondary winding is so designed that the voltage can be varied in steps of

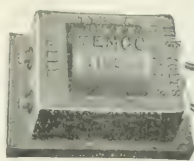


FIG. 1—BELL-RINGING TRANSFORMER

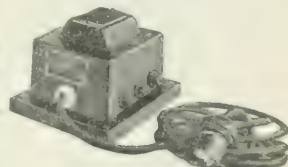


FIG. 2—TOY TRANSFORMER

one volt. The secondary terminals are of the binding-post type. The toy transformer is made in three sizes.

The transformers described above are the product of the Electric Manufacturing Company, 2046 Harlem Avenue, Baltimore, Md.

### Kitchen Table with Electric Plate-Warmers

The kitchen table shown herewith is equipped with an electric plate-warming compartment. A three-heat switch and a pilot lamp are also provided. The facings



TABLE WITH ELECTRIC PLATE-WARMING COMPARTMENT

are of Russia iron, and the remainder of the table may be of steel, German silver or monel metal. The table is built in sizes ranging from 4 ft. long up and is fitted with drawers and shelves for pots, pans, etc. The table is being manufactured by Wells, Mowbray & Newman, Inc., 125 West Forty-second Street, New York.



# Jobber, Dealer and Contractor

## FREE ADVERTISING LITERATURE

Attractive Booklets, Posters, Window Displays, and Advertising Copy. Available for Christmas Business Building

By A. J. EDGELL.\*

"Something for nothing." Something for nothing and no strings on it. How many men will pass up such a proposition? It is safe to say that few would acknowledge such a tendency. And yet every dealer in electric merchandise has this offer put to him by the manu-

while he gets the benefit indirectly, the distributor reaps an enormous benefit from the easy sale of the goods advertised. For the success of his campaign he needs the retailer's co-operation.

A device well advertised is half sold. Much of the other half of the selling lies in letting the people know where they can get the advertised article. That is the work of the advertising helps that are furnished gratis.



FIG. 1—ATTRACTIVE BOOKLETS ON ELECTRICAL SUBJECTS

facturers, and rare indeed is the man who is taking full advantage of the large expenditures being made for his benefit in the many selling helps that are his for the asking.

Co-operation—that is what the manufacturer is up to. He advertises his goods for mutual benefit. In exploiting his product he spends thousands of dollars, and

\*Society for Electrical Development, Inc.

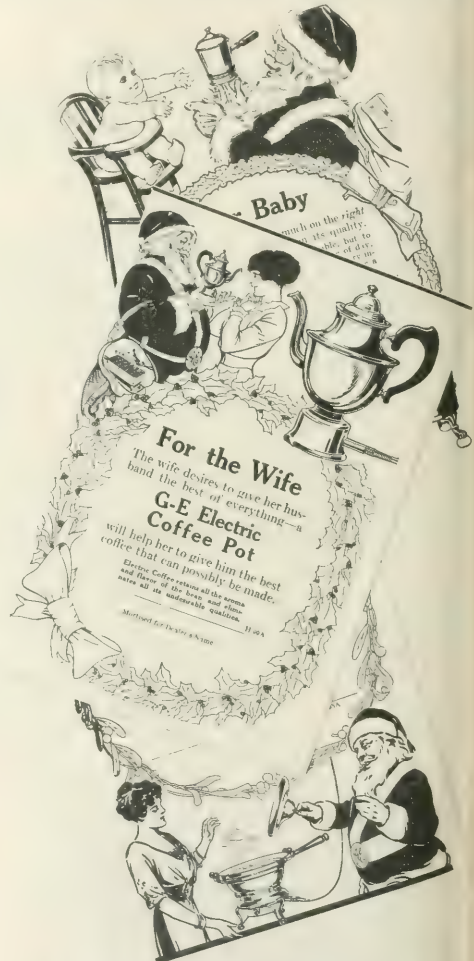


FIG. 2—CHRISTMAS PLACARDS ON HEATING DEVICES

It's not enough to stock the appliances. There is a decided difference between keeping electrical merchandise and selling it. Some dealers keep appliances just as if they loved them so dearly that it would pain them to part with them.

"Silence is golden" was never intended as a motto for a business man. If he wants to do a retail business he must make a noise. Whether he pays for all of it or let the manufacturer pay for a part depends on his willingness to co-operate. Nearly every manufacturer whether large or small furnishes some ready-made advertising matter, and the best thing a dealer can do is to plan his own advertising to link up with the big noise made by the manufacturer.

Real, live advertising men who are keen in their hunt for ideas that will help increase the dealer's sales and build him more profitable business prepare these helps. By experience these men have learned what to eliminate, what to say, what to suggest, how to attract attention, how to interest, convince and compel action. These men know instead of guessing.

Like certain nationally advertised products, these

store interior, silent salesmen who convey their message to the customer, are ready, too.

Handsome posters printed in colors on materials ranging from cardboard to tin provide effective display in the window or store interior.

Booklets, many of them works of art, for mailing or distribution in the store, will do missionary work in the home where the "prospect" has leisure to read them.

Return postal cards with the printing done, even to the return address, are furnished sometimes. A postage stamp is the extent of the dealer's investment for these business emissaries.

There are street-car cards to attract the eye of the shopper on the way down town, at the time when she is looking for suggestions; posters for billboard advertising, lantern slides for "movie" theaters, and so on. If that sort of service is not co-operation, what is?



FIG. 5—ELECTRIC YULETIDE LITERATURE



FIGS. 3 AND 4—SUGGESTIVE CHRISTMAS ADVERTISING

selling helps come in fifty-seven varieties, or nearly that many.

There are cuts, big, little and medium-sized, for small announcements or big spreads, with human-interest illustrations, and pictures of the devices themselves. Some have the reading matter prepared for inserting the dealer's name—the only step necessary for the printer to take. No brain-taxing attempt of the amateur is required to get up something to fill the space in the newspaper. The "ad" is there ready for use. It has the punch that will get results.

Window display suggestions are to be had—sometimes photos of displays, sometimes sketches, and at other times only a description—but the idea is there—some of the material needed to place the display, a few well-worded window cards, or more than likely it is material that will serve to attract attention to the display or enhance its appearance. Descriptive cards for the

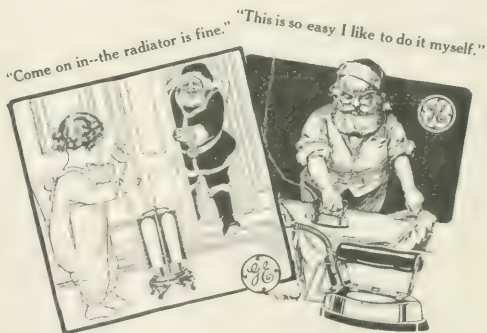


FIG. 6—SANTA CLAUS AS AN ELECTRICAL-SUPPLY MAN

There is no better time to use these materials than right now, when the race for Christmas business is rounding into the home stretch. It is a good habit to get. It's a mighty comfortable sort of feeling, that of knowing one has a high-salaried advertising manager to prepare his campaigns. He pays Uncle Sam 2 cents and receives his ready-to-use material by return mail.

That's co-operation and service.



# Industrial and Financial News

## Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

**New Building for Supply Company.**—The Electric Supply Company, Memphis, Tenn., has constructed a new fireproof building. Outside of the front doors and a small amount of shelving no wood has been used.

**Substation Equipment for St. Louis Electric Company.**—Recently nine General Electric induction regulators were installed in the Morgan Street substation of the Union Electric Light & Power Company, St. Louis, Mo., to replace the old hand-operated boosters.

**Electrical Equipment for Snow-Plow Service.**—The Boston Elevated Railway Company has placed an order with the Westinghouse Electric & Manufacturing Company for eight motors and control equipment for use on two new snow plows which are being built by this company, and which will be ready for the winter season.

**Special Christmas-Tree Lamps.**—It has been said that there is a shortage of small incandescent lamps for trimming Christmas trees on account of the European war, but a number of companies, including the Anglo-American Company, 717 New Grant Street, Pittsburgh, Pa., find that this is not the case. The above company has on hand a large number of 14-volt lamps in the form of birds, animals, fruit, etc.

**Jeffersonville, Ind., to Purchase Energy from Louisville.**—The United Gas & Electric Company, of Jeffersonville, Ind., has closed a long-term contract with the Louisville (Ky.) Gas & Electric Company for the purchase of 1500 kw of electric power for distribution in Jeffersonville. A line has been completed between the two cities, and by the arrangement of purchasing power the Jeffersonville company will be saved considerable investment in additional power-plant rating.

**Orders for Turbo-Generator Sets.**—Last fall the Mountain Ice Company installed a 375-kva turbo-generator outfit in its natural-ice storage plant at Lake Hopatcong, N. J., for generating energy for lighting and motors. Recently the ice company ordered a 219-kva set for its plant at Gouldsboro, Pa. These sets were furnished by the Terry Steam Turbine Company, Hartford, Conn. The Excelsior Needle Company has also installed a 375-kva Terry turbo-generator outfit in its factory at Torrington, Conn.

**Progress of the United States from 1800 to 1914.**—An epitomized record of the nation's growth in area, population and resources is contained in a pamphlet just issued by the Department of Commerce through its Bureau of Foreign and Domestic Commerce, entitled "Statistical Record of the Progress of the United States, 1800-1914." In all cases where the statistical data permit the tables cover more than a century, but the later inauguration of certain lines of statistics necessarily restricts in those cases the period covered.

**Westinghouse Lamp Company Acquires Milwaukee Factory.**—The Westinghouse Lamp Company has purchased from the Kissel-Kar Company of Milwaukee five large buildings along the tracks of the Chicago, Milwaukee & St. Paul Railroad, Milwaukee, which since March of this year it has been equipping with machinery for the manufacture of 600,000 lamps per month. Installation of this machinery is now completed, although the new factory will not begin operation until after the first of the year, it was announced at the office of Mr. Irving Cary, local manager for the company.

**Large Demand for Portable-Lamp Fixtures.**—The Wallace Novelty Company, 18 East Forty-first Street, New York, recently placed on the market a low-priced collapsible portable lighting fixture, consisting of the base, socket and connector cord and shade. The base and shade can be clamped together so that it takes up a very small

amount of space. The device is particularly popular with travelers. Within a short period the output of the above company's factory has jumped from fifty fixtures to 1200 fixtures a day, and according to Mr. C. L. Waterbury, of the Wallace company, it is almost impossible to fill promptly all the orders being received.

**Electrical Exports of the United States.**—The government has just released statistics on the electrical exports of the country for the year ended June 30, 1914. These are published in tabular form on the page opposite. It is of interest to note that North America absorbs the largest number of batteries; Asia the greatest value in dynamos, with North America second; South America the largest quantity of fans, with Asia second, while North America takes most of the insulated wire exported as well as interior-wiring supplies. The great bulk of lamps of all kinds, motors, transformers, telephones, etc., also find their way to Canada, Mexico and other North American countries, with Asia second in motor demand, Europe first in transformers and South America second in telegraph and telephone instruments.

**Electric Sterilizer for Hospitals.**—Several electric heaters of the universal type for use with sterilizing apparatus, particularly pressure sterilizers, have been developed by the American Sterilizer Company, Erie, Pa. An installation of this company's equipment has recently been made in the Mount St. Mary's Hospital, Niagara Falls, N. Y. In one room of this hospital there is a battery of sterilizers with a total rating of 60 kw. During the past summer orders for electric sterilizing equipment with a total rating of 183 kw have been received by the above company. Electric installations have been made in more than sixty institutions throughout the United States, Canada and Mexico within the past three years, including apparatus for several army posts and the battleship *Pennsylvania*.

**Recent Contracts of the Brooklyn Edison Company.**—The Edison Electric Illuminating Company of Brooklyn finds that during periods of industrial depression manufacturers are in a receptive mood and will entertain any proposition which results in lessening production costs. Mr. T. I. Jones, general sales agent of the company, reports recent power contracts as follows: A. D. Matthews & Sons, Inc., department store, 300 hp, displacing isolated plant; Austin-Nichols & Company, 600-hp, centralized plant, displacing five isolated plants; Keeney Theater, 100 kw; Keith's Theater, 125 kw; Flinn-O'Rourke Company, East River tunnel construction, contract for three and one-half years, 7500 kw, involving the taking over of a \$120,000 steam plant; long-term contract with the Bush Terminal Company for approximately 10,000,000 kw-hr. yearly on a connected load of 4000 kw.

**Good Demand for Stage-Lamp Dimmers.**—The Ward Leonard Electric Company, Bronxville, N. Y., has recently developed a 110-step dimming device for tungsten stage lamps. The demand for these devices is quite large. The following are some of the theaters in which these devices have been installed: Garden Theater, Elizabeth, N. J.; DuPont Theater, Germantown Theater, Philadelphia, Pa.; Pantages Theater, Winnipeg, Can.; Gotham Theater, New York; Gayety Theater, Buffalo, N. Y.; John Cort Theater, Boston, Mass.; Dyckman Street Theater, New York; Majestic Theater, Newark, N. J.; Strand Theater, Newark, N. J.; American Theater, Chicago, Ill.; Globe Theater, Philadelphia, Pa.; New Pantages Theater, Victoria, B. C.; Hart House, Toronto, Can.; Prospect Theater, Brooklyn, N. Y.; Madison Theater, Brooklyn, N. Y.; Flatbush Theater, Brooklyn, N. Y.; Crotona Theater, New York; Cort Theater, New York; Brownsville Theater, Brooklyn, N. Y.; West End Theater, New York; Proctor's Theater, Troy, N. Y., and Globe Theater, Baltimore, Md.

Figure 11. MCHENGO, Amman, and Damascus.

Country to Which Exported	Dynamics of Generation		Inland Water and Canals	Interior Wiring Supply Type	Inland Supply Type	Incandescent		Motors	Farm Machinery	Incl. Wires Apparatus	Tele- phone	All Other	
	Batteries	Generators				Carbon Filaments	Metal Filaments						
Argentina	8210	81 180									8673	\$6,647	
Argentina, Mendoza Province	7 041	26	4	807	81 000	100 81 524	62,245	27 000	100	8258	11,000	8 142	200,827
Bahamas	800			780						1,887	210	1,254	5,000
Bahamas, Nassau	719	883								2,549			
Bahamas, Nassau	6,074	9,300		1,784	8474	10 181	3,300	552	5,625	1,764	182,914	32,311	15,847
Bahamas, Nassau	15,398	30,279	12	548	344	100 10	21,100	2,320	1,471	216	27,996	1,910	5,683
Bahamas, Nassau	194		114	10 181						1,980			1,000
Bahamas, Nassau	8,545	8,913					2,400	228	3,608	829	47,798	1 000	135,012
Bahamas, Nassau	1,217	108								710	185	2,514	6,809
Bahamas, Nassau	4,387	159								5,307		2,345	6,900
Bahamas, Nassau	26						8,600	1,000		680		23	16,859
Bahamas, Nassau		821											11,284
Bahamas, Nassau	14 176	20,335				18	10 128	12,100	908	3,300	438	78 904	1 708
Bahamas, Nassau	170	170											64,197
Bahamas, Nassau	4 752	181 914	10 8			111 800	5	125				2,010	277,125
Bahamas, Nassau	360					250							10,700
Bahamas, Nassau	709	224	45			303				115		66	6,743
Bahamas, Nassau	168	327 087	10 2			125,044	70 100	247	1 000	1 452		14,548	54,643
Bahamas, Nassau	4 711	8,595	185	1,871	8,341	364	68	1 000	278	428 587	35,136	3,385	28,460
Bahamas, Nassau	77			108						32,572		184	2,836
Bahamas, Nassau													
Bahamas, Nassau	1 335	945	8	100	2,453	2,797	1	42	292	43	7,534	1,846	834
Bahamas, Nassau	304,656	397,103	6,334	69,727	200 704	416,305	1670	34,913	54,583	6,696	75,568	25,585	82,805
Bahamas, Nassau	1,067	6,587	29	329	4,322	11	13,976	1,657	7,017	1,767	7,075	13,396	3,526
Bahamas, Nassau	572	2,538	1	14	3,101		2,020	194	760	156	1 000	1,074	268
Bahamas, Nassau	1,782	2,030	10	208	4,948	151	500	60	1,390	58	2,198	100	4,130
Bahamas, Nassau	2,278	166			808	28	31,230	4,813	66,020	8,153	221,178	136,649	11 000
Bahamas, Nassau	43,455	260	31,783	278,241	10,921	27	512						28,258
Bahamas, Nassau	2,749	5,319	11	3,978	3,807	798	2	66	7,050	1,182	9 064	2,327	2,458
Bahamas, Nassau	33,296	25,532	557	6,090	100,228	17,426	132	2,194	746,214	97,810	144,891	30,718	263,847
Bahamas, Nassau													
Bahamas, Nassau	35				14 000	107	18	509	12,308	2,670	26,542	7,896	7,666
Bahamas, Nassau	6,306	115			634	65				50	15	333	842
Bahamas, Nassau	394	95			2,812	2,249	1	27	762	180	5,392	1,808	4,016
Bahamas, Nassau	2,316	560	21	41	2,226	790				3,482	845	196	465
Bahamas, Nassau	932	408	11	904									1,294
Bahamas, Nassau	1,267	488	22	197	824	633			137	36	875	379	233
Bahamas, Nassau	25,621	234,976	626	7,504	215,427	66,654	300	6,128	50,839	5,876	73,904	18,181	131,079
Bahamas, Nassau	63				363	228			72	13			102
Bahamas, Nassau	116				17 000		1	29			102	70	45
Bahamas, Nassau	124	4									97		4
Bahamas, Nassau	256		1	12	1 195	966			600	96	2,332	873	3 05
Bahamas, Nassau	761	6,039	32	348	29,629	10,394	27	564	5,944	786	10,172	2,898	3 05
Bahamas, Nassau											1,351	2,110	4,714
Bahamas, Nassau	13,465	15,263	6,715	87,246	12,490	422	1	20	41,812	4,288	71,825	12,765	109,057
Bahamas, Nassau	74	9 711			333						16,322	2,734	74
Bahamas, Nassau	28,700	136,369	2,277	25,712	322,856	3,424 1146	13,832	54,478	10,364	56,555	24,069	179,315	147,712
Bahamas, Nassau	2,054	19 687	168	1,630	45,932	26,175	90	1,880	53,275	6,780	31,996	8,344	92,747
Bahamas, Nassau	3,962	16,903	148	1,601	25,132	3,950 126	2,911	10,676	2,099	32,762	8,419	24,754	5,431
Bahamas, Nassau													6,413
Bahamas, Nassau	2,313	3,895	30	175	5,231		113	1,700	680	6,551	1,488	6,323	655
Bahamas, Nassau	247	392	12	200	177	452	5	95	3,400	382	6,898	1,350	973
Bahamas, Nassau	9									72	27		28
Bahamas, Nassau	145				25 496	840	30	641	26,675	3,647	20 524	4,186	809
Bahamas, Nassau	4,709	12,081	12	66	1 350				746	170	2,839	676	15,993
Bahamas, Nassau	2,309	12,127	972	16,552	24,147	17,034	59	1,168	12,591	2,209	13,471	3,862	10,564
Bahamas, Nassau	7,789	5,921	8	167									18,079
Bahamas, Nassau													790
Bahamas, Nassau	5,029	13,089	959	26,581	18 485				1,850	480	2,261	662	23,577
Bahamas, Nassau		16 275	100	1 001	1 707								16,882
Bahamas, Nassau	7	10 171	4	7	1 100								156
Bahamas, Nassau	5,176	7,979	3,641	47,355	51,116		4	20	2,548	383	6,850	4,030	98,761
Bahamas, Nassau													
Bahamas, Nassau	88	8,229	18	372									3,178
Bahamas, Nassau	55	7 063	163	1 001									151
Bahamas, Nassau	193				1,784	310	5	95					18
Bahamas, Nassau	439	9,249	784						12	3	8,095	1,890	
Bahamas, Nassau	5,006	869,405	1,863	25,025	27,962	1 000	49	1,000	270	4,875	1,341	828,664	23,291
Bahamas, Nassau		12	245										8,106
Bahamas, Nassau													13,671
Bahamas, Nassau	259	224	42	304									43
Bahamas, Nassau													
Bahamas, Nassau	35,113	91,880	1,025	10,494	121,181	47 726	74	1,101	29,828	5,027	67,499	12,802	268,350
Bahamas, Nassau	10,662	2,414		1 420	1 800	2 818	69	730	1,325	154	5,367	1,555	14,300
Bahamas, Nassau	438	75											11,088
Bahamas, Nassau	1,742	158											359
Bahamas, Nassau	288												61
Bahamas, Nassau	24,866	27 915	784	11 014	103,397	30,178	12	137	6,760	931	23,515	6,446	96,745
Bahamas, Nassau													6,194
Bahamas, Nassau													14,003
Bahamas, Nassau													20,935
Bahamas, Nassau													243,636
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## Corporate and Financial

**Niagara, Lockport & Ontario Notes.**—The Bankers' Trust Company of New York offers a limited number of Niagara, Lockport & Ontario Power Company 6 per cent collateral notes, due Oct. 1, 1916, to net approximately 8 per cent.

**Federal Utilities Elect President.**—Directors of the Federal Utilities Company, Inc., have elected Mr. George T. Ordway president to succeed Mr. De Forest Candee, resigned. Mr. Ordway is connected with the banking firm of Bertron, Griscom & Company. Mr. Candee will continue as a director.

**Alabama Power Sued.**—Suits have been filed for damages aggregating over \$500,000 against the Alabama Power Company, which is controlled by the Alabama Traction, Light & Power Company, Ltd. It is charged that the water stored up by the Coosa River dam has caused mosquitoes and other insects to thrive, thereby causing illness. The government will make an investigation to find out whether there has been an accumulation of water by reason of the dam.

**Virginia Railway & Power Company.**—The Virginia Railway & Power Company has applied to the City Council of Richmond, Va., for a new thirty-year franchise to cover franchises already held. The ordinance, as submitted by the company, is simply a preliminary draft, containing the principal features of the present ordinances. The company hopes that when the ordinance is taken up by the City Council some modifications will be made in the conditions therein contained.

**Better Conditions Prevailing.**—That better conditions prevail in the unlisted securities market is asserted by Messrs. Williams, Dunbar & Coleman, of New York, in their review, in which they say: "Trading in unlisted securities has been more active during the last week and inquiries for public utilities broadened materially. We still believe that the present time is propitious for purchasing high-class unlisted securities. The record established by public utilities for earnings during the past months, when so many railroads and industrials have been adversely affected, is sufficiently convincing to warrant their selection by investors."

**Detroit Edison Offers Bonds to Stockholders.**—The Detroit (Mich.) Edison Company will offer to its stockholders on Dec. 10 at par the unissued balance, \$2,645,500, of its ten-year 6 per cent convertible debenture bonds. These bonds will be convertible Jan. 15, 1917, and Jan. 15, 1923, at the option of the holders, into paid-up shares of the stock of the company of the same par value. The bonds are dated Jan. 15, 1915, and mature Jan. 15, 1925. Payment may be made in three instalments at the Bankers' Trust Company, New York; 50 per cent Jan. 15, 1915, 25 per cent April 15, 1915, and 25 per cent July 15, 1915. All applications must be made on or before Jan. 15, at which time the unsubscribed portion will be sold to bankers who have underwritten them. The bankers who underwrote these bonds are Spencer, Trask & Company, and F. S. Smithers & Company.

**Consumers' Power Bond Offering.**—Perry, Coffin & Burr, of Boston and New York, and Harris, Forbes & Company, of New York, are jointly offering \$1,146,000 of first lien and refunding 5 per cent gold bonds of the Consumers' Power Company of Michigan, dated Jan. 2, 1911, and due Jan. 1, 1936. These bonds are part of an authorized issue of \$35,000,000, of which \$12,936,000 is outstanding. These bonds are secured, through the deposit of securities, by a first lien on all the properties of the following constituent companies: Flint Electric Company, Pontiac Power Company, Saginaw Power Company, Bay City Power Company, Consumers' Power Company of Michigan, Economy Power Company, Au Sable Electric Company and Central Power Company. They are further secured by a lien on the following properties, subject to their outstanding bonds: Commonwealth Power Company, Grand Rapids-Muskegon Power Company and Grand Rapids Edison Company. The Consumers' Power Company, through its constituent companies, controls the light and power business in a large section of Michigan, of which the population is more than 450,000. At present this block of escrow bonds is selling at 90 to net 5.82 per cent.

## NEW ENGLAND LOCALLY AFFECTED

**Central Stations in New England Generally Did Well in September—Operations Reflect Industrial Conditions During Month**

The September operations of the electric utilities of New England, while not showing so large a growth as was shown in previous months, were well ahead of the September figures of last year. The companies generally did well, in fact as well as in former months. Many of New England's large industries are largely localized, and when one of these industries suffers a depression the entire locality feels the effects. Such was the case with some of the central stations, and as a result they experienced a decrease in comparison with 1913. Had these companies been left out of the compilations, the resulting figures would compare favorably with the ante-war figures.

The comparative figures in Table I include returns from companies of all sizes and from every state. It will be noticed that the income growth rate has decreased but slightly from the average rate of somewhat over 8 per cent. The output growth rate has fallen considerably. The demand for higher-priced energy has been maintained during the period of industrial curtailment. The figures in Table II, while not strictly comparable, show the same results to a somewhat lessened degree.

TABLE I—COMPARATIVE RETURNS OVER A FIVE-MONTH PERIOD COVERING 60 PER CENT OF THE ELECTRIC-UTILITY INDUSTRY OF THE NEW ENGLAND STATES

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
May	\$1,704,102	\$1,573,119	8.4	51,519,410	49,752,133	3.6
June	1,467,791	1,356,552	8.3	50,456,031	45,268,312	11.6
July	1,551,797	1,419,597	9.3	50,644,731	45,861,737	10.4
August	1,608,730	1,489,213	7.5	52,398,832	49,576,095	5.5
September	1,658,740	1,556,250	6.7	55,056,974	53,017,201	3.9

The returns for August and September have been broken up first into states and then into communities of various sizes, to see whether or not the war has caused any lasting effects and if so in what direction. In both compilations the data from the holding companies have been left out, inasmuch as these data are in a lump form and therefore cannot be localized. Also the same companies have been taken for both months, so that our figures are strictly comparable. Our returns from Vermont, outside of holding companies, included but one company, so that Vermont has not been included in the figures for our state group.

Ten companies in Massachusetts reported a 9 per cent growth in income in August and a 6.3 per cent growth in September. The output from the same companies showed a growth of 3.8 per cent in August and 2.6 per cent in September, the growth being over the corresponding month in the previous year. Two companies in Rhode Island gave a 15.4 per cent growth in income in August and a 8.5 per cent growth in September, the output growths being respectively 18.5 per cent and 17 per cent. Three Connecticut companies for August showed a 5 per cent growth in income and a 3.7 per cent growth in output. In September these companies registered a 3 per cent income growth and a 0.2 per cent decrease in output. Three companies from Maine for August and September respectively showed income growths of 2.5 per cent and 6.5 per cent and output growths of 3.4 per cent and 3 per cent. Three companies from New Hampshire for the two months showed growths of 3.5 per cent and 1.7 per cent in income and 6.6 per cent and 3.1 per cent in output. With the exception of Maine each of the states fell behind in growth rate. Maine seems to have reached a turning point and should show better results for October. The other states showed

such a small difference in growth rate that it is highly probable that they reached their low point some time after the middle of September. With the exception of the cotton industry and some of the minor industries, the tone of New England's manufacturing was much better toward the end of September than at the beginning.

The second treatment of these figures by cities contains four groups. In the group of cities whose population is over 100,000 are the returns from five cities. The August figures show a 10.5 per cent growth in income and a 5.1 per cent growth in output. The September figures show a 6.1 per cent growth in income but a 1.2 per cent decrease in output. The next group contains seven cities whose population is between 50,000 and 100,000 inhabitants. The growths for August and September were 4.8 per cent and 6.4 per cent in income and 15 per cent and 13.2 per cent in output. The third group contains four cities whose inhabitants number between 25,000 and 50,000. The cities recorded a decrease for both months, the decrease in income being 0.6 per cent and 0.4 per cent and the decreases in output being 7.1 per cent and 6.4 per cent. In the last group there are six towns whose population is less than 25,000. For the two months the growth percentages were 10 per cent and 8.3 per cent in income and 2 per cent and 4.2 per cent in output. The medium and small-sized cities did well in September in comparison with the month of August, and the figures indicate that a turning point has probably been reached, as was borne out in our other groupings.

#### Industrial Review

A review of the industrial conditions in New England and September will act as a key to a more nearly complete understanding of the operating figures from the

TABLE II.—RETURNS FOR HALF-YEAR PERIOD FROM NEW ENGLAND  
ELECTRIC UTILITIES

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN Kw.-hr.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
April (12 per cent of industry)	\$1,501,773	\$1,384,225	8.5	45,386,624	39,181,988	10.8
May (45 per cent of industry)	1,745,160	1,609,234	8.4	52,752,247	50,779,103	3.9
June (67 per cent of industry)	1,560,872	1,442,178	8	53,463,013	48,049,756	11.1
July (70 per cent of industry)	1,670,819	1,530,410	9.2	54,074,533	49,255,893	9.8
August (71 per cent of industry)	1,734,383	1,607,649	7.5	55,801,224	52,913,483	5.4
September (71 per cent of industry) . . .	1,811,762	1,696,997	6.8	59,763,538	57,081,873	4.7

central stations. In the first week the shoe factories were doing fairly well but were curtailing. The mills engaged in the production of dress goods and woolen goods reported better conditions. All factories were working on old contracts and spot orders. The uncertainty of the future and the stringency of money forbade the booking of orders far in advance. The second week saw somewhat better conditions. Money was easier. The factories engaged in making shoes, silk goods, lace, woolen goods and paper reported as doing fairly well. In all cases the trend of the market was irregular. Buyers were buying for immediate use and salesmen were cautioned to go slow in booking orders. Cotton manufacturers reported a curtailment. In the third week the volume of business was not large but there was a firm undertone. The outlook became very favorable. Firearms, of course, were in great demand. The smaller isolated industries "fell down," but the larger ones reported conditions as better. The last week of the month saw quiet conditions with a certain better-

ment. Woolen, lace and silk mills and jewelry factories reported business as active. The shoe trade was quiet but the outlook was good. The textile industry was unsatisfactory. This trade has felt the loss of the German dye trade. The demand for granite was poor. With the Christmas orders many of the mills, especially the jewelry mills, are enabled to prevent curtailment.

Considering the month as a whole, it will be seen that conditions grew better all through the month. The large war orders of October ought to make for better conditions throughout the New England States. The patriotic demand for cotton goods will make itself felt in this region.

## Business Notes

The Power Specialty Company, 111 Broadway, N. Y., has removed its office at Chicago from the People's Gas Building to the Harris Trust Building.

Ralph B. Clapp, Los Angeles, Cal., is now representing the Electrical Engineers' Equipment Company, the Electro-Magnetic Tool Company and the Pittsburgh Transformer Company.

The Western Electric Company, New York, has leased the ground floor of a large building in course of construction on Park Place, Newark, N. J., where it will open an electrical supply house.

## New Industrial Companies

The Imperial Electrical Company, of Union City, Ind., has been incorporated with a capital stock of \$1,000 by B. H. Garver, W. S. Buchanan and A. N. Hercules. The company purposes to manufacture and sell electrical devices.

The Universal Chain & Metal Stamping Company, of New York, N. Y., has been incorporated by Brinton Carigan, John L. Cohen and Charles Robertson, 806 Greenwich Street, New York. The company is capitalized at \$10,000 and purposes to manufacture metal goods and electrical appliances.

## Trade Publications

**Insulating Tapes.**—"Westinghouse Insulating Tapes" is the subject of Folder No. 4286 issued by the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.

**Synchronous Converters.**—Bulletin No. 42,500 of the General Electric Company contains a discussion of the characteristics and adaptability of synchronous converters made by that organization.

**Water Heater.**—An electric water heater which can be attached to any faucet is referred to in a booklet distributed by the Geyser Electric Water Heater Company, 42 Hudson Street, New York City.

**Lineman's Shield.**—The Withers lineman's protector for inclosing conductors carrying high potentials is described in a folder prepared by the Associated Engineers Company, 180 North Dearborn Street, Chicago.

**Air Compressors for Foundries.**—Bulletin No. 42,800 recently issued by the General Electric Company contains an article comparing motor-driven centrifugal compressors with other blowers for foundry service.

**Substation Equipment.**—Circular No. 1550, which is being distributed by the Westinghouse Electric & Manufacturing Company, contains descriptions of some 1500-volt direct-current railway substations in this country.

**High-Efficiency Incandescent Lamps.**—The Edison Lamp Works of the General Electric Company, Harrison, N. J., have issued Bulletin No. 43,603, which contains information on various types of high-candle-power incandescent lamps.

**Alternating-Current Machinery.**—Vertical-type and horizontal-type alternating-current generators which can be belt-driven or directly connected to the prime mover are described in Leaflets Nos. 303, 356, 376, 383, 410, 424 and 476 issued by the Electric Machinery Company, Minne-



apolis, Minn. Leaflet No. 480 of that company refers to induction motors.

**Wiring Devices.**—In Catalog No. 16 issued by the Arrow Electric Company, Hartford, Conn., various wiring devices are described and illustrated.

**Garage Lamps.**—Frank W. Morse, Boston, Mass., has issued a leaflet containing information on a portable lamp and a floor lamp for use in garages.

**Ball Bearings.**—The Abbott Ball Company, Hartford, Conn., has issued a small folder announcing that special machinery has been installed in its plant.

**Water Weighers.**—The Kennicott Company, Chicago Heights, Ill., has issued Bulletin No. 41, which describes water weighers and condensation meters.

**Push-Button Devices.**—A catalog entitled "Push-Button Specialties" has recently been published by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

**Steam-Engine Plants.**—The Murray Iron Works Company, Burlington, Ia., has issued Pamphlet No. 12, which includes a number of diagrams of Corliss engine installations.

**Polyphase Induction Motors.**—Bulletin No. 123 issued by the Robbins & Myers Company, Springfield, Ohio, describes and illustrates the type "K" polyphase induction motors.

**Electrical Equipment for Theaters.**—A booklet entitled "Electrical Equipment for the Theater" has been issued by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

**Portable Voltmeter.**—Bulletin No. 46,018, recently issued by the General Electric Company, Schenectady, N. Y., describes and illustrates a portable voltmeter, designated as type P-8.

**Telegraph Instrument.**—An instrument for improving telegraphic communication is described in a booklet prepared by J. H. Bunnell & Company, 32 Park Place, New York City.

**Fiber Conduit.**—An attractively illustrated eighty-four-page catalog describing various kinds of light-weight conduit has been issued by the Fibre Conduit Company, Orangeburg, New York.

**Motor Equipment.**—The Wagner Electric Manufacturing Company, St. Louis, Mo., has issued Bulletin No. 98, which is printed in Spanish and which describes various types of motors and other electrical apparatus.

**Radio Telephone Outfit.**—Apparatus for carrying on radio-telephonic communication is described in a pamphlet being distributed by the De Forest Radio Telephone & Telegraph Company, 101 Park Avenue, New York City.

**Lighting Fixtures.**—Plates Nos. 25, 26, 36 and 38 give illustrations of lighting equipment put out by the National X-Ray Reflector Company, Chicago, Ill., suitable for stores, gymnasiums, show and wall cases and central stations.

**Domestic Refrigerating Outfit.**—Information regarding a 300-lb.-a-day domestic refrigerating set driven by electricity is given in Bulletin No. 20 sent out by the firm of Westenberg & Williams, Woolworth Building, New York City.

**Switchboards.**—The Western Electric Company, New York, has issued Catalog No. S-1, which is printed in Spanish for South American and Central American trade and which describes and illustrates various types of switchboards.

**Station Devices.**—A folder recently published by the General Devices & Fittings Company, 817 West Washington Boulevard, Chicago, Ill., contains descriptions and illustrations of various types of low-tension and high-tension station devices.

**Jointless Grid Resistors.**—Various types of grid resistors, the sections of which are made in continuous pieces, are described in bulletins issued by the Electro-Mechanical Brake Company, West Bromwich, England, the American agent for which is the Elcon Company, 50 Church Street, New York.

**Electrical Devices for Christmas Presents.**—Landers, Frary & Clark, New Britain, Conn., have issued Bulletins No. 497 and No. 505, which list various devices suitable for Christmas gifts. Bulletin No. 508 contains illustrations of electrotypes which the above company is prepared to send to dealers for newspaper advertising.

## Personal Mention

**Mr. Morgan Ellis**, Chicago, has been appointed second tribune of the Chicago Jovian League to fill the vacancy created by the resignation of Mr. Victor R. Desjard.

**Mr. Alexander Shane**, safety inspector for the Middle West Utilities Company, Chicago, has been elected vice-president of the local Chicago section of the National Safety Council.

**Mr. Delos F. Wilcox**, for many years head of the bureau of franchises of the Public Service Commission, First District, New York, was recently appointed deputy commissioner of the Department of Water Supply, Gas and Electricity of New York City.

**Mr. C. G. MacAvoy**, who was manager of the Bellefonte (Pa.) Electric Company for over six years, has been retained as superintendent of the Dansville (N. Y.) Gas & Electric Company by the new owners of the property. Mr. MacAvoy has been superintendent of the company for the past six months, under the old management.

**Mr. L. T. Mason** has been elected president of the Dansville (N. Y.) Gas & Electric Company, which recently changed ownership. Mr. Mason was one of the incorporators of the Hornell (N. Y.) Electric Company twenty-eight years ago, and he has been its manager ever since. He was also manager for a time of the Atlantic City (N. J.) Electric Company, dividing his time between Hornell and Atlantic City, until the work in the former city became so heavy as to take up all of his time. Mr. Mason will still retain his position as manager of the Hornell Electric Company.

**Mr. J. Harry Pieper**, assistant to the general agent of the Southern California Edison Company, has been elected president of the Los Angeles Ad Club. This is the organization that captured the *Printers' Ink* Cup at the last convention of the Associated Ad Clubs for its record of efficiency in promoting the advancement of the locality it serves and the interests of better advertising during the preceding year. Mr. Pieper's connection with Ad Club work comes through his development of advertising by electrical methods. His recent election to the office of statesman of the Southern California Jovian Electrical League was noted in the *Electrical World* for Oct. 31.

**Mr. A. A. Pope**, who was recently elected chairman of the Sales Managers' Association of Edison Companies, is assistant general inspector of the New York Edison Company and well known in lighting circles. Mr. Pope was

born in Brooklyn and acquired his first electrical experience in Roselle, N. J. This place was the home town of Mr. M. F. Moore, one of the early officials of the parent concern of what is now the New York Edison Company. Some time before the opening of the old Pearl Street station in New York, an exhibition of an electric-light plant was given in the Old Mansion House in Roselle, and this simple plan so interested Mr. Pope that he was a frequent visitor to the old Pearl Street station. In 1889 this interest found



A. A. POPE

Mr. Pope connected with the electrical industry as a wireman's helper for the Brooklyn Edison company. The following year he left the Brooklyn company and went to New York, joining the underground construction force. In 1891 he became an inspector in the contract and inspection department, with which he has been identified ever since. Mr. Pope has been active in committee work in the National Electric Light Association, in the Association of Edison Illuminating Companies and in the Sales Managers' Association. He is also one of the charter members of the Illuminating Engineering Society.

## Construction

### New England

**GREENVILLE, N. H.**—The last few months the Greenville El. Ltr. Co. expects to purchase a boiler-feed pump. H. J. Taft is treasurer.

**LANCASTER, N. H.**—The Lancaster & Jefferson El. Co. has been authorized to purchase within the next eight months one 140-hp horizontal tubular boiler (125 lb. pressure). Walter U. Colby is superintendent.

**LYNN, MASS.**—Bids will be received by George A. Cornet, commissioner of public property, City Hall, Lynn, until Nov. 24, for furnishing material and restoring the electric wiring and lighting system in the new Blossom street school building. Specifications and form of tender may be obtained at the office of the commissioner. Plans may be obtained at the office of M. F. Burk, 233 Union Street, Lynn.

**SALEM, MASS.**—The Salem Chamber of Commerce is considering the question of improving the street-lighting system in the business section of the city.

### Middle Atlantic

**HANNAWA FALLS, N. Y.**—The Aluminum Co. of America, which recently acquired control of the Hannawa Falls Wtr. Pwr. Co., with water rights on the Raquette River, near Potsdam and Colton, is securing right-of-way for a high-tension transmission line from Hannawa Falls and Massena, a distance of 30 miles, which will connect its plants at Cedar Rapids, Massena, Hannawa Falls and High Falls. The line will be carried on steel towers and aluminum cable will be used.

**NEW YORK, N. Y.**—Bids will be received by C. B. J. Snyder, superintendent of school buildings, Department of Education, corner of Park Avenue and Fifty-ninth Street, New York, until Nov. 30, for installing an electric elevator in Public School 62, Hester, Essex and Norfolk Streets, borough of Manhattan. Blank forms, plans and specifications may be seen or obtained at the office of the superintendent, and also at the branch office, 69 Broadway, Flushing, borough of Queens.

**NEW YORK, N. Y.**—Bids will be received by the Board of Trustees, Bellevue and Allied Hospitals Department of New York City, Bellevue Hospital, 415 East Twenty-sixth Street, New York, until Nov. 23, for furnishing and installing electric and gas fixtures in pavilions "L" and "M" of the new Bellevue Hospital at Twenty-sixth to Twenty-ninth Street, First Avenue to East River, borough of Manhattan. Blank forms and further information may be obtained at the office of the contract clerk and auditor, at 400 East Twenty-ninth Street, New York. John W. Brannan, M.D., is president of board.

**SCHROON LAKE, N. Y.**—The Leland House (owned by James A. Emerson, of Warrensburg, and L. W. Emerson) and the electric-light plant connected with the hotel were destroyed by fire on Nov. 1.

**SYRACUSE, N. Y.**—Commissioner Hitchcock of the Department of Public Safety is considering the establishment of additional ornamental lighting districts. It is proposed to erect ornamental standard lamps of single lamps of 600 cts. in the residential districts. If the project is carried through, the property owners will bear half the expense of maintaining the lamps.

**WATERLOO, N. Y.**—The City Council has adopted a resolution authorizing the city attorney and the city engineer to engage an electrical engineer to prepare estimates of the cost of building and maintaining a municipal electric-light plant, also to give an estimate of the present value of the distribution system of the Watertown Lt. & Pwr. Co. for street-lighting and commercial lighting.

**BAKERTON, PA.**—Arrangements have been made whereby the Sterling Coal Co. will supply electricity to operate the machinery in the mine of the Barnes-Tucker Coal Co., both of Bakerton.

**CENTER VALLEY, PA.**—Work will soon begin by the Coopersburg El. Lt. & Pwr. Co., of Coopersburg, on the erection of a transmission line from the Coopersburg substation on the Schuylkill Valley Lf. & Pwr. Co. to Center Valley, a distance of 2 miles, to supply electricity for lamps and motors here.

**HASTINGS, PA.**—At an election held recently the proposal to issue \$32,000 in bonds for a municipal electric-light plant was carried.

**HOMER CITY, PA.**—Application for a charter has been filed for the Homer City

Lt. & Pwr. Co., of Homer City, at the office of the Public Service Commissioner. The company proposes to supply electricity in the borough of Homer City.

**LANSDOWN, PA.**—The capital stock of the Panther Valley El. Lt. Ht. & Pwr. Co., of Lansdown, has been increased from \$10,000 to \$50,000.

**LILY, PA.**—Arrangements have been made by the Town Council with Julius F. Klemmstein, owner of the local electric-lighting plant, for improvements to the street-lighting system.

**PITTSBURGH, PA.**—The Bureau of Electricity has filed a requisition with the City Council asking for \$26,082 to be used in enlarging and cable extension in Second Avenue between Second Avenue and Glenwood Bridge.

**PITTSBURGH, PA.**—The Smithfield Street Business Men's Association has petitioned the City Council for the installation of ornamental lamps on Smithfield Street similar to those erected on Federal Street, Penn Avenue and other thoroughfares of the city.

**PITTSBURGH, PA.**—The contract for electrical work in connection with Schenley High School has been awarded to the Craig El. Co., of Pittsburgh, at \$35,900, by the Board of Education. Reported in the issue of Nov. 14 that the bid of the system engineering Co., of Pittsburgh, at \$36,172, was recommended by the finance committee.

**NEWARK, N. J.**—The Board of Public Works has approved seven ordinances granting the Public Service Electric and Power Co. to extend its lighting system in different sections of the downtown district.

**NEWARK, N. J.**—The Borough Council of East Newark is contemplating the installation of an ornamental street-lighting system. The improvement will be made in connection with a new lighting contract with the Public Ser. El. Co.

**PENNINGTON, N. J.**—The Hopewell Township committee is considering the installation of a street-lighting system along the road from the Ewing Township line to Pennington.

**PERTH AMBOY, N. J.**—At the election held Nov. 3 the citizens voted in favor of municipal ownership of the electric-lighting system.

**ABINGDON, VA.**—The Bristol Gas & El. Co., of Bristol (it is reported) has been granted a franchise to supply electricity for lamps and motors in Abingdon for a period of 30 years. Under the terms of the franchise the system is to be completed within 18 months.

**CLARKSVILLE, VA.**—At an election held recently the proposal to issue \$60,000 in bonds for the installation of a municipal electric-light plant was carried.

**STAUNTON, VA.**—The City Council has passed an ordinance providing for an issue of \$30,000 in bonds for the installation of a municipal electric-lighting plant in Staunton.

**WASHINGTON, D. C.**—Arrangements have been completed, it is reported, by Walter C. Allen, district electrical engineer, for the installation of about 900 incandescent lamps to replace arc lamps on various streets during the winter and spring. Among the improvements contemplated for the spring is the installation of four rows of lamps on Pennsylvania Avenue between Second and Seventeenth Streets, Southeast.

**WASHINGTON, D. C.**—Foreign trade opportunities as announced by the Bureau of Foreign and Domestic Commerce in the Department of Trade and Commerce, No. 14,392—A contractor and dealer in railway materials in a Mediterranean Sea country is desirous of entering into correspondence with American exporters of railway material.

**WASHINGTON, D. C.**—A report, No. 14,392—A contractor and dealer in railway materials in a Mediterranean Sea country is desirous of entering into correspondence with American exporters of railway material in general, especially roadbed material, such as rails, steel cross-ties, bolts, nuts, washers, cross-arms, poles, etc.

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United Kingdom is in the market for all classes of opal glass and enameled iron shades, insulating materials, such as black adhesive tape, half-profiled tape, Chatterton's compound, shellac, manila paper tape, etc. Suitable for use in the manufacture of electrical cables. No. 14,447—An electric-lighting company in South America would like to receive catalogs from American manufacturers of electrical appliances of all kinds, except power-plant equipment. No. 14,301—An American consul in northern Europe reports the name of a firm which desires to purchase electrical machinery in large quantities. No. 14,335—A firm of electrical engineers in Australia informs an American consul that it desires to be placed in communication with American manufacturers of electrical machinery. No. 14,316—An American consul in Great Britain writes that a firm advises that increased prices will have to be paid in the future for porcelain and brass sub-switches, electric cables of all classes, glassware in the form of shades, bowls and reflectors, and also a large number of other electrical appliances. American manufacturers may compete successfully.

No. 14,323—An American consul in France has been advised by a firm that it desires to obtain the business of a French firm or more American firms manufacturing steam-driven and electrically driven shovels, excavating machinery and dredges. No. 14,117—A firm of electrical engineers dealing in electrical supplies and electrical machinery of various kinds in a city in southern Europe has requested an American consular officer to purchase electrical machinery, manufacturers in these lines; illustrated catalogs, price lists, and conditions of sale are desired; the firm is particularly interested in electrical machinery, such as electric motors, dynamos, and electric supplies generally; correspondence should be in Spanish. Prices should be c.i.f. destination. No. 14,191—An American consul in Mexico reports the name and address of a firm in his district which is desirous of corresponding with manufacturers of arc-lamp carbons with a view to purchasing in considerable quantities. No. 14,351—An American consular officer reports that municipal authorities of a city in his district have advertised a concession for an electric-lighting plant to be installed in the near future and that there will probably be a demand for electrical supplies; the consular officer has submitted a list of names of electric machinery manufacturers in a position to represent American firms; a copy of the list may be had on application to the Bureau of Foreign and Domestic Commerce.

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### North Central

**BENTON HARBOR, MICH.**—Ornamental lamp standards will be erected on West Main Street and East Main Street at a cost of about \$5,000.

**CHASSSELL, MICH.**—The Worcester Lumber Co., owner of the local electric-lighting plant, expects to purchase wiring supplies to the amount of \$30,000 between now and May 1, 1915, as needed. W. H. Madden is electrician.

**DETROIT, MICH.**—The Edison Ill. Co. of Detroit has applied to the State Railroad Commission for a permit to issue \$2,400,000 in bonds, the proceeds to be used for improvements and extensions, principally at the new Conner's Creek plant at the foot of Lyster Avenue.

**DETROIT, MICH.**—Smith, Hinchman & Grylls, architects, have obtained a permit for the construction of an addition to the municipal electric-light plant at 50 Water Street, to cost about \$14,000. The new building will be used as switchboard and transformer room.

**DETROIT, MICH.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Nov. 25, for the extension, remodeling, etc., of the United States post office and court house at Detroit. Drawings and specifications may be obtained at the post office or from the custodian at Detroit. O. Wenderoth is supervising architect.

**DETROIT, MICH.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Dec. 12 for mechanical equipment (ex-



United States post office and court house, Detroit, Mich., in accordance with plans and specifications copies of which may be obtained from the above office or the custodian of site at Detroit. O. Wenderoth

**FENTON, MICH.**—All bids submitted for the installation of an ornamental street lighting system have been rejected. The Council has decided to purchase the material and install the system under the direction of E. A. Lockwood, village engineer.

**HAITFORT, MICH.**—Within the next six months Anderson Brothers, owners of the local electric-light plant, expect to purchase one 75-kw, 2200-volt alternator and exciter. M. J. Anderson is manager.

**ROGERS, MICH.**—The contract for the construction of power house for the municipal electric-light plant has been awarded to I. N. Hagle, at \$1,050. The building will be 40 ft. by 60 ft., of brick construction.

**CLEVELAND, OHIO.**—The Cleveland L. & Pwr. Co. has been granted permission by the City Council to lay and maintain pipes and conduits on certain streets to transmit and supply steam and hot water in the city of Cleveland.

**CLEVELAND, OHIO.**—The City Council has passed an ordinance granting the Cleveland El. Llig. Co. permission to lay and maintain pipes and conduits in certain streets for the transmission and supplying of steam and hot water in the city of Cleveland.

**FREMONT, OHIO.**—A movement has been started by the Chamber of Commerce for the installation of ornamental lamps in the business district.

**LORAIN, OHIO.**—A special committee has been appointed by the City Council to make investigations and secure data relative to the installation of a municipal electric-light plant. It is proposed to submit the proposal to issue bonds for the installation of the plant to the voters at the next municipal election. The cost of the plant is estimated at \$100,000.

**MASON, OHIO.**—Bids will be received by R. G. Gutermyer, village clerk, Mason, until Nov. 30 for construction of power plant and equipment as follows: (1) For boiler, engine, heater, pump, feed pump, injector, steam piping, belts, etc.; (2) generator, exciter, switchboard, lamps, transformers, etc.; (3) poles, distribution circuits, lamp hangers, transformer mountings, etc.; (4) concrete foundation, concrete power house building; (5) alternative to No. 1—oil engine, dynamo and exciter, belts, etc. Plans and specifications may be seen at the office of the village clerk. Copies may be obtained of H. C. B. Abbott, of Lockland, Ohio, upon payment of \$2, which will be refunded upon return of same.

**TREDROW, OHIO.**—The Toledo & Indiana R. Co., of Wauseon, is reported to be negotiating for the completion of a transmission line from Ottokoe to Tredrow to furnish electricity here.

**TIFFIN, OHIO.**—Preliminary steps, it is reported, have been taken by the Ohio L. & Pwr. Co., of Tiffin, to move its plant from its present location in the center of the city to a point in the suburbs of the city on the Big Four railroad.

**LOUISVILLE, KY.**—Plans are being considered by the Schoppenhust Dry Cleaning & Finishing Co., of Louisville, it is reported, for the construction of a power plant. The equipment will include boilers, engine and generator.

**MIDDLESBORO, KY.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Dec. 23, for construction complete, including mechanical equipment, interior lighting fixtures and appliances, and the United States post office at Middlesboro, Ky. Drawings and specifications may be obtained at the above office or from the custodian of site at Middlesboro. O. Wenderoth is supervising architect.

**NEW HAVEN, KY.**—At an election held recently bonds to the amount of \$4,500 were voted for the installation of a municipal electric-light plant.

**PRINCETON, KY.**—At the election held Nov. 3 the proposal to issue \$5,000 in bonds for a municipal electric-light plant was defeated.

**WARSAW, KY.**—Local capitalists, it is reported, are planning to organize a company to construct and operate an electric-light plant in Warsaw.

**NORTH JUDSON, IND.**—Within the next 20 days the North Judson El. Co. expects to erect 12 miles of transmission lines, transformers, lightning rods, etc., for same have been purchased. D. Pika is manager.

**ROANN, IND.**—The Roann L. & Pwr. Co., recently incorporated, is planning to install

an electric light and power plant to furnish electricity in Roann and surrounding territory. The proposed work will include the erection of 11 miles of transmission line, about 475 25-ft., 30-ft., 35-ft. and 40-ft. (6-in.-top) poles, possibly 100 meters and 150 incandescent street lamps. Transformers and other equipment have not yet been determined. R. F. Smith is superintendent.

**SOUTH BEND, IND.**—The Indiana & Michigan El. Co., of South Bend, is installing an underground street lighting system at a cost of about \$100,000. F. A. Bryan is president.

**CHICAGO, ILL.**—The Illinois Public Utilities Commission has granted a license to the Chicago Automobile Transportation Co., which proposes to establish a motor bus line. The company expects to operate 150 cars.

**FOX LAKE, WIS.**—A proposal has been submitted to the Village Board by D. West, president of the Beaver Dam L. & Pwr. Co., of Beaver Dam, to furnish electricity in Fox Lake.

**MADISON, WIS.**—Bids will be received by Lew F. Porter, secretary of the Capitol Commission, Madison, Wis., until Dec. 15, for furnishing labor and material for the interior finish of the north wing and the northeast and northwest corner pavilions of the Wisconsin State Capitol now building at Madison. Separate proposals will be received on each of the different branches of the work as follows: Mason work, carpentry work, stone and masonry work, plumbing, electrical work, heating and ventilating, ironwork, leaded-glass work and elevators. Plans and specifications may be seen at the office of George W. Decker, president of the Capitol Commission, New York, N. Y.; office of the Capitol Commission, Capitol, Madison, and the Builders & Traders' Exchange, Milwaukee.

Plans may also be obtained upon deposit of \$100, which will be refunded upon return of same.

**BLUE EARTH, MINN.**—The electric-light commissioners expect to install about 40 more ornamental standards carrying 100 lamps about May 1, 1915. D. Fitch is superintendent.

**DODGE CENTER, MINN.**—The Iowa & Minnesota L. & Pwr. Co. is installing an electric-light plant in Dodge Center. The equipment will consist of a 65-hp Munz gas producer, one 60-kva, three-phase, 60-cycle, 2400-volt generator and switchboard, Duncan transformers (a Hayfield substation, outside type, 3000 lbs., 30 ft. in.), three-conductor cable for the business section; Duncan meters and Packard incandescent lamps will be used. Homer T. Hall, of Dodge Center, is engineer in charge.

**LYLE, MINN.**—Within the next six months the village of Lyle expects to purchase one single-phase, 133-cycle dynamo, switchboard and oil engine (second-hand); also one 30-hp, next 30-hp, three-phase generator, transformers, meters, lamps and washing machines. N. T. Fortun is manager.

**PRINCETON, MINN.**—The Water and Light Commission expects to purchase electric appliances and supplies, including vacuum cleaners, washing machines, etc., as needed. O. B. Randall is manager.

**WINTON, MINN.**—The installation of a new lighting plant in Winton is reported to be under consideration.

**ALTA, IA.**—Within the next three months the town of Alta is expected to purchase poles, wire, etc., for rebuilding part of the municipal electric distributing system. B. Gurney is city electrician.

**NORTH LIBERTY, IA.**—Steps have been taken to organize a company to know as the North Liberty L. Co. to supply electricity for lamps and motors in North Liberty. The company will be capitalized at \$3,000. A. L. Moreland is interested in the project.

**PATON, IA.**—The contract for the installation of a complete transmission line, substation and distribution system for the town of Paton (bids for which were opened recently) will be given to the Standard El. Construction Co. of Waterloo.

**ELDORADO SPRINGS, MO.**—Within the next six months the Missouri Valley L. & Pwr. Co., of Eldorado Springs, expects to purchase a small (about 30-hp) 2300-volt steam-driven generator unit, to be operated in parallel with a Corliss engine. D. E. Bent is manager.

**HALE, MO.**—The Citizens' L. Wtr. & Pwr. Co., of Hale, expects to erect within the next six months a power house and install two boilers, 60 ft. by 16 ft., and one Corliss engine. Fred Halbauer is president.

**KANSAS CITY, MO.**—A movement has been started by property owners to replace the old street lamps with modern brackets on the viaduct extending from Twentieth Street to Twenty-fourth Street on Grand Avenue.

**NEW HAVEN, MO.**—Bonds to the amount of \$10,000 have been voted for the construction of a municipal electric-light plant and improvements to water-works system.

**KEARNEY, NEB.**—The State Railway Commission has authorized the Kearney Wtr. & El. Co. to issue \$35,000 in bonds, of which the proceeds of \$15,000 will be used to pay outstanding indebtedness and the remainder for additional equipment for power plant.

**LINCOLN, NEB.**—The Lincoln Trac. Co. has recently erected a 2300-volt transmission line to the village of Bethany to supply electricity in that village. O. J. Shaw is assistant secretary.

**LINDSAY, NEB.**—The El. Lt. & Pwr. Co., of Lindsay, is contemplating installing a storage-battery system or changing its plant from direct to alternating current. As yet nothing definite has been decided upon. The company also expects to sell some electrical devices during the coming year. F. W. Edwards is manager.

**NELIGH, NEB.**—The Neligh Mills, recently awarded the contract for lighting the streets of the village of Neligh, has placed 100-cp incandescent lamps and 50 nitrogen-lamp of 60 cp. J. W. Spirk is manager.

**SOUTH BEND, NEB.**—Contract for the installation of the proposed municipal electric-light plant will be awarded in about 30 days. C. A. Norgan, care Fairbanks, Morse & Co., Omaha, Neb., is engineer.

**DODGE CITY, KAN.**—Within the next three months the Midland Wtr. & Gas Co., of Dodge City, expects to purchase a generating unit and switchboard. The company is rebuilding its 2300-volt lines and rearranging the overhead lines. The street-lighting wires in the business district are being placed underground. It has also just completed the erection of a transmission line to St. Mary's Academy, of Elkhart, 10 miles distant. Otto Thies is treasurer and manager.

**PERRY, KAN.**—Within the next ten months Charles Burgess, of Perry, expects to purchase a 50-kw generator, switchboard, waterwheel governor, meters, etc., for a city in Indiana.

## Southern States

**KINSTON, N. C.**—The city of Kinston is contemplating the installation of a 300-kw steam-driven generating unit with condensing outfit in the municipal electric-light plant. Gilbert C. White, of Charlotte, is engineer.

**THOMASVILLE, GA.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Dec. 15 for the construction complete, including mechanical equipment, interior lighting fixtures and approaches, of the United States post office at Thomasville. Drawings and specifications may be obtained at the above office or from the custodian of site at Thomasville. O. Wenderoth is supervising architect.

**UNADILLA, GA.**—The Council is contemplating the installation of an electric-lighting plant in connection with the pumping station later on. W. T. Van Lulingham is superintendent.

**MARIANNA, FLA.**—At an election held recently bonds to the amount of \$35,000 were voted for extensions and improvements to the municipal electric-light plant and water-works system.

**CHATTANOOGA, TENN.**—The Tennessee Pwr. Co., of Chattanooga, it is reported, is planning to exercise its option on nearly 20,000 acres of land lying along the Toccoa River for a power plant. The tie-lines connecting the hydroelectric plant on the Ocoee River (so named where the Toccoa River enters the Tennessee), the Hale's Bar plant on the Tennessee River and the small generating plant at Nashville, Tenn., have been completed.

**DRESDEN, TENN.**—The Council has engaged Philip Porter, of Clinton, to make plans for the proposed municipal electric-light and water-works system. An election will be held Nov. 21 to vote on the proposal to issue bonds for the plant.

**FRANKLIN, TENN.**—The Franklin El. Co., of Franklin, it is reported, contemplates extending its water-works system to Portland, a distance of about 12 miles.

**CRYSTAL SPRINGS, MISS.**—H. Converse, lessee of the municipal electric-light plant, expects to purchase within the next six months two crude-oil-engine-driven

generating units (one 12½ kw and the other 75-kw, 125 volts, direct current, directly connected).

**LAUREL, MISS.**—The Laurel L. & Ry. Co. is now installing an 800 kw. A. C. Chalmers turbo-generator set, with condenser, for 200 kw. for street-lighting for street-railway service. The company has purchased three additional street cars.

**GRAVETTE, ARK.**—Within the next few months the village of Gravette expects to erect a local power house and to install boilers, generators, engines, wire and meters, and wiring supplies. E. H. Chaffin is superintendent.

**SPRINGDALE, ARK.**—The local electric light plant, owned by M. C. & G. E. Martin, has been purchased by T. C. Dwyer, who took possession of the property Nov. 1.

**ALEXANDRIA, LA.**—The City of Alexandria expects to purchase on Dec. 7 a condenser, two fire pumps, one service pump and one vertical centrifugal pump for the municipal electric light plant and water-works system. J. C. Raxdale is superintendent.

**MELVILLE, LA.**—The city of Melville has awarded the contract for the construction of the proposed municipal electric light plant to C. A. Rees, of Shreveport, for \$15,000.

**NEW ORLEANS, LA.**—Bids will be received by the board of commissioners of the port of New Orleans, Suite 200, New Orleans Court Building, New Orleans, until Dec. 1, for the construction of a power house, with shops Nos. 1 and 2, power house, garage, office, warehouses J. K. G. and H. and their appurtenances, to be situated on the east bank of the Mississippi River, between Napoleon Avenue and Soniat Street, in New Orleans. Plans and specifications are on file in the office of Ford, Bacon & Davis, engineers, 325 Canal Street, New Orleans. Copies of specifications may be obtained of the engineers upon deposit of \$100, which will be refunded upon return of plans.

**PRYOR, OKLA.**—The Pryor L. & Ice Co. has been reorganized under the name of the City L. & Ice Co. The officers of the company are: W. A. Cullane, La Salle Building, St. Louis, Mo., president; W. J.'Brien, of Durant, vice-president, and C. C. Wisel, secretary.

**YALE, OKLA.**—The city of Yale is sinking test wells for the purpose of finding a satisfactory water supply. As soon as the water is reached it is proposed to submit the proposal to issue bonds for water extension and also for electric lamps to the voters. Benjamin Boon, of Hominy, is engineer.

**BRYAN, TEX.**—Bids will be received at the office of the supervising architect, Treasurer's Building, Washington, D. C., until Dec. 18 for construction complete, including mechanical equipment, lighting fixtures and approaches, of the United States post office at Bryan. Drawings and specifications may be obtained from the office of the architect, the custodian of site at Bryan, O. Wenderoth, a supervising architect.

**COMMERCE, TEX.**—The bond issue of \$4,500 for the proposed municipal electric light plant has been approved by the State Department.

**CORPUS CHRISTI, TEX.**—The Commissioners' Court of Nueces County has granted the Texas Southern El. Co., of Victoria, a franchise to construct and operate an electric interurban between Corpus Christi and Bishop, a distance of 35 miles. During the past few months the company has purchased several electric-light and water plants in different towns in South Texas.

**ORANGE, TEX.**—The properties of the Orange Ice, Lt. & Wtr. Co. are reported to have been purchased by W. H. Stark. The new owner, it is understood, will enter and make improvements to the electric-light and power plant.

**SAN ANTONIO, TEX.**—The National Masonic Sanitarium Association, it is understood, will build a power house in connection with other buildings. The building will be of fireproof construction and provide space for generating room, pumping room, boiler room, machine shop, incinerators, laundry, etc. Reuter & Harrington, Frost Building, San Antonio, are architects and engineers. C. A. Soule, 317 State Bank & Trust Building, is president.

**SEGUIN, TEX.**—Improvements are contemplated to the municipal electric-light and water plant, for which bonds to the amount of \$20,000 have been voted.

**SHEPHERD, TEX.**—Plans have been prepared by H. L. McDuffie, superintendent of the municipal electric-light plant, for extension to the street-lighting system in the business district and residential section of the city.

## Pacific States

**SPOKANE, WASH.**—The city of Spokane is installing the first electric street-lighting system on Sprague Avenue, between Third and Sixth Streets, on Trent Avenue, from Division Street to Lincoln Street, to cost about \$110,000.

**LAKEPORT, CAL.**—The Municipal Light & Pwr. Co. of Lakeport, expects to purchase the electric power plant and a small quantity of material for distribution and lighting system, including transformers, poles, distribution cable and wire, meters, incandescent lamps, also some electrical appliances, including heating and cooking apparatus, etc. A. C. Hastings is vice-president.

**SAN BERNARDINO, CAL.**—The Southern Sierras Power Co. of San Bernardino, has applied to the State Railroad Commission for permission to issue \$300,000 in bonds, the proceeds to be used for retiring outstanding notes and for extensions and improvements of its system.

**OGDEN, UTAH.**—The Grand Canyon Canal & Pwr. Co., Ogden, recently incorporated with a capital stock of \$200,000, contemplates the construction of a hydro-electric power plant on John Day's River, about 15 miles from Soda Springs, Idaho. The company has taken over the power sites held by Alexander Toppone, of Ogden, the consideration being \$65,000. The officers are: Sidney Badcon, of Ogden, president; C. L. Gosling, vice-president; Arthur Kuhn, secretary, and Ralph Hoag, treasurer.

**NOGALES, ARIZ.**—Preparations are being made by the International Gas Co., of Nogales, for the installation of a new electric-light plant and ice factory for which contracts will soon be awarded. The equipment of the proposed plant will include two 300-kva, three-phase, 60-cycle, 2300-volt generators, driven by gas engines of the diesel type (directly connected), switchboard equipment, transformers, etc.; 30 miles of wire will be required for the overhead distributing system and red-cedar poles will be used. The ice-making and refrigerating equipment will include a motor-driven compressor of 40 tons refrigerating capacity, with complete ice-making and insulated cold-storage rooms. Later a new gas holder will be purchased for the existing gas plant. Ives & Davidson, 84 William Street, New York, N. Y., are engineers in charge of the project and will also supervise the operation of the plant after the new construction work is completed.

**GARDINER, MONT.**—The Gardiner El. Lt. & Wtr. Co. expects to purchase within the next 12 months one 8½-in. by 8-in. triplex double-acting pump. Albert Collins is engineer of power station.

**POLSON, MONT.**—Preliminary steps have been taken by the City Commission toward establishing a lighting district in Polson and installing a municipal electric-light plant.

**BUENA VISTA, COL.**—In accordance with the terms of a ten-year street-lighting contract signed last July the Buena Vista El. Lt. & Pwr. Co. has completed the installation of several additional lamps and has replaced the former incandescent arc lamps with tungsten lamps using 400-watt units. W. P. Eyre is manager.

**ALAMOGORDO, N. M.**—The Alamogordo Lt. & Pwr. Co. has awarded a contract to the Fulton Iron Works Co., of St. Louis, Mo., for furnishing and installing one 150-hp. Diesel engine, one 80-kva, three-phase, Diesel oil engine, one 80-kva, three-phase, 2300-volt generator (directly connected to engine), with exciter and switchboard complete. William R. Eldson is general manager.

## Canada

**EDMONTON, ALTA.**—Plans have been prepared, it is reported, by the Edmonton, Dunvegan & British Columbia Ry. Co. for 150-hp. power house, the power to be at St. Albert's Trail, to cost about \$8,000.

**KAMLOOPS, B. C.**—At a special election to be held in the near future the proposal to issue bonds to the amount of \$50,000 will be submitted to the ratepayers. If the bonds are voted the proceeds of \$10,000 will be used for extensions to the lighting service.

**TRANSCONA, MAN.**—The contract for furnishing and installing pumping machinery and electrical equipment has been awarded by the City Council to the Dominion Equip. & Sup. Co., of Winnipeg, for \$18,100.

**FLESHERTON, ONT.**—The ratepayers, on Oct. 13, approved the by-law authorizing an appropriation of \$5,500 for the installation of hydroelectric power in Flesherton

**NEWMARKET, ONT.**—The Town Council has requested the Provincial Hydro-Electric Commission to submit estimates of the cost for furnishing electricity in Newmarket for street-lighting and domestic purposes.

**OTTAWA, ONT.**—Tenders will be received by the Board of Control, City Hall, Ottawa, until Nov. 26 for furnishing an electrically driven low-lift turbine pump and motor, also an electrically driven high-lift turbine pump and motor (both directly connected). Specifications and full information will be obtained at the office of the city engineer.

**ST. CATARINES, ONT.**—Plans are maturing for a 250,000-hp development on Sixteen-mile Creek. It is proposed to erect a power house on the banks of Sixteen-mile Creek, using the water from Chipewaga Creek, by means of an artificial channel 6 miles in length. The project was promoted by E. A. Low over fifteen years ago, but was abandoned because the Cataract Pwr. Co. was the first to start operations at Decew Falls and the future extent of the power market was uncertain.

**TORONTO, ONT.**—Tenders will be received by the Board of Control of the Toronto Electric Commissioners, Toronto, until Nov. 26 for synchronous converters with transformers and switchboard panels. Specifications and form of tender may be obtained at the office of the purchasing agent.

**WELLAND, ONT.**—The electric-light committee, it is reported, has decided to erect ornamental lamp standards at the north and south ends of the city, tenders for which will be called in the near future. The cost of the work is estimated at about \$11,000.

**QUEBEC, QUE.**—Plans are being considered by the Quebec Ry., Lt. & Pwr. Co. for the development of additional power. The company has recently closed or is now negotiating power contracts aggregating 5000 hp, which include 2000 hp for the St. Malo shops of the National Transcontinental Railway and 3000 hp for the government dry dock at St. Levis. The company has recently closed a contract with the Ross rifle factory for an additional 6000 hp.

## Mexico

**GUADALAJARA, MEX.**—Application has been made to the federal government by Charles P. Martin for a concession for the use of the water falls of Juancatalan on the Santiago River, near Guadalajara. Mr. Martin contemplates the construction of a hydroelectric power plant and a system of transmission lines.

## New Incorporations

**ANDALUSA, ALA.**—The Andalusia Lt. & Pwr. Co. has been incorporated with a capital stock of \$15,000 by J. D. Henderson and others.

**WILMINGTON, DEL.**—The Pennsylvania Pub. Ser. Corp. has filed articles of incorporation under the laws of the State of Delaware with a capital stock of \$100,000. The company proposes to operate electric-lighting plants. The incorporators are M. C. Miller, C. W. Hyde, of Harrisburg, and H. W. Dugan, of Wilmington.

**OGDEN, UTAH.**—The Grand Canyon Canal & Pwr. Co. of Ogden, has filed articles of incorporation under the laws of the State of Idaho with a capital stock of \$200,000, for the purpose of constructing a hydroelectric power plant on John Day's River, about 55 miles from Soda Springs. The officers are: Sidney Badcon, of Ogden, Utah, president; C. L. Gosling, vice-president; Arthur Kuhn, secretary, and Ralph Hoag, treasurer.

**MARKSVILLE, LA.**—The Marksville Lt. & Ice Co. has been chartered with a capital stock of \$10,000 by E. M. Kursheedt, James R. Black and R. F. Strong.

**ELYRIA, OHIO.**—The Lorain County El. Co. has been incorporated by E. E. Berger, R. A. Brooks, J. B. Johnson, and others. The company is capitalized at \$10,000, and proposes to take over the properties of the Citizens' Gas Power Co. and the City of Pwr. Co., which have been operated under the name of R. E. Berger, agent, since they were purchased by the Milligan company.

**FULTON, TENN.**—The South Fulton Lt. & Pwr. Co. has been incorporated by W. C. Morehead, D. H. Skeen, Herbert Carr, and others. The company is capitalized at \$2,000.



# Weekly Record of Electrical Patents

## UNITED STATES PATENTS ISSUED NOV. 10, 1914.

[Prepared by Robert Starr Allyn, 16 Exchange Building, New York, N. Y.]

- 1,116,402. CONDUCTOR-WIRE-REELING MECHANISM. E. Friedman, United States Navy. App. filed Sept. 3, 1913. For communicating data from gunfire control station to the plotting room and from plotting room to sight setters.
- 1,116,424. INDUCTION MOTOR. R. E. Hellmuth, Pittsburgh, Pa. App. filed Aug. 2, 1909. Secondary winding for non-synchronous motor.
- 1,116,430. SYSTEM OF ELECTRICAL DISTRIBUTION. R. P. Jackson, Wilkesburg, Pa. App. filed Dec. 5, 1907. Circuit-closers do not open under abnormal conditions for which they are not adapted.
- 1,116,432. REGULATOR FOR ELECTRIC CIRCUITS. H. D. James, Pittsburgh, Pa. App. filed Feb. 19, 1910. For manually regulating with continuously running motor for adjusting the windings.
- 1,116,433. CONTROLLER FOR INDUCTION MOTORS. H. D. James, Pittsburgh, Pa. App. filed Sept. 13, 1910. For manually removing resistance from secondary and automatically reinserting same upon interruption of primary circuit.
- 1,116,442. ELECTRIC TOASTER AND BROILER. H. F. Kirkwood, Kimo, Mo. App. filed June 7, 1913. Oscillating carrier positions the food between the heating elements.
- 1,116,447. ELECTRICAL SYSTEM. C. D. Lanning, Boston, Mass. App. filed Dec. 30, 1905. Telephone repeater system.
- 1,116,450. MANUFACTURE OF METALLIC FILAMENTS FOR ELECTRIC LAMPS; A. Lederer, Vienna, Austria-Hungary. App. filed Nov. 11, 1910. Heats tungsten filament in an atmosphere of pure dry hydrogen.
- 1,116,453. SYNCHRONIZING APPARATUS. S. Lubin, Philadelphia, Pa. App. filed March 5, 1909. Orally signals the operator when the speed of the kinesiscope is out of time with the phonograph.
- 1,116,455. ELECTRICAL MEASURING INSTRUMENT. F. MacGahan, Pittsburgh, Pa. App. filed July 17, 1912. Special mounting for the pointer.
- 1,116,458. FIRE-ALARM SYSTEM. M. Matos, Lorain, Ohio. App. filed Feb. 11, 1914. Circuit-closer is explosively operated.
- 1,116,472. ALTERING-CURRENT ELECTRIC METER. C. North, Stretford, England. App. filed June 21, 1911. Induction type; of light and simple construction.
- 1,116,475. CIRCUIT-BREAKER. T. S. Perkins, Wilkesburg, Pa. App. filed June 12, 1905. Overload; for electric railway cars.
- 1,116,477. SAFETY DEVICE FOR ELECTRIC CIRCUITS. O. Peterson, DeKalb, Ill., and H. C. Smith, Chicago, Ill. App. filed May 16, 1914. For protecting house-lighting systems from higher potential circuits.
- 1,116,480. ELECTRIC-VAPOR ARC LAMP. E. Polzbus, Berlin, Germany. App. filed Oct. 4, 1909. Vaporized electrode is conducted through a solid tube of refractory material, which is caused to glow by the heat of the arc.
- 1,116,492. BRUSH-HOLDER. A. M. Sammarone, Akron, Ohio. App. filed Jan. 31, 1914. Stamped sheet-metal holder for carbon brushes.
- 1,116,504. MOTOR CONTROLLER. A. Simon, Milwaukee, Wis. App. filed Jan. 11, 1909. For alternating current motors; controlling switch and transformer both arranged in same case and immersed in oil.
- 1,116,522. DEVICE FOR SUSPENDING TROLLEY WIRES, ETC. W. H. Watts, Hamilton, Va. App. filed Nov. 18, 1913. Construction of hinged clamp.
- 1,116,527. SIGNAL RECEIVER. C. A. Bais, Chicago, Ill. App. filed April 24, 1911. Two-gong bell with two coils controlled by the armature of a relay.
- 1,116,528. TELEPHONE-EXCHANGE SYSTEM. M. L. Johnson, Chicago, Ill. App. filed July 15, 1912. Has a plurality of operator's positions.
- 1,116,529. TELEPHONE-EXCHANGE SYSTEM. M. L. Johnson, Chicago, Ill. App. filed July 15, 1912. Numbers of the desired lines are automatically repeated back to the calling parties.
- 1,116,540. TELEPHONE-EXCHANGE SYSTEM. M. L. Johnson, Chicago, Ill. App. filed Aug. 10, 1912. Operators for receiving calls and other operators for extending calling lines.
- 1,116,541. TELEPHONE-EXCHANGE SYSTEM. M. L. Johnson, Chicago, Ill. App. filed Aug. 10, 1912. Recording and reproducing apparatus conveys the information in recorded form from the first operator to the second operator.
- 1,116,542. TELEPHONY. M. L. Johnson, Chicago, Ill. App. filed Dec. 4, 1912. Plurality of signal-sending lines.
- 1,116,552. MOTOR-STARTING SWITCH. C. H. Bissell, Syracuse, N. Y. App. filed May 21, 1913. Special means controlling the operation of the shiftable switch member.
- 1,116,561. SWITCH-PLUG LOCK. H. Butz, Albion, Ind. App. filed April 3, 1913. Permutation-lock indexing switch.
- 1,116,566. ELECTRIC SWITCH. R. H. Conrad, Oakland, Cal. App. filed Feb. 2, 1914. Automatic starting, overload and no-voltage-release switch.
- 1,116,586. ELECTRIC SADRON. W. S. Hadaway, Jr., East Orange, N. J. App. filed May 13, 1909. Body of metal poured about metal-clad resistance element.
- 1,116,588. RECEIVER FOR WIRELESS COMMUNICATION. W. Harrison, Brooklyn, N. Y. App. filed Feb. 8, 1904. Wires of antenna bent sinusoidally into loops.
- 1,116,591. TELEGRAPH REPEATING SYSTEM. A. T. Jester, Houston, Tex. App. filed May 12, 1913. Improved repeater adapted to repeat both ways.



1,116,595—Incandescent Lamp

- 1,116,595. INCANDESCENT LAMP; A. S. Knight, Newark, N. J. App. filed Nov. 3, 1909. W-shaped filament symmetrically arranged in respect to the supporting arm.
- 1,116,598. ANNUNCIATOR. O. M. Leich, Genoa, Ill. App. filed March 4, 1912. Combined door and jack.
- 1,116,606. ELECTRICAL APPARATUS FOR EFFECTING THE CHEMICAL COMBINATION OF GASES. C. C. Meigs, Charleston, S. C. App. filed Jan. 23, 1914. Electrical sparks produced within spaces between the cooling rings.
- 1,116,607. PROTECTIVE DEVICE FOR ELECTRICAL CIRCUITS. G. Moore, Frankfort, Ind. App. filed Oct. 16, 1913. Particularly for telephone circuits.
- 1,116,621. INSULATOR. F. J. Schisler, Winthrop, Minn. App. filed March 24, 1913. Reinforced glass with slot in which the conductor rests loosely.
- 1,116,652. TROLLEY HEAD. C. W. Warner, Vancouver, British Columbia, Canada. App. filed Feb. 28, 1914. Carries vertical guide rolls engaging guide wires at the opposite sides of the trolley head.
- 1,116,657. PRINTING. TELEGRAPH. C. J. V. V. App. filed June 16, 1913. Independent mechanisms for printing quotations of the lesser and the more active stocks.
- 1,116,661. TREATMENT OF GASES. E. R. Volcott, Chicago, Ill. App. filed Aug. 14, 1909. Combining nitrogen and oxygen of air to form nitric acid.
- 1,116,657. TELEPHONE CUTOFF. J. Anderson, Jr., Omaha, Neb. App. filed Oct. 7, 1912. Push-button on the post of the instrument for breaking the transmitter circuit.
- 1,116,705. ELECTROMOTOR. B. F. Hutches, T. App. filed Nov. 1, 1913. Motor.

1910. Novel construction and mounting of parts; low power motor.
- 1,116,763. SYSTEM OF AUTOMATIC BLOCK SIGNALING. J. P. Townsend, New York, N. Y. App. filed Jan. 26, 1906. Special track circuits.
- 1,116,772. APPARATUS FOR TREATING METALS. S. T. Wellman, Cleveland, Ohio. App. filed Aug. 18, 1911. Reducing and melting steps accomplished by electric furnaces, a movable bottom containing the charge being shifted from one to the other.
- 1,116,818. STORAGE BATTERY. F. M. Holmes, Springfield, Mass. App. filed Aug. 12, 1912. Can be charged at a very high rate.
- 1,116,855. ELECTRIC HEATER. E. A. Sperry, Brooklyn, N. Y. App. filed Jan. 4, 1908. Steam generator, with heating units contained within a heating fluid circulating within the flues of the boiler.
- 1,116,865. PROCESS OF PRODUCING ALKALI AND ALKALINE-EARTH METALS. C. E. Acker, Ossining, N. Y. App. filed Aug. 10, 1910. Produces alkali by electrolyzing a fused cyanogen compound of sodium.
- 1,116,870. CONTROLLING FROM A DISTANT POINT THE OPERATION OF A MECHANISM OR INSTRUMENT. C. Berger, Budapest, Austria-Hungary. App. filed March 19, 1910. Electric acoustic mechanism for operating toys, etc.
- 1,116,871. METHOD AND MEANS FOR REDUCING SPRINGS OF ELECTRICAL APPARATUS. D. M. Bliss, West Orange, N. J. App. filed Aug. 30, 1911. Sprays a vaporizable liquid upon the commutator segments.
- 1,116,883. ELECTRIC SYSTEM FOR AUTOMATIC FILES. E. J. Halblieb, Rochester, N. Y. App. filed Oct. 9, 1911. Three-wire system with differentially wound dynamotor.
- 1,116,885. ELECTRIC FURNACE. W. H. Hampton, New York, N. Y. App. filed Feb. 17, 1913. For reduction of iron ore.
- 1,116,893. SAFETY DEVICE FOR SECONDARY CELLS. M. R. Hutchinson, West Orange, N. J. App. filed June 21, 1911. Gasoline separator, electrolyte replenisher and flame extinguisher.
- 1,116,902. SWITCH. J. M. Lorenz, Chicago, Ill. App. filed March 9, 1914. Ratchet button for attachment to ordinary rotary snap switch.
- 1,116,951. PROCESS OF ELECTRICAL SEPARATION. H. E. Sutton and W. E. G. Steele, Dallas, Tex. App. filed Sept. 24, 1904. Electrostatic system.
- 1,116,952. STARTING BOX. M. Taigman, New York, N. Y. App. filed May 8, 1914. Special resistance coil and other features.
- 1,116,960. METALLIC ELECTRODE. E. Weintraub, Lynn, Mass. App. filed April 5, 1912. Mercury-arc rectifier with anodes of drawn metallic tungsten.
- 1,117,006. CUP POST FOR ELECTRIC BATTERIES. J. A. Doran, Providence, R. I. App. filed July 3, 1913. Cup which frictionally engages over the end of the electrode has a conical post drawn up out of the metal thereof.
- 1,117,021. ELECTRIC LIGHTING FIXTURE. J. F. Gilchrist and G. B. Keil, Chicago, Ill. App. filed March 2, 1914. Shade bracket and socket for adjustable connection with a electric fixture.
- 1,117,029. STERILIZER. J. O. Halverson, Portland, Ore. App. filed June 23, 1913. Has a cover which, as it is lifted, raises the article-supporting tray.
- 1,117,042. TRAIN STOPPING AND SIGNALING SYSTEM. J. H. Sisson and W. H. Sax, Katchewan, Canada. App. filed May 27, 1913. Special signaling and stopping mechanism.
- 1,117,046. ELECTRIC SWITCH. C. Hill, Geneva, Ohio. App. filed May 15, 1912. For use in a signal system.
- 1,117,054. ATTACHMENT FOR CONDUIT OUTLET BOXES. J. C. Phelps, Springfield, Mass. App. filed April 11, 1912. Extension piece connecting with the neck of the outlet box.
- 1,117,128. CLARIFYING TRANSPARENT MEDIA. C. E. Camm, Chicago, Ill. App. filed Feb. 11, 1913. Heater wire disposed between two transparent glass panes to keep them free of moisture, etc.
- 1,117,140. PORTABLE ELECTRICALLY DRIVEN TOOL. J. A. Osborn, St. Louis, Mo. App. filed Dec. 12, 1912. Drill or reamer.

# Electrical World

The Consolidation of *ELECTRICAL WORLD* AND *ENGINEER AND AMERICAN ELECTRICIAN*

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## Improvement in Bond Trading

The full extent of the improvement in general business conditions in the last few weeks is shown by various indications. The one which is of leading importance is the change in the financial situation. For the first time since the war was started four months ago trading in bonds is a real factor in the situation. Inquiries are reported, bond offerings by established banking houses are appearing, prices are fairly stable, and definite notice has been given that the long-awaited opening of the New York Stock Exchange for restricted dealings in bonds will take place on Nov. 28. If trade here can be strengthened to its normal state and the banking position reaches a point where the authorities pronounce it safe, business men can look forward with much easier minds to the questions of international financial importance which are in the future. The problem which is of immediate concern to many public utility companies is that of the probable date when new financing can be arranged at economical rates. Without waiting for the broad general market which will be available at some later day that cannot now be marked on the calendar, several companies are successfully undertaking the sale of securities in a small way to provide for current needs. That it is possible to do as much of this as has been done, though the aggregate amount involved is small when compared with the regular investment buying power of the country, reveals an improvement that is highly encouraging. Barring the possibility of a sudden sweeping reversal in the present trend of affairs, improvement of this kind will continue proportionately with the growth of confidence. The Federal Reserve banks, which opened with no display of the power that they will have over financial conditions, are undoubtedly exerting already a silent, forceful, steady influence which means as much sentimentally as practically.

## Municipal Ownership in Cleveland

An account of conditions in Cleveland and of the state of the competition between the established private plant and the new municipal plant is published elsewhere in this issue. The city of Cleveland has adopted methods that have put it in possession of a plant which, if it does any sizable amount of business, must do so by duplicating the service and facilities of the existing efficient private company. It has also, in further exercise of its power, made rates for the company which have been appealed to the State Public Utilities Commission, the authority which can control private-plant rates but not municipal-plant rates. The fair, proper remedy for the city if it had grievances

did not lie in the use of both of these alternatives. If it chose to compete with the private plant, it could fairly have left the private plant free to compete with it; but since it had adequate means of regulation through the state commission, it might more justly have left the question of reasonableness of rates to that body. As the city stands now it is in the triple rôle of competitor, regulator (subject to the overruling decision of the State commission) and user of the service of the private company. There are two essential things which it is not doing—(1) furnishing the capital for the large investment of the private company; (2) furnishing the initiative, ability and organization which supply the overwhelming proportion of the good private service enjoyed by the citizens. No sound basis in economics can be found for the wasteful duplication of plant facilities in which the city has engaged. The fact that its expenditure and its plant are relatively small as compared with the investment and plant of the private company does not lessen the economic wastefulness of its policy in principle. Large or small, any expenditure that duplicates existing facilities which provide good service, where the reasonableness of rates may be submitted to a state commission, is inexcusable.

## Short-Time Lighting Loads

One of the pestilent problems which beset a central-station manager in many small towns is that of dealing with the customer who wants lighting service for eight or ten weeks at most and looks with horror on anything which approximates paying a fair price for it. Many a good-natured manager has erected two or three miles of line to accommodate ten or a dozen customers whose aggregate bills are hardly sufficient to pay for the insulators. Moreover, in nine cases out of ten the installation has not even a fighting chance of paying for itself by the load obtained along the way. Just what to do with the demand of this class of customers it is not always easy to say. In many cases a special rate is established reasonably high in appearance yet very seldom actually recouping the station for its pains. No ordinary form of demand system can cope with the problem, since it is not the demand which is at issue, but the great distance of the load. The best way out of the difficulty in such cases is actually to charge the construction to the distant subscribers, perhaps letting the charge take the form of a minimum monthly bill until the account is squared. In the case of an unreasonably long line to be built to serve very few customers the customers should pay for the construction and no attempt should be made to levy special rates.



### A New Radio-Frequency Oscillator

On page 1048 of this issue we present the authentic information available at this time with regard to the new alternating-current generator of Dr. Peter Cooper Hewitt. A simple vacuum-tube oscillator producing sustained waves of considerable power at high frequencies is bound to find valuable application in radiotelegraphy, and if the device embodies in itself some "trigger" action whereby its output in power or frequency can be quantitatively altered in large amounts by the application of small electric forces the apparatus will be valuable for radiotelephony. Its economy and efficiency in continuous operation at high powers are still unknown, but should the present indications be borne out the new oscillator should prove a strong competitor of the hydrogen arc and mechanical generators now in use.

The commercial utility of ultra-sensitive receivers is more difficult to grasp, for the reason that in radiotelegraphy—as in line telephony—the instruments now in use are so delicate that interfering disturbances produce disproportionally strong effects. Progress is more to be expected from increase of transmitting ability and from electrical reduction of "atmospherics" than from added sensibility in the receiving instruments. For this reason the new oscillator is arousing more interest than is the receiver, though the engineering public will be glad to learn of the operation of both devices as soon as full disclosures can be made.

### The Larger Market for Electric Energy

A presidential address before the British Institution of Electrical Engineers is nearly always an important contribution to the art, and the recent address of Sir John Snell, abstracted elsewhere in our columns, is no exception to this rule. From a practical American standpoint the most interesting portion of the document is that which deals with the aspects of the larger field for electrical supply which is now opening up, and particularly the question of ultimate price in its relation to such supply. Sir John Snell takes a rather conservative view of the bulk-supply problem; indeed, he is decidedly less optimistic regarding the great gains from generation upon a particularly large scale than are most engineers in our own country, holding that under existing circumstances the extra operating cost of an addition to a well-organized local station is often cheaper than any practicable form of bulk supply. There is no doubt that the situation with respect to the economy of great stations has changed materially in recent years. Particularly since the introduction of highly economical turbo-generators there has been a tendency to decrease the difference in cost as between medium-sized and very large stations to an extent that scarcely seemed possible a few years ago. The main point of Sir John Snell's contention is that once a station is fairly in operation and the capital charges incurred the gain from bulk supply, unless obtained at a very low price indeed, is frequently little or nothing. He readily grants,

however, that the bulk-supply question should be carefully looked into before undertaking to build a new station.

From the standpoint of the central-station man the most hopeful part of the address is the great progress that has been made in some of the British plants regarding domestic supply, and particularly for purposes other than lighting. As our readers may know, for several years a vigorous effort has been made by British central-station managers to exploit the use of electricity for heating, cooking and similar purposes, and the efforts have met with a very gratifying degree of success. Although individual districts vary very greatly in such matters, instances have been found in which the proportion of such load to the lighting load is as high as ten to one. Such figures as these one must, of course, consider at present exceptional, but all the indications from the British experience go to show a great and profitable field in the miscellaneous and domestic uses of energy. Not only is the bulk of business large, but it is particularly advantageous in being essentially off the peak, at least under British conditions. In one station having some 15,000 kw connected, inclusive of a large amount of heating and cooking—an amount reaching a third of the total load—it was found that the addition of this amount produced no perceptible effect whatever on the maximum demand. The diversity-factor of this class of load is certainly great, so that from the standpoint of investment it is most attractive. The English experience with it teaches the necessity of offering low rates, although it is a well-paying load even at the prices charged. These are usually based on some form of equipment charge plus a very low service rate, commonly 2 cents per kw-hr., sometimes as low as 1 cent.

Following up the subject of rates, President Snell points out what is far too often forgotten, that in a modern central station the constant tendency is to reduce the importance of fuel as a factor in the costs. In generation on a large scale he estimates the whole generating cost at about 30 per cent of the total, nearly half of which must be reckoned as capital charges which represent permanent investment in plant and distributing system. Even if by some extraordinary improvement in generation the cost of coal could be eliminated entirely, the possible reduction in price of the consumer would be only about one-fourth of the total, so that one cannot reasonably expect, from now on, any considerable reduction in price due to improvements in generation. Business of a kind which may fully utilize the investment stands a good chance, however, of helping legitimately to lower the price. From the standpoint of supply the operating expenses at the station are steadily decreasing in importance, and the necessity of operating the system to the best advantage to obtain large and steady load becomes predominant. It will pay some of our American central-station managers to investigate thoroughly the English experience in developing domestic load other than lighting, particularly since improvements in lamps are likely steadily to decrease rather than to increase the importance of the

lighting load. The keynote of success in future central-station work is to make electricity a necessity in the daily life of every man to an extent that has not hitherto been approached.

### Radiation from Straight and Helical Filaments

The gas-filled tungsten lamp, as recently introduced into practice, not only manifested itself as a novelty but also introduced some novel problems into photometry and radiation measurements. In order to keep the loss of heat by convection from the surface of the glowing filament to suitably small limits, the filament is spiraled, and a question arises as to the influence of this spiraling of the filament on its luminous efficiency. It is generally admitted that the greater luminous efficiency of tungsten-filament vacuum lamps over carbon-filament vacuum lamps is attributable to two distinct causes combined; namely, first, their capability of withstanding a higher operating temperature without evaporation or disintegration, and, second, their selective character of radiation at working temperature. The higher the temperature of any glowing body, the greater is the ratio of its visible to total radiation, and therefore the greater its luminous efficiency. A metallic radiator which, when incandescing, emits a larger percentage of visible radiation than a "black body" at the same temperature possesses an inherent advantage in luminous efficiency due to this selective radiation.

A "black body" is the name of an ideal substance which is powerless to reflect radiation. At any temperature it is a perfect non-reflector. It therefore radiates non-selectively, strictly according to its temperature. The nature of the radiating substance, and especially the condition of its surface, determine how nearly a radiator approaches a black body. A roughened, dirty and irregular surface tends to radiate blackly; whereas a polished, clean and smooth surface tends to radiate selectively, or in the manner of a reflector. Untreated carbon filaments are nearly black in their radiation, but metallized carbon filaments are distinctly more selective. Tungsten, for a given surface quality, radiates more selectively and less blackly than carbon. It was shown by Kirchhoff that any metallic inclosure like the inside of an oven with a small aperture for observation behaves substantially like a black body, whatever the surface and metal may be. That is, the radiation escaping from a small aperture of an oven is non-selective, owing to the sifting by continual reflections from the internal walls; whereas if the oven were sufficiently hot to glow externally its external radiation might be selective, or gray as distinguished from black.

When a tungsten filament is rolled into a spiral, how far does its radiation lose in efficiency by coming from the inside of the spiral, regarded as an oven and as an approach to a black body? If the entire filament were "black," it would lose all of the luminous efficiency due to its selective radiation and retain only that due to its high operating temperature. This is the question which Dr. W. W. Coblentz seeks to answer experimentally in the investigation he describes in this issue. The article

indicates that, although a certain amount of blackening in the radiation occurs owing to the action of the inner walls of the spiral, yet the effect is relatively small and is much more than compensated for by the reduction in convection loss due to the spiral form. The experimental method employed is an interesting one.

### Atmospheric Refraction of Electromagnetic Waves

The emission of electromagnetic waves from a simple dumbbell Hertzian oscillator, assumed to be operated in free space and far from this earth or any other conductor, is supposed to be transmitted in simple straight lines from the oscillator as a point source, just as we have reason to believe that light travels. When, however, the oscillator is set vertically, with the ground as counterpoise, the waves do not proceed rectilinearly but bend around the conducting surface of the earth. In this respect radiotelegraphic waves differ from ordinary light waves. The marked influence of the weather, season of the year, time of day and other meteorological conditions upon the strength of radio signals as received at a great distance indicates that the transmission is profoundly affected by causes resident in the atmosphere. Various conjectures have been made to account for such causes.

In a recent article published by the London *Electrician*, referred to in this week's Digest, Dr. J. A. Fleming presents some interesting suggestions as to the effect of pure refraction on the path of electric waves emitted horizontally at some point on the earth's surface. If we assume that the refractive index of the gases composing the atmosphere is substantially the same for long radio waves as for short light waves, then there is a certain relation between the density and the index of refraction for each gas at which it will produce circular refraction and prevent the waves from escaping above the atmosphere. Whether these conditions are met with completely in the earth's atmosphere or not, it is evident that the influence of ordinary refraction is to bend the waves over and to retain them much longer in the neighborhood of the earth than if refraction were non-existent.

Dr. Fleming suggests that the conditions existing in the atmosphere of our earth may be particularly favorable to the transmission of long-distance radiotelegraph signals, and that, considering the great variations which exist in planetary atmospheres, it is possible that our earth is unique in this respect. We can lay, then, the flattering unction to our souls that this world may be the best of worlds in respect to the refraction of long-distance radio electromagnetic waves, a blessing in which no doubt some of our more spiritually minded readers may perceive a direct intervention of Providence. However, some benefits ought to be allowed, on the doctrine of uniformity in compensation, to a planet like ours possessing only one moon, in view of the numerous moons allotted to other planets and their opportunities to dispense with artificial light at night time.



# The News of the Week

## Activities and Events in the Electrical Field— Reports of Meetings—Commission Findings, Etc.

### Los Angeles to Condemn Distributing System

After preparatory studies covering several months, the city attorney of Los Angeles was instructed on Nov. 17 to institute proceedings in the Superior Court of Los Angeles County for the condemnation of the Southern California Edison Company's distributing system in that city. A petition is being filed with the Railroad Commission asking that body to fix a price to be paid for the property, which the city desires to use as a distributing system for electrical energy generated by aqueduct power plants.

### New York Merchants and Prosperity

The Members' Council of the Merchants' Association of New York held a "prosperity" lunch at the Hotel Astor, New York, on Nov. 24. It was attended by 1625 people and was held primarily to celebrate the "promotion of business prosperity by Federal Reserve banks." Among those who made addresses were Gov. Benjamin Strong, Jr., of the Federal Reserve Bank of New York.

A bulletin issued by the Merchants' Association states that one of the noticeable features in the development of American trade during the last five years has been a remarkable increase in the exports of American electrical machinery, apparatus and supplies. "American electrical equipment," it adds, "has won a high reputation in the various foreign markets, and the increase in sales has been secured almost entirely on merit, for comparatively few American producers have made any serious attempts to push their products in the foreign market." Special attention is called to the market created by hydroelectric development in foreign countries.

### The Federal Trade Commission

Reports that President Wilson will probably name as members of the new Federal Trade Commission, which is soon to be organized, certain members of the House of Representatives and the Senate who were defeated for re-election, and who are popularly known as "lame ducks," are found, upon inquiry in Washington, to have no basis in fact.

It is said in Washington that nothing has occurred to change the generally accepted idea that Mr. Joseph E. Davies, commissioner of corporations, will receive a place on the commission, although not necessarily as chairman. A report that Secretary Redfield would head the commission was characterized by him as "a crazy dream." It is said in Washington that President Wilson has under consideration the name of former Judge Edward M. Cullen, of New York, as a member of the commission.

It was understood originally that President Wilson would name the commission about Dec. 1. Since that was announced, however, it has become understood in Washington that the administration does not intend to "rush into" any of the administrative features of the new trust legislation. The opinion of a frequent visitor at the White House is that President Wilson thinks

there has been enough discussion of finance and commerce for awhile and believes in "giving business a chance." As the Senate will have to confirm the appointments and could not reach that business until well after assembling in December, there is not believed to be any necessity for hurry.

### Report on Electric Rates at Cincinnati

A valuation of the electrical equipment and property of the Union Gas & Electric Company, Cincinnati, Ohio, together with an analysis of the rates charged by the company for electric service, has just been submitted to the director of public service of the city administration by Mr. Arthur C. King, Chicago, following an engineering investigation into the company's operations. The company will reply to the report later.

The city's engineer places the valuation of the property used for furnishing electric service in Cincinnati at \$6,848,760.31, based on a reproduction cost new of \$7,952,893.79 diminished by an existing depreciation of \$1,104,133.48. No allowance was made for intangible value, but the figure of \$241,673 was assigned for working capital.

The income accounts for the twelve months ended June 30, 1914, were examined and adjusted, the final figure for Cincinnati's business being \$2,023,835.61. From these figures the net earnings were computed to have been \$1,182,865.70. The amount allowed as a deduction from net earnings to offset future depreciation is \$284,921.82.

A return of 8 per cent, or \$567,234.66, is allowed as representing the interest or return to the owners for the use of their property.



DATA ON UNION GAS & ELECTRIC SYSTEM

Deducting the depreciation reserve and return on investment from the adjusted net earnings arising from the present business and rates, a surplus of \$330,709.22 is declared to remain to be utilized in rate deductions. Mr. King recommends that a reduction be made in all rate schedules, the reduction to total approximately the above figure, and that the maximum rates of all classes of electric business be reduced accordingly.

### Death of Chairman Barker

Chairman Forrest E. Barker, of the Massachusetts Gas and Electric Light Commission, died suddenly at Washington, D. C., on Nov. 20, while in attendance upon the convention of the National Association of Railway Commissioners. Accompanied by Mrs. Barker, he had been away from Boston for about a week, and while his health had not been good for some time, his death was unexpected and was a great shock to his associates. Mr. Barker was born in Exeter, N. H., in 1853, was graduated from Wesleyan University, Connecticut, in 1874, and later took up the study of law at the Boston University Law School. After being admitted to the bar, he practised law in Worcester, Mass., serving on the school board and representing his district in the Legislature in 1883-4. He was also at one time chairman of the Republican Congressional district committee and from early manhood was prominent in Masonic circles, having attained the thirty-third degree and held many honors in affiliated fraternal organizations.

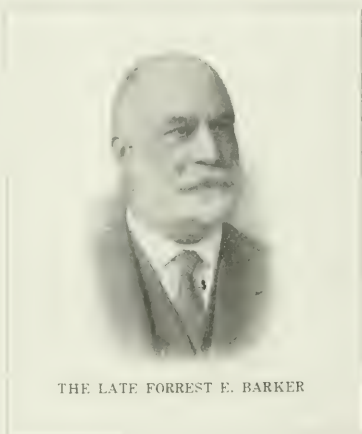
In 1885 he was appointed a member of the Gas and Electric Light Commission by Governor Robinson of Massachusetts, the board having just been created by the Legislature along the lines of a bill drafted by Mr. Barker himself. The regulation of these utilities was then in its infancy, and in the pioneer days of the commission Mr. Barker rendered invaluable service to the State, becoming chairman of the board in 1894 after nine years of fundamental and painstaking effort to establish and maintain a constructive policy which should be just to the public and the companies alike. Of a conservative temper of mind, he was thoroughly alive to the progress of the great industries under his supervision and responsive to the needs of the consumer and the welfare of the general public. All through his chairmanship Mr. Barker strove to administer justice with conscientious and unsparing labor, and while his mind was of the deliberate type, it worked with great precision and adhered with the utmost tenacity to decisions reached. It is to a large extent due to him that the policies and decisions of the commission have been extraordinarily free from inconsistencies; that the board has been growing stronger year by year in its grasp of the important problems placed before it, and that its acts have been sustained and reinforced by the courts and the Legislature. That the commission was not abolished at the time of the creation of the Public Service Commission in 1913 was in no small part due to the years of devoted service and wise direction given by Mr. Barker in his responsible office.

In speaking of Mr. Barker, Gen. Morris Schaff, associated with him on the board since 1893, expressed the heavy loss which the commission has sustained and said that the late chairman was the ablest man with whom he had ever had the privilege of working; that he was the wise counselor of many other commonwealths in relation to public utility regulation, unswerving in his loyalty to the cause of right as he saw it and, while slow to reach a conclusion, possessed of a comprehensive grasp of the needs of the companies and the public, and firm in the support of his convictions. Both the companies and the public owe the deceased commissioner more than is realized, the former having extraordinary confidence in his sympathetic understanding, which also was not wanting in his treatment of the latter. Commissioner Weed also spoke feelingly of the board's affliction and commented upon the judicial qualifications of his late associate and the soundness of his views.

Gov. David I. Walsh of Massachusetts said that in the death of Mr. Barker the State has lost its ablest commissioner, and that as chief executive he had enjoyed the closest and most friendly relations with the late

chairman, valuing his counsel upon every phase of commission work and relying upon him in many other ways, although the two were of different political faiths. Few if any of the Governor's advisers possessed his confidence to a greater degree and none had greater capacity in investigating and reporting upon the advantages and drawbacks of specific policies. The Governor said: "Mr. Barker loved the work, he was 'always on the job,' he was endowed with a peculiarly judicial mind, never giving offhand opinions, and he was a constructive thinker and administrator whose abilities were ever at the service of the State and whose counsel was of the greatest value in shaping legislation."

President Charles L. Edgar, of the Edison Electric Illuminating Company of Boston, said that in his opinion Mr. Barker was the best-posted man on public service in the country; that in twenty-five years' association with him relations of close personal friendship had come about between the two, and that the chairman's death is a heavy loss to the State and to the companies. Mr. Edgar said that Mr. Barker was entirely competent to run a public utility from the company end, that he was absolutely straight in every detail of his official life, and that he possessed the confidence of the public



THE LATE FORREST E. BARKER

no less than of the companies, although his work was quietly done, many of his best activities being employed in the informal adjustment of matters brought to his attention.

Mr. Everett W. Burdett, general counsel of the National Electric Light Association, said:

"The death of Mr. Barker is a serious loss both to the public service and to the lighting interests of Massachusetts. By reason of his long experience, his laborious and untiring studies, his infinite patience and his native ability he had long been the best equipped public service official in the State. While his methods were laborious and his processes sometimes circuitous, his conclusions were usually sound. I think one word more fitly expresses his leading characteristic than any other, and that word is 'wisdom.' Mr. Barker was wise in a large sense. He recognized both the reasonable demands of the public and the legitimate rights of the corporations. He held the scales so evenly that the contending interests with which he dealt usually came to recognize the propriety of his actions and the fairness of his decisions, however much they may have experienced the temporary sting of defeat."

Mr. A. Stuart Pratt, of the Stone & Webster Management Association, Boston, Mass., said that Stone &



Webster learned with sincere regret of Mr. Barker's death. The commission was the first in the United States to cover this class of public service; the experiment was approved by the people and served as a model which has been followed in many other states. Mr. Barker became a member of the board as a young man and had been largely responsible for its policy ever since. His wise counsel was a great benefit to legislature after legislature both in shaping good legislation and in suppressing bad. For a comparatively small salary he made his lifework the service of the State. Honest and conscientious always, he held the esteem of those who came in contact with him. By his death the people suffer a serious loss, as no matter how able may be the man who takes his place, the knowledge which Mr. Barker had acquired by his long years of service in respect to conditions both within and without the companies can be attained by no man except after similar years of arduous work.

Mr. A. B. Tenney, of C. H. Tenney & Company, Boston, also expressed a keen sense of the loss to the State which has come in the closing of Mr. Barker's life and spoke appreciatively of his painstaking, conscientious devotion to the duties of his office.

### New Street-Lighting Contract for Boston

A new street-lighting contract was submitted to the Boston (Mass.) City Council on Nov. 18 by Commissioner of Public Works L. K. Rourke, following conferences with President Charles L. Edgar, of the Edison Electric Illuminating Company. The contract contains several concessions to meet the objections of the Council to previous drafts, the most important feature being a clause providing for compulsory arbitration of the price per lamp per year at the end of five years. The contract reads for a term of ten years, and the proposed price of \$87.53 per 6.6-amp magnetite lamp is subject to arbitration by the Gas and Electric Light Commission immediately after approval by the City Council. It is also provided that the city shall be allowed 75 per cent of any future saving in carrying out the contract, and in case of disagreement between the city and the company between arbitrations each may select an arbitrator, the two selecting a third. A public hearing will be given on the contract on Dec. 1 at the Boston City Hall.

### Western Association of Electrical Inspectors

Mr. J. H. Miller, general superintendent of the Otis Elevator Company, Chicago, will read a paper on "Elevator Control Wiring" at the annual convention of the Western Association of Electrical Inspectors, to be held at the Hotel Radisson, Minneapolis, Minn., Jan. 26 to 28. Hazards in electrical wiring and construction introduced by the use of nitrogen-filled tungsten lamps of large sizes, the motor operation of motion-picture machines, etc., will be among the topics to be discussed. President George E. Vincent, of the University of Minnesota, will also address the inspectors and on Thursday evening at the joint dinner with the local section of the A. I. E. E. Mr. C. H. Pillsbury, Minneapolis, will speak. Friday will be given over to local inspection trips. Coincidentally with the sessions of the inspectors the Minnesota Electrical Contractors' Association and the Minnesota sections of both the A. I. E. E. and the A. S. M. E. will hold meetings. To celebrate its tenth annual convention, the inspectors' association will have the wives of its members present as guests on this occasion. Members from the Chicago territory will gather at Chicago, whence a special train is to be

run to Minneapolis. Mr. W. S. Boyd, Insurance Exchange Building, 175 West Jackson Boulevard, Chicago, is secretary-treasurer of the association.

### Meeting of Ohio Contractors

The Ohio Association of Electrical Contractors met in Dayton, Ohio, last week, for its semi-annual convention, about twenty-five members attending. President Charles Aull, of Cincinnati, presided, other officers present including Secretary F. M. Grant, of Cleveland, and Treasurer William G. Rauter, of Cincinnati. Many of the topics discussed at the meeting with the greatest interest fell under the "safety-first" classification, the contractors placing themselves vigorously on record against the wiring of houses already built by any except experienced men, and advocating stringent regulations governing wiring under all circumstances, in order to avoid the danger from fire which results from improper wiring. The State law giving municipalities the right to license contractors, of which Cleveland, Cincinnati and Youngstown have already taken advantage, was also discussed.

### Ohio Electric Light Association Discusses New-Business Co-operation

A most interesting, instructive and largely attended meeting of the committee on new-business co-operation of the Ohio Electric Light Association was held at the Hotel Gibson in Cincinnati on Nov. 18, with approximately 100 delegates in attendance representing different central stations throughout Ohio, Kentucky and Indiana, together with a number of representatives of manufacturers of electrical apparatus in the vicinity of Cincinnati. The chairman of the committee, Mr. Thomas F. Kelly, sales manager of the Dayton Power & Light Company, presided. Mr. W. W. Freeman, president and general manager of the Union Gas & Electric Company of Cincinnati, extended a hearty welcome to the delegates and drew attention to the importance at this time of securing all the business possible at a minimum of expense. Mr. D. L. Gaskill, secretary of the association, responded and spoke of the fine work of the different standing committees of the association.

Mr. Dexter Rollins, of the Simplex Electric Heating Company, of Chicago, read a paper entitled "Industrial Heating as Power Business," which created considerable interest and was discussed thoroughly by Messrs. J. C. Matthieu, F. E. Morrison, L. C. Anderson, H. B. Bixler, T. J. Ryan, J. E. North, D. L. Gaskill, J. W. Schrantz and G. C. Gillie. At the close of the morning session the delegates adjourned to the Cincinnati Jovian League lunch room in the annex of the "blue fountain" room in the hotel, where they were addressed by Mr. W. C. Culkins, executive secretary Cincinnati Chamber of Commerce, on "Salesmanship."

At the afternoon session Mr. R. A. MacGregor, of the Toledo Railway & Light Company, presented a paper entitled "Vital Points on Power Sales Work." This paper also created a large amount of interest and a very hearty discussion. Among those who discussed the paper was Mr. Harry Adams, of the Nagel Electric Company, Toledo, Ohio, who drew attention to the spirit of co-operation that existed in Toledo, where business is sought for by representatives of the electric manufacturers, jobbers and central stations co-operatively. In this way the central station not only has its own means of securing the business but the help of the live representatives of the other concerns interested in the developments of the business in Toledo. Mr. Adams made the

statement that 8000 hp in motors had been sold in Toledo during the past year on long-time payments. A number of other delegates spoke of the same spirit of co-operation that existed in their different communities.

Secretary Gaskill drew attention to the standing offer of the committee on new-business co-operation to secure the services of an expert on motor load from some of the large central stations in Ohio for any small central stations in Ohio who wished to secure some particular piece of motor business. Following the discussion of this paper, the delegates went into a regular round-table discussion on different methods of securing business under the following headings: Electrical advertising, wiring of old houses, methods of selling electrical appliances, and methods of securing power business.

Practically all of the delegates had something to say as to what they were doing to secure these different classes of business. The meeting was one of the most profitable held in connection with the work of the committee since its inauguration the early part of 1914. The next meeting will be held in Cincinnati on Jan. 20, 1915. A tentative program has already been arranged.

### Electrical Credit Association of Chicago

The nineteenth annual meeting of the Electrical Credit Association of Chicago was held at the Chicago Athletic Association on Nov. 19. In his address President A. O. Kuehnmsted, Chicago, declared that the recent business depression has affected the electrical industry to a much less extent than other classes of business. The report of the secretary-treasurer, Mr. Frederic P. Vose, Marquette Building, Chicago, showed an enrollment of 232 members, an increase of thirty-seven during the year. Mr. F. M. Pierce reported on the national convention of electrical credit associations held at Buffalo in June, and Mr. H. E. Wilkins read the report of the nominating committee, which was unanimously accepted, officers being declared elected as follows: President, Mr. Henry Schwab, secretary and treasurer Monarch Electric & Wire Company, Chicago; vice-president, Mr. A. O. Kuehnmsted, general manager Gregory Electric Company, Chicago; secretary-treasurer, Mr. F. M. Vose, Chicago; national representative, Mr. F. M. Pierce; members of the national committee, Messrs. Benjamin P. George and E. M. Hawley.

Moral-risk clubs and local business conditions were discussed by Messrs. C. C. Gray, Detroit Insulated Wire Company, Detroit; Ernest B. Dalton, Post-Glover Company, Cincinnati; W. J. Burton, Frank Adams Electric Company, St. Louis; E. W. Shepard, Western Electric Company, Cleveland; Edward Pfeiffer, Andrae & Sons Company, Milwaukee, and W. P. Vose, Chicago. Mr. Gray made the statement that he based his own credit allowances about one-quarter on the reports of the mercantile agencies and three-quarters on the reports furnished by the association. The matter of individual moral risk, he pointed out, is, however, more subtle, and the best results are gained from personal discussions between credit men at such meetings as the moral-risk club luncheons. The work of the Electrical Credit Association was discussed by Messrs. J. D. Meek, Indianapolis Electrical Supply Company, Indianapolis; W. P. Johnson, Manhattan Electrical Supply Company, Chicago, and C. C. Miner, Robbins & Myers Company, Springfield, Ohio.

"The Basis of Establishing Credit Limits" was the subject treated by Messrs. T. I. Stacy, Electric Appliance Company, Chicago, and Alexander J. Klein, M. Klein & Sons, Chicago. Evils of cash discount allowances after the lapse of the discount period were dis-

cussed by Messrs. J. N. Kirby, the Consumers' Rubber Company, Cleveland, and F. W. Seywert, Erner Electric Company, Cleveland.

Secretary F. P. Vose acted as toastmaster at the dinner in the evening, when addresses were delivered by Dr. J. T. Stone, Mr. E. D. Hulbert and others.

### MR. WAKEMAN ON BUSINESS IMPROVEMENT

General Manager of Society for Electrical Development  
Sees Encouraging Factors

Mr. J. M. Wakeman, general manager of the Society for Electrical Development, Inc., expressed the belief, in talking with a representative of the *Electrical World*, that general business conditions are getting better each day.

"When the war was started," said Mr. Wakeman, "people in all parts of the country were almost as panic-stricken as if the conflict had involved this nation. At first general business was prostrated, but in the last few weeks it has been resuming its normal activity gradually and surely. I have been in touch with many men connected with the electrical industry in various parts of the country, and the only people I find suffering from the effects of the war are those whose financial support was obtained abroad and those whose communities include many factories that are largely dependent on export trade. Even among manufacturers who are largely dependent on export trade I find a number who state that business is becoming normal in every respect. For instance, in Cincinnati, where I am creditably informed the central-station motor-service load is above rather than below normal, machine-tool manufacturers are thriving upon the still existing foreign trade. From California reports are received of the largest crops in the history of the State and a demand therefor from European belligerent nations which promises consumption for the entire product at good profitable prices. From the Southern States we are getting reports which indicate that they are recovering from the depression that swept over them and that in some cities mills are now running on full time.

"I can see only one outcome of the situation. With the continent of Europe practically stopping production and the United States the only large country still producing, an era of larger business must follow. This, however, will not be forced upon us. Financiers and manufacturers in the United States must recognize that prosperity will come to those who seek it most diligently and that one of the first requisites in the struggle is confidence. We do not need to be over-optimistic, but we do need to show faith in ourselves and to let others feel that we make the most of the encouraging factors in the situation. Without an attitude of this kind we would fail to take full advantage of the opportunities which undoubtedly lie just ahead of us.

"The society, of course, is devoting its energy to the development of the electrical industry and, except that its members recognize the general feeling and the desirability of conservatism until the future is a little surer, it has not been affected by the war. We recognize the necessity of extending business in every possible direct and indirect way and at this time are especially interested in development work. With that object in view we are doing all we can to help central stations to increase their load. This policy will reduce the burden of overhead expenses, which central stations are more likely to feel in these times than in generally prosperous seasons, and will do a great deal to increase their business for the future years."



## OPPORTUNITIES BROUGHT BY WAR

Secretary Redfield and Others Tell Washington Engineers of Trade Stimulation and of Prosperity in Sight

The Washington Society of Engineers held its annual dinner at Rauscher's in Washington on Nov. 19, with Mr. William Bowie, the president, as toastmaster and with a number of prominent men as speakers. Among these were Secretary William C. Redfield of the Department of Commerce; Mr. Winthrop More Daniels, a member of the Interstate Commerce Commission; Dr. Henry Sturgis Drinker, president of Lehigh University; Dr. Bailey Willis, consulting geologist to the Argentine government, and Mr. Marshall O. Leighton, consulting engineer, of Washington, D. C.

Mr. Leighton, who described the effect of the war upon the American engineer, declared that the war has postponed advancement.

Mr. Daniels said in part: "It is interesting to note that in its evolution from the status of an exceptional employment to that of a recognized profession engineering has been forced, little by little, to take account of other laws and forces than those of mathematics and physical science. Primarily designed to effect certain well-defined technological results, it has increasingly had to take account of economic and social considerations, of the fluctuation of prices and price levels, and of varying rates of pecuniary return. Besides mathematics, it has had to study markets; besides excavation, it has had to study sanitation; besides strength of materials, it has had to study strength of motives to save and invest; and thus eventually engineering has been forced to embrace within its horizon the age-long problem of the Sphinx—the ascertainment and the quantitative appraisal of matters relating to justice and equity between man and man."

Dr. Drinker spoke on "Public Service Movements in Our Universities and Colleges," telling particularly of the growth of the movement for the conservation of natural resources. Dr. Willis told of the opportunity of the American engineer in South America.

Mr. Redfield said in part:

"Economy lies always in wise expenditure. It is not what is spent but what is gained for what is spent that tests economy. He who deals penuriously in engineering costs suffers through engineering laws as well as the laws of nature.

"The United States has mobilized its wealth and property for the protection of its people during the European war. There are three points in the crisis of the world to-day as inexorable as the laws of nature with which you deal—first, the shock, then stimulation, and finally readjustment. The period of shock we have happily passed. We are entering the period of stimulation with the utmost optimism. The period of readjustment will pass readily or with difficulty as we keep our heads during the two preceding periods.

"Trade is now stimulated. An army in the field is five or six times as heavy a consumer as the same number of men in times of peace. The shock had for us a peculiar significance. In all previous great financial crises since we became a great fiscal power we have been able to call on the other world powers for assistance. The war cut off such aid. Further, we are a debtor people. There are thousands of millions of foreign money invested here. Hardly a great railroad is not owned or controlled by foreign capital. Not only were we forced to bear the shock of outside aid being cut off but we were met by demands from other countries to pay. That is a financial crisis that the United States has met and happily passed which the general public reckoned little of.

"South America is craving American trade. With

the exception of Italy we are the only great industrial country, and we are the only great financial country that is in a position to engage in this trade. For the engineer there is a wide-open door of opportunity to carry in American enterprise. It is a great opportunity for your constructive enterprise. It brings to your profession a field hardly opened to it before."

## THE CLEVELAND MUNICIPAL PLANT

History of the Ohio City's Competition with the Local Illuminating Company and Its Efforts to Establish a 3-Cent Rate for Electrical Energy

Partial operation of the new Cleveland municipal central station in competition with the Cleveland Electric Illuminating Company has been started. This plant is the outgrowth of a small system which the city has operated since 1906. The city has had three small plants without physical connection, each operating in a restricted area. The new plant is to take the place of these.

The fact that the city can thus engage in direct competition with the company without conflict with the Ohio regulative law is due to the unusual absence of a clause in the law preventing such duplication of facilities. Unlike many public service commission laws, the Ohio law does not give the commission the right to prevent duplication of a company service by a municipality. It does not protect an existing company against such competition or a community from the loss which occurs to it by reason of the waste occasioned by the duplication of plants.

The beginning of the Cleveland municipal system in 1906 arose from the annexation of the suburb of South Brooklyn, which had built a plant from the proceeds of an issue of \$30,000 in bonds. This plant has been enlarged until at present it represents a value of around \$400,000. To the original investment, according to the city, over \$101,000 has been added from taxes and over \$219,000 from the general fund. In a similar way the city acquired a small plant when the village of Collinwood was annexed. Forty thousand dollars of village bonds had been issued to establish this plant. Of these bonds \$18,000 are due on Jan. 1, 1915. An ordinance is now pending in the City Council for the renewal of these bonds, although the generating plant is about to be abandoned. The remaining \$22,000 bonds fall due in 1916. There has also been electrical equipment in the Division Street plant of the city water-works department. Water department funds to the amount of \$35,000 were used to install it about two years ago. It is now being dismantled. The value of the three plants is estimated by city officials at present to be about \$500,000.

The amount available for the new plant was \$2,500,000, so that the total city investment as now contemplated by officials will be \$3,000,000. According to present plans, the three old generating stations are to be abandoned and scrapped as soon as the necessary connecting lines to the new generating station are completed. During the eight years the city has been engaged in the electric-lighting business it has collected exactly the same rate for street lamps as is paid to the private company, and prior to May 1 of the current year its rates for residence lighting averaged about the same as the rates of the private company. It has not, however, set aside any depreciation fund out of earnings, so that the scrapping of these generating stations will probably result in a complete loss to the taxpayers of the investment represented by the scrapped machinery. If to this be added lost interest on the

whole investment, lost taxes and depreciation on the distribution system, the equivalent of the entire original investment derived from taxation and bond issues has been lost.

Of the \$2,500,000, \$500,000 represents the proceeds of bonds which the city authorities were able legally to issue without a referendum. The \$2,000,000 bonds were approved specifically by voters. Of the \$2,000,000 bond issue the actual disbursements on July 1, 1914, were \$998,340; the amount of cash on hand unspent was \$1,001,669; the total amount spent, including commitments for outstanding contracts on which payment had not been made, was \$1,319,859. Obligations to the water department for property transferred and cash advances of perhaps \$250,000 are not, it is believed, in these figures. Compared with these figures the investment in the property of the Illuminating company is stated officially to be about \$17,500,000.

#### Comparison of the Systems

A comparison of the capacity of the systems will be interesting. The municipal plant has installed three Allis-Chalmers steam turbines of a normal rating of 5000 kw, a maximum continuous rating of 6250 kw and a maximum rating for two hours of 7500 kw. The Illuminating company has in operation at its two stations at present units with a maximum rating of 98,000 kw. There are now being installed units with an additional rating of 20,000 kw, making 118,000 kw. The additional machinery installed this year is the same in rating as that which was added last year, the normal growth of business having warranted these additions.

The capacity of the municipal plant is based, of course, not on business that it has but on that which it hopes to get by invading the Illuminating company field. The load on the new station was stated by city officials on Aug. 5 as 2400 kw. To this should be added the load, approximately 400 kw, in the Brooklyn plant, which is to be transferred to the larger station, and also the load of the Collinwood plant.

It was stated by city officials that probably 1000 kw would be added to this load within the next two weeks after Aug. 5, but no figures subsequent to those stated have been received. From these data it is evident that the business thus far connected is far short of the plant capacity. There is no fair basis for comparison of earnings of the Illuminating company and the municipal system under present changed conditions, but figures of the last year reveal the differences under the old conditions. In 1913 gross revenues of the Illuminating company were \$4,008,776. The revenue from energy sales by the Brooklyn plant was \$185,699. Gross revenue of the Collinwood plant in 1912, the last available figure, was \$35,496. This indicates a total revenue of roughly \$225,000. Owing to the reduction in municipal rates the revenue per unit in future will be less. As the new plant did not begin even partial operation until late in the summer and started then with only a small load, it is scarcely likely that the 1914 report can show a large or material total increase.

#### Electric Railway Fares and Energy Rates

Other elements enter into the history of the Cleveland experiment. When Tom L. Johnson was Mayor the city was threatening and hostile. Three-cent electric railway fare was then the political issue. The 3-cent electric railway fare was made possible mainly by a forced valuation which compelled a reduction of 45 per cent in the outstanding Cleveland Railway capital stock. Strangely enough, shortly after the long discussed 3-cent municipal-light plant started partial operation the electric-railway fare was advanced to 3 cents cash fare plus 1 cent for a transfer. This makes the

cash fare for passengers who use transfers 4 cents.

The analogy and easy progress from 3-cent electric railway fares to 3-cent energy for lighting attracts the attention of observers of Cleveland affairs. There is a general belief that this analogy had something to do with the rate and the slogan adopted in the campaign against the Illuminating company. Strength is given to this idea by the popularity of 3 cents as a unit in Cleveland. The city is in other 3-cent enterprises. One example is the operation of 3-cent municipal dance halls in the public parks and another is the operation of municipal refreshment stands in the public parks at which 3-cent as well as 5-cent portions of ice-cream, lemonade, milk and buttermilk were sold in summer. It is stated on behalf of the city, however, that the sales of 3-cent portions at the municipal refreshment stands are small.

The statement that the analogy between the figures was mainly responsible for the selection of 3 cents as a unit selling price for electrical energy is not confirmed by city officials. They explain that they had estimates from engineers that energy could be produced and sold for less than 3 cents, but that to be on the safe side they made the maximum rate 3 cents. It is not pretended by anyone that the electrical situation has not been in politics. It was there in the time of Mayor Johnson, although in the years of his rule lighting was subordinated to the electric railway. During the administration of Mayor Baker the question of the municipal plant has been a leading one.

If nothing else had done so, the fact that the proposed issue of \$2,000,000 bonds had to be voted on would have made the issue political. In the last mayoralty campaign much agitation took place over the bond proposal. Directors of the Chamber of Commerce of Cleveland objected to the proposal on the following grounds: "Because the Legislature has created a public utilities commission; because other municipal projects requiring the issue of bonds demand commencement or completion; because the municipal ownership of public utilities under the present political conditions, with the civil service law in operation less than two years and partisanship and the spoils system still dominant factors to be reckoned with in municipal government, is an experiment involving greater public dangers than advantages." After the voters authorized the bond issue on Nov. 7, 1912, the city administration went ahead. The legality of the bonds was contested but was upheld by the Ohio Supreme Court. Other steps were taken in court by taxpayers who claimed that the city sinking fund commissioners were disposing of bonds in their keeping at less than par in order to buy municipal light bonds at par and thus hasten construction of the plant. This charge was disproved in court.

After the bonds had been declared legal they were bought by a syndicate composed of Hayden, Miller & Company of Cleveland, Rhoades & Company of New York and Merrill, Oldham & Company of Boston. They have been marketed principally outside of Cleveland as the interest rate is not enough for local investors. They are secured by the credit of the city.

The city selected a site in the East Side factory district on the shore of Lake Erie. It used ground belonging to the water department. City officials state that the appraised value of this ground, about \$141,000, will be paid to that department by the light department, but, according to the information available, this had not been done when this article was written. Construction of the plant proceeded slowly, and it was some months after the early promises of completion before it was ready for even partial operation. When it was believed that the plant would be in early operation the City Council passed an ordinance making the maxi-



imum rate of private companies 3 cents per kw-hr. This ordinance, if effective, would place the companies on the same maximum revenue basis as the municipal plant. Two small companies operate independently in limited areas in the city, and they, as well as the Illuminating company, were subject to this legislation. After introduction of the ordinance, Mr. S. C. D. John, secretary of the Illuminating company, wrote a protest to the Council. He said in part:

#### Contention of the Company

"Twenty years ago the company started business in Cleveland. During this period it has been the company's policy to reduce rates for service as rapidly as the reduction in costs and improvement in the electrical art would permit and still enable it to maintain a high standard for excellence of service to the whole community. An inferior service in a restricted territory could doubtless have been rendered at a less cost, but we have considered it an obligation to serve the entire community with the best service obtainable.

"In pursuance of this policy rates for electric service in the home have been reduced by the company from 12½ cents in 1897 to an average rate of less than 6½ cents for all electricity used in residences for the year 1913. The cost to the city of a street arc lamp in 1897 was \$94.80 per year. The price to the city for the year 1914 is \$49.80 per lamp.

"These reductions have been made gradually, from time to time, and have been made by the company voluntarily. In addition to this substantial reduction in the cost per unit, there has been a further reduction brought about by the greatly increased efficiency of incandescent lamps, so that to-day the consumer obtains as much light for 3 cents as he could get in 1897 for 12½ cents. In other words, the consumer obtains four times as much light to-day as he did in 1897 for the same amount of money. In this same period the general cost of living has advanced from 40 to 60 per cent.

"In comparison with this record the rate of 40 cents per 1000 cu. ft. charged for water by the water-works—owned by the public and operated by the city—has not changed during the entire period.

"The company's policy regarding extensions has been liberal. It has run lines wherever there has been a reasonable demand for service, and this has meant in many cases an investment producing but a meager return thereon. A less liberal policy on the part of public service companies tends to congestion of population and consequent unhealthful conditions because it inevitably retards the development of residence growth into outlying districts.

"The company has always considered that its welfare is bound up with the interest of the entire community and, so believing, it has endeavored to so shape its policy as to retain the good will of the people whom it serves as well as to promote the industrial business life of the city.

"The company recognizes that it is a most natural desire for the users of its service, as well as those who may expect to become users of its service, to secure such service at the lowest possible cost to themselves; but we are confident in the belief that they neither desire nor would they approve of the enforcement of unjust conditions to bring about such a result.

"Since the company began business in Cleveland it has anticipated the necessity for compulsory regulation by voluntarily reducing rates whenever possible. The city, however, has seen fit to enter this field as a competitor and otherwise to impose onerous conditions of operation, with which conditions—for its own plant—it has not deemed it necessary to comply. The city has gone into competition with the company but has denied

to the company the privilege of competing in the territory occupied exclusively by the city. We submit that a rate which would be reasonable when this company had the entire field may easily prove to be insufficient when the possible loss of business, added to the expenses of securing business and additional business risk incident to competition, are considered.

"The pending rate ordinance, we believe, is unfair and unjust. The maximum rate imposed is based on neither the logic of reason nor any recognized principles of rate-making. The mere fact that 3 cents has been adopted as being the proper rate for a street-car ride makes it no measure of the value of a unit of electricity any more than it makes it the measure for the price of a sandwich or a glass of beer.

"Entirely aside from the foregoing considerations, we submit that the whole principle of public regulation of public service companies rests on the principle of exact justice, first to the public who are users of the service, and next to the person or company that furnishes the service. Public regulation of utilities is a judicial rather than a legislative function, and only an impartial tribunal can act disinterestedly. The city, by itself electing to compete for the electrical business of Cleveland, has placed itself in a position where it must of necessity be a prejudiced judge when it undertakes to regulate the terms upon which its competitors may do business.

"For the city to engage in any business and at the same time exercise the functions of prescribing rates and conditions of operation for its competitor is so obviously unfair that it needs no further comment."

#### Valuation Under Way

Nevertheless, the Council passed the ordinance. The companies concerned then appealed to the Public Service Commission of Ohio, with which the maximum rate issue now rests. The city has authority to make rates, but if rates are made that imperil the return on the property, a company has the right of appeal to the commission. A valuation is now under way.

It is a notable fact that even in those quarters of the city administration which appear to be most hostile to the company the company service is admitted to be excellent. In fact, there is in the city hall and among city officials generally a pride that is not repressed and a belief that the lighting and motor service found in Cleveland is far superior to that of most other cities. The city officials, however, do object to the company rates. It is the belief of observers that the testimony of city officials as to the excellent character of company service represents the attitude of the city generally.

Voluntarily the company has made steady reduction in rates. Until the last ordinance was passed no regulating ordinances had been enacted by the city in twenty years. Prior to 1893 an incandescent-lighting flat rate was used without meters. In 1893 the city passed an ordinance fixing a maximum rate of 12½ cents per kw-hr. In 1896 the Illuminating company adopted the two-rate system, 12½ cents per kw-hr. for sixty hours' use of rating in any month and 5 cents for all energy used in excess of sixty hours' use of rating. In 1901 the company reduced rates by requiring only fifty hours' use of rating. In 1905 a further reduction was made to forty hours' use of rating. In 1906 a reduction was made to 30 hours' use of rating. In 1911 the maximum charge was reduced to 10 cents per kw-hr. for the first thirty-six hours' use of rating and 5 cents for all in excess of thirty-six hours in any month. The changes in rates since 1896 are shown in the accompanying table. The reduction in the city arc rate from 1896 to Jan. 1, 1906, when the city acquired the Brooklyn plant, was 22.4 per cent; from Jan. 1, 1906, to the pres-

ent it was 32.3 per cent. The reduction in the average rate for motor service from 1899 to Jan. 1, 1906, was 16 per cent; from Jan. 1, 1906, to the present it was 39 per cent.

To take charge of the design and construction of the new city plant as well as the management of the city lighting business Mr. F. W. Ballard was selected. Mr. Ballard began his service on Feb. 1, 1912, before

TABLE SHOWING CHANGES IN COMPANY RATES SINCE 1899

Year	Rate	Notes	Motor Service Rate
1899	\$1.80		
1900	93.24		
1901	96.24		
1902	80.88		
1903	87.00		
1904	82.92	Jan. 1, 1904	1.88
1905	82.92		1.616
1906	75.00		
1907	75.00		
1908	75.00		
1909	73.56	May, 1909	1.406
1910	69.72		1.406
1911	67.92	June, 1911—5 cents (30 hours)	3.456
1912	54.36		3.050
1913	54.36		2.522
1914	54.36		2.522
1915	53.88	June, 1915—5 cents (36 hours)	4.480
1916	51.96		2.522
1917	49.80		2.522

\*Motor service consumption for 1914—1,000 kw-hr.

the public approved of the \$2,000,000 bonds. He had been chief constructing and consulting engineer of the Sherwin-Williams Company. Mr. A. B. du Pont was appointed consulting engineer.

#### Statement of Mr. du Pont

Mr. A. B. du Pont, who acted as consulting engineer in the construction of the plant and resigned upon the substantial completion of the structure, expressed the following opinion to a representative of the *Electrical World*: "As to the question of results of operation of the new plant I do not know. It starts with an advantage over the private plant in two particulars. In the first place, the cost in proportion to capacity is relatively low compared with what private plants heretofore have cost; its efficiency in so far as design is concerned is at least equal. In the second place, the rate of interest that the city will be required to pay on the cost is less than  $4\frac{1}{2}$  per cent, whereas private capital in the past has been forced to pay and is paying anywhere from 6 to 20 per cent. If the new municipal plant can have any disadvantage compared with the private plant, it must be in the cost of labor and material involved in the production of energy and in the maintenance of the plant. Time alone can tell to what extent the money expended in operation and maintenance of the plant will tend to destroy the advantages already mentioned. The civil service rules of the city might hamper the operation of the plant a little."

#### Statement of Mr. Ballard

Mr. Ballard stated to the *Electrical World* that the plant will have three 7500-kw maximum-rating Allis-Chalmers steam turbines, which have been purchased new, and one 1500-kw Westinghouse steam turbine, which will be transferred from the Brooklyn plant. There will be installed six 1000-hp special-type double-fire Sterling boilers similar in design to those in the Detroit Edison Company plant. These boilers will be equipped with Taylor stokers capable of operating at 300 per cent rating. There will be installed a Green economizer with 27,000 sq. ft. of heating surface. A steam pressure of 250 lb. will be carried on the boilers and 150 deg. Fahr. superheat. Current will be generated at 11,000 volts which will be used for under-

ground distribution for substations to be constructed in various parts of the city. The station will be used for all purposes for which central stations are generally operated. A large part of the street lighting for the city will be done by the station, and in addition the general business of residence and other lighting as well as a general motor-service load will be put on the plant. Mr. Ballard will read a paper on the plant before the American Society of Mechanical Engineers.

The general conclusion to be drawn from a study of the situation in Cleveland is that the city has invested in the plant without any more knowledge or promise of what it can do than might be had by a similar private competitive plant. It has equipped a huge plant for the generation of electrical energy on a large scale. Beyond that point it has had no experience to guide it except on the small scale permitted by its earlier plants. Problems of transmission and sale of the service and energy are almost wholly before the city. Whether or not it will be able to solve those problems cannot be foretold at this time. Upon the answer the success of the experiment rests.

The plant has been erected in a factory district in order that if possible it may build up a large motor-service load. Criticisms that no effort is being made to extend 3-cent service to the residence districts, which comprise, of course, the centers of largest population, are answered by city officials by the statement that it is necessary for them to get first a large motor-service load. Then, they say, they can accommodate the residence load at 3 cents.

The city has made an enormous investment in a monumental experiment. It has not hesitated to set itself in competition against the company in every possible way. It is openly soliciting company business. It is sending solicitors to company motor-service customers and offering them lower rates. It has a new-business organization at the head of which is a former employee of the Illuminating company. It has, however, no such valuable organization as the company has developed. It cannot offer, and has evidently made no effort to offer, the valuable engineering service to patrons which is a feature of the company organization. It does not go into a plant and suggest and criticize as does the company organization. It has no one to give service of that kind. Its motor-service rates run as low as 1 cent per kw-hr. The company rates, so far as its largest customers are concerned, are lower. The contract of the Illuminating company with the Cleveland Railway provides for payment in accordance with consumption, and at present this rate is 7 mills per kw-hr.

Everything indicates that the city officials fully realize the uncertain situation in which they stand at the present time. They have not made a success of the municipal venture, but they have not yet gone far enough with it to enable fair judgment to be passed on their ability to manage it. No matter how low a rate they reach on their production of energy, large and serious costs will arise in transmission and sale. With these costs they have not yet gone far enough to learn the effect on operation. It is clear that some time will have to elapse before the municipal plant can get a reasonable load approximating its capacity. This may require one year. It may take two years, three years or even more. The longer it takes, the heavier is the burden of capital cost which is part of the fair cost of the plant. Until a load approximating the maximum rating is obtained the cost of operation and maintenance will, of course, be far above the minimum desired.

Officials of the company express great confidence in the character of their service and in the economy of their capital, operation and maintenance charges.



## PUBLIC SERVICE COMMISSION NEWS

## Current News Notes

## District of Columbia Commission

The commission has notified the Potomac Electric Power Company that it has declared void four contracts with Washington consumers which antedated the Public Utilities Commission act. The commission announced that it would send notices to this effect to the company and the consumers with a statement that if the contracts were not canceled by a given date both company and consumers will be deemed liable to fines as provided in the act for not observing regulations of the commission.

## Idaho Commission

Mr. W. D. Standrod, of Pocatello, has resigned as a member of the Idaho Public Utilities Commission on account of personal reasons.

The Public Utilities Commission has rendered decisions reaffirming its determination not to grant certificates of public necessity and convenience to companies to enter a field which is being adequately served by the existing company. The decisions had reference to the application of the Idaho Power & Light Company and Clear Lake Power & Improvement Company to enter the field supplied by the Great Shoshone & Twin Falls Water Power Company in the counties of Twin Falls, Gooding and Lincoln.

## Indiana Commission

Attorney-General Thomas M. Honan has given an opinion to Mr. Charles J. Murphy, of the Public Service Commission of Indiana, holding that the war-tax bill passed recently by Congress does not affect in any way the relationship between the commission and the utilities. Mr. Murphy had submitted to Mr. Honan the provision of the war-tax measure for the payment of a 1-cent tax on telephone or telegraph messages. Mr. Honan declared that the war-tax measure is one that is to be handled only between the utilities and the federal government and that it cannot in any way affect state laws regulating utilities.

## New York Commissions

The last argument in the long-pending Westchester Lighting Company cases was presented before the Second District Commission on Nov. 10 by Mr. Charles F. Mathewson for the company and Mr. Joseph S. Woods for the complainants.

Mr. Mathewson argued that the rate of \$1.50 for gas in the complaining villages of Westchester County was not excessive inasmuch as the record proved that the return to the company on its investment at these rates was but a little over 4 per cent. He said that where the units to be served were scattered over a large territory, as they are in the Westchester villages, the larger investment required and the greater expense of distribution made unfair any comparison with the rates for gas in more densely settled communities. Mr. Mathewson described the territory served by his company as unique in that it consisted largely of small units scattered through a rocky, hilly countryside yet so close to the city of New York and growing so rapidly that constant improvements and extensions were demanded along with a constant demand for service of the highest class.

Mr. Woods told of the action of the New Jersey commission, which he said had established an almost universal 90-cent rate for gas in suburban territory.

Mr. Robert A. Carter, secretary of the Westchester company and vice-president of the Consolidated Gas Company, which controls the former concern, testified that a reduction in rates would seriously cripple the Westchester company.

**INDEPENDENT TELEPHONE ASSOCIATION OF AMERICA.**—The 1915 convention of the Independent Telephone Association of America will be held at the Hotel Radisson, Minneapolis, Minn., Jan. 19, 20 and 21. Mr. W. S. Vivian, 19 South LaSalle Street, Chicago, is secretary.

\* \* \*

**WISCONSIN ELECTRICAL CONTRACTORS.**—The twelfth annual meeting of the Electrical Contractors' Association of Wisconsin will be held at Milwaukee Jan. 18, 19 and 20. There will be several business sessions, an all-day open session and a dinner. Mr. Albert Petermann, 626 Lloyd Street, Milwaukee, is secretary.

\* \* \*

**ENGINEERS' SOCIETY OF MILWAUKEE.**—At the meeting of the Milwaukee section of the national engineering societies held at the Plankinton Hotel, Milwaukee, Nov. 20, Mr. Arthur J. Sweet, illuminating engineer with Vaughn, Meyer & Sweet, Milwaukee, gave a short talk on "Street Lighting Problems: Units, Poles and Systems."

\* \* \*

**OFFICIALS OF NATIONAL ASSOCIATION OF RAILWAY COMMISSIONERS.**—At the annual meeting of the National Association of Railway Commissioners, held in Washington, D. C., Nov. 17 to 20, the following officers were elected for the ensuing year: President, Mr. Clifford Thorne, of Iowa; first vice-president, Mr. Robert R. Prentiss, of Virginia; second vice-president, Mr. Max Thelan, of California; secretary, Mr. William H. Connolly, Washington, D. C.; assistant secretary, Mr. James B. Walker, of the New York Public Service Commission, First District.

\* \* \*

**MEETING OF NATIONAL CIVIC FEDERATION.**—Part of the program of the annual meeting of the National Civic Federation, to be held at the Hotel Astor, New York, on Dec. 4 and 5, will be devoted to the subject of public ownership. Prof. J. W. Jenks will review tendencies toward the substitution of governmental action for private enterprise. Ex-Governor Stubbs of Kansas and ex-Senator Jonathan Bourne of Oregon will open the discussion on the question "Shall the Government Own and Operate the Railroads, Telegraph and Telephone Systems and Municipal Utilities?" Congressman David J. Lewis, Dr. Frederick C. Howe and others will speak.

\* \* \*

**WASHINGTON SECTION, E. V. A.**—The first regular monthly meeting of the Washington Section of the Electric Vehicle Association of America for the season 1914-1915 was held in the offices of the Potomac Electric Power Company on Nov. 12. Mr. F. T. Kalas, of the Electric Storage Battery Company, gave a talk on the trip which he conducted from Washington, D. C., to Philadelphia and return in electric vehicles, and a representative of the B. F. Goodrich Tire Company gave an illustrated lecture on the methods employed in its factory in the manufacture of cord automobile tires. The results of the tests made by the Goodrich company show that 35 per cent more mileage can be obtained per gallon of gasoline when cord tires are used than can be obtained when fabric tires are used. Mr. Marlow, chairman, in outlining the policy of the association for the season, said that at the future meetings of the association papers would be presented which would deal with all phases of the electric-vehicle industry and would not be limited to technical and shop-practice subjects.

## Hydroelectric Development on Bishop Creek, Cal.—VII

**Transmission system of the Nevada-California Power Company—Details of construction of the lines in service—The stations at Palmetto, Silver Peak and Alkali. By C. O. Poole**

**E**ARLY in February, 1905, the writer, in company with one of his assistants, surveyed the preliminary location of the transmission line across the barren waste of desert country lying between Goldfield, Nev., and Bishop Creek, Cal., a distance of over 100 miles. Aside from the little, almost deserted mining camp of Silver Peak and one or two ranch houses, the country was devoid of habitation, and in some places water was 30 miles away. In order to fill contracts in the then new mining camps of Goldfield and Tonopah, it was necessary to have the line, substations, distributing systems and generating station constructed and in service by September of that year. Specifications were drawn and all material and apparatus ordered from the preliminary surveys. The first line constructed had an aluminum No. 0 seven-strand conductor extending from the power house to the Alkali switch station and from Alkali to Tonopah, a total distance of 118 miles. From Alkali to Goldfield, a distance of 10 miles, the conductor is No. 2 strand aluminum. By referring to the map (Fig. 61) a good idea of the territory covered can be had.

In 1908 a second line was constructed consisting of No. 00 seven-strand copper extending from the power houses to Palmetto switch station and No. 0 seven-strand copper extending to Tonopah by way of Silver Peak and Miller's. In 1910 a line was constructed from Miller's to Manhattan, a distance of 38 miles. This line is of No. 0 seven-strand aluminum. The poles are 8-in. top, 35-ft. cedars, except at road crossings, where they are larger to give proper clearance. They are spaced seventeen to the mile. The separation on the equilateral triangle is 72 in. Oregon pine cross-arms,  $5\frac{3}{4}$  in. by  $5\frac{3}{4}$  in., are used, with a special steel pin and support on top of the poles. Fig. 57 shows the design of the pole tops. The two lines where they parallel each other are placed 100 ft. apart and a telephone line is placed between the two main lines. The telephone circuit consists of two No. 9 B. U. G. wires, and the poles are spaced seventeen to the mile, the same as on the transmission lines. The telephone line gives very good service.

A main branch and telephone line extends from the Palmetto switch station to Rhyolite, another mining

camp, a distance of 72 miles. This line is of No. 0 seven-strand copper, and 8-in.-top, 35-ft. poles are used, spaced seventeen to the mile. This branch was constructed in 1908. The insulators used on all the lines are No. 351 Locke, 14 in. in diameter, or their equivalent. The insulator pins are made of 2-in. gas pipe swaged down to  $2\frac{1}{4}$ -in. outside diameter, where they

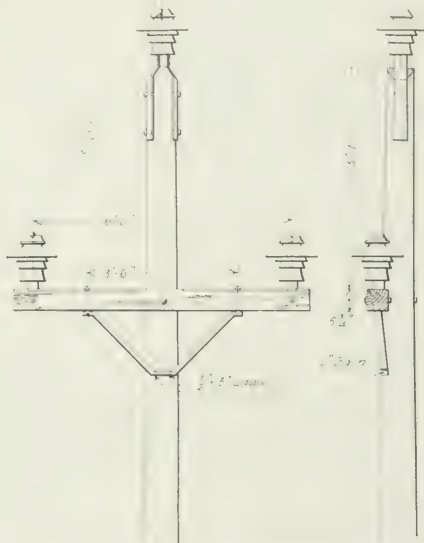


FIG. 57—POLE TOP OF 55,000-VOLT LINES

enter the cross-arm and reduced to  $\frac{7}{8}$ -in. diameter at the top, where a thread molded of antimonial lead is fitted to the insulator. Some of the poles are showing decay, as they were not treated, and a number of them are now being stubbed.

The two trunk lines leave the switch house at plant No. 4 and cross Owens River Valley, a distance of 12



FIG. 56—SWITCHING STATION AT PALMETTO



FIG. 58—SUBSTATION AT SILVER PEAK



miles. They then enter a canyon of the White Mountain range, where they reach an elevation of 10,500 ft. On this summit during the first winter's operation a heavy sleet storm occurred, accompanied by a severe wind storm. The aluminum line (the only one constructed at that time) was sleeted to a thickness of 5 in. in diameter. One pole top was broken off and the

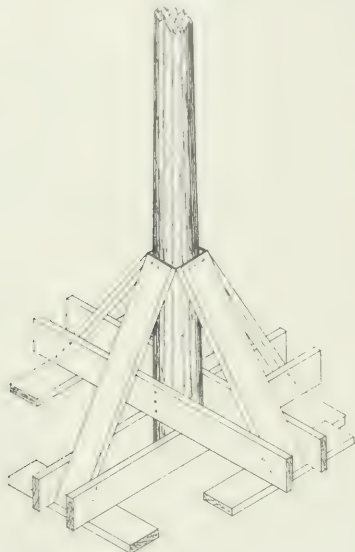


FIG. 59—POLE SUPPORT IN SOFT GROUND

line went to the ground. The line was repaired with extreme difficulty in 6 ft. of soft snow and at zero temperature. The following spring this conductor was replaced with No. 0 copper for a distance of one mile over the summit, and the number of poles was doubled for that distance. The line has not given trouble since. At a point 8 miles on the eastern side of this summit a set of switches is placed in each line for opening in case of trouble, and a line rider's cabin is situated at this point.

After crossing this mountain range Deep Springs Valley is reached. At this point a branch line extends south for a distance of 14 miles to the Loretto copper mine. Then another small range of hills is passed over, after which the lines lead across Fish Lake Valley, then up the gradual slope of the Palmetto Range of mountains, where they enter the Palmetto switch house near the summit of this range. The Palmetto switch house is shown in Fig. 56. It is a steel-frame building covered with corrugated iron. The lines enter the building through disconnecting switches as each line passes through a 55,000-volt Baum oil switch. A paralleling bus connects the line together through a Kelman 55,000-volt oil switch. The lines leave the building through disconnecting switches. The arrangement is such that either section of line east or west can be disconnected from the system, leaving all but the one that may be in trouble still in parallel. From this station the Rhyolite line is taken off through an automatic Kelman oil switch. This line is shown in the illustration. From Palmetto station the lines descend the slope of the mountains to the Silver Peak wash and into the Silver Peak station. Before entering this station the lines pass through Baum open-air-type switches. The two lines pass directly through the station. An oil switch is placed in each line just after it enters the building.

There is also an oil switch to parallel the two lines. Each of the lines is provided with a series horn-type lightning arrester with a concrete resistance placed in each leg to ground. There is also a 55,000-volt, three-phase General Electric electrolytic arrester connected to the circuits in a separate building.

From Silver Peak station the two lines branch in different directions, a No. 0 aluminum line going directly east 18 miles to the Alkali switching station and a No. 0 copper line leading north a distance of 30 miles to Miller's substation.

The Silver Peak substation building is of concrete with steel roof trusses. Fig. 58 is a general view of the building and grounds. Comfortable living quarters for the attendant are a part of the building. The station contains three 500-kw Westinghouse self-cooled transformers fitted with water-cooling coils for use in extremely hot weather or in case of overload. The transformers are connected to the line through an oil switch, are wound for 50,000-volt star and have four  $2\frac{1}{2}$  per cent taps. The low-voltage winding is delta-connected for 6600 volts.

The Silver Peak substation is located on the shores of a dry salt lake, and the aluminum line crosses this lake for a distance of 4 miles. In sinking the pole holes in this lake, the surface of which is covered with a crust of salt and hard mud, it was found that salt water came within 3 ft. of the surface and that the soil material was too soft to support the pole. In order to make the line safe against the severe winds in that locality, the poles were supported in the manner shown in Fig. 59. After the planks and braces were placed around the poles a huge pile of soil was thrown up around their bases, and by the action of the weather this became one solid mass uniting with the ground. The poles have been in place eight years and are in good condition at the present time.

The Alkali switch station is situated at a spring on the desert, 10 miles from Goldfield and 18 miles from Tonopah, both important mining towns. The main line enters the station and connects to a bus, from which an aluminum line of No. 2 seven-strand wire is taken through a Kelman 55,000-volt automatic oil switch. This line leads to the Goldfield substation. Another line of No. 0 seven-strand aluminum leads to Tonopah, being controlled by a Kelman automatic switch. This branch line is 18 miles in length. Fig. 60 is a general view of the Alkali switch station. There are in this



FIG. 60—SWITCHING STATION AT ALKALI

station three 50-kw 55,000-volt star to 6600-volt delta Stanley transformers, used for supplying energy for operating pumps at the springs, the water being forced 10 miles through a steel pipe to Goldfield. The 55,000-volt incoming line is protected with a set of electrolytic lightning arresters, in a separate sheet-iron building. This point is also a headquarters for line patrolmen.

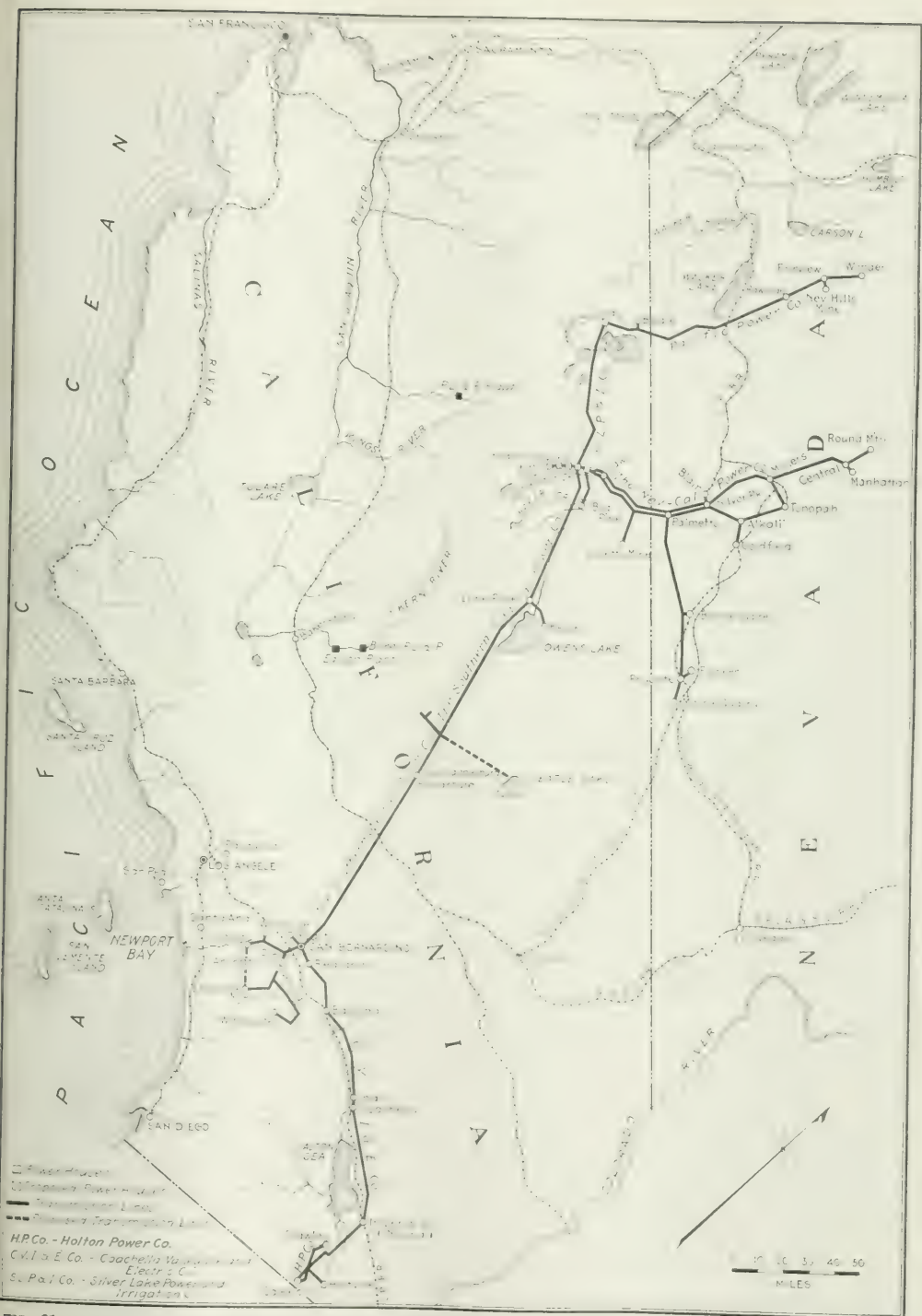


FIG. 61—PROPERTIES AND DEVELOPMENTS OF THE NEVADA-CALIFORNIA POWER COMPANY AND ITS SUBSIDIARIES



# Comparison of Radiation Quality of Filaments

Relative emissivities from nitrogen-filled tungsten lamps with helical filaments and from vacuum-type tungsten lamps with straight filaments. By W. W. Coblentz

THE object of the investigation recorded below was to determine whether there is any difference in the shape of the spectral-energy curve of the nitrogen-filled lamp having a spiraled filament as compared with a straight-filament vacuum-type tungsten lamp. The latter lamp was, of course, operated at its normal rating, namely, 1.2 watts per mean horizontal candle. The nitrogen-filled tungsten lamp was operated far below normal, being set to the same emissivity (color match) as the other in the visible spectrum, by means of a spectrophotometer. The spectral-energy curves of these two types of lamps were observed with a vacuum spectrophotometer. The radiation constants were computed by methods previously described.<sup>1</sup> It was found that the spectral energy curves for these two types of lamps superposed very closely throughout the infra-red. The slight lack of coincidence of the two energy curves beyond  $2\mu$  (where the absorption of glass becomes marked) could easily be explained by the difference in the thickness and in the kind of glass used in the lamp bulbs. If the quality of the radiations emitted by the spiraled filament had been affected (blackened) by reflections within the helix, then the energy curves on the long wave-length side of the maximum emission would not have coincided.

The method used for setting the two lamps to a color match was somewhat defective in that in the spiraled filament radiations came from within and from the outside of the filament. However, the accuracy attained in setting for color match was much greater than was possible with the arrangement which was tried at that time in order to set the outside surface of the turn of the spiraled filament to the same emissivity as obtained in the straight-filament lamp. To make the experiment more conclusive it was desirable to have the straight and the spiraled filaments of the same kind of wire (the size used in the present experiments was 20-mil wire) in nitrogen-filled bulbs of the same kind and the same thickness of glass.

Through the courtesy of Drs. Whitney and MacKay, of the General Electric Research Laboratory, lamps fulfilling the aforesaid requirements were placed at the writer's disposal for further investigation. The subject was therefore undertaken anew, with improved equipment for calibrating the lamps. The spectral-energy curves were obtained with the vacuum spectrophotometer and fluorite prism as in the previous work.

## Method of Calibration

One calibration of these lamps consisted in setting the straight and the spiral filament to a color match, the lamps being at the temperature of normal operation (wave-length of maximum emission  $\lambda_{max} = 1.06\mu$ ). The color-match settings (made by the photometrical division of the Bureau of Standards) were in agreement to from 0.1 volt to 0.2 volt for various observers. This was, of course, practically repeating the previous work, the lamps being at their normal operation.

The most crucial calibration consisted in operating the hairpin filament at its normal temperature ( $\lambda_{max} =$

$1.06\mu$ ) and adjusting the current in the spiraled filament so that the outside surface of the turn had the same emissivity, the same intrinsic brilliancy, as the straight wire.

The general arrangement for setting the two filaments to the same emissivity is shown in Fig. 1. The nitrogen-filled lamps were placed (one at a time) at *L*. The image of the lamp *L* was viewed by means of a microscope *O*, consisting of a 48-mm focal length objective and a low-power (Zeiss No. 2) eyepiece *E*, the combination giving a magnification of about 20. A higher power gave poor definition owing to imperfections in the glass bulbs. An iris diaphragm, at *I*, was useful in adjusting the focus on and within the spiral. A water-cooled screen was placed at *W*. An image of the filament *L* was brought to focus by means of two triple achromatic telescope objectives *T*, made by Zeiss. Two objectives were used because they are a set belonging to a high light-gathering power (18-cm focal length, 6-cm diameter) spectrometer. They give the best definition by using them in pairs, with the source placed at the principal focus, so that the light is parallel on leaving the first objective and on entering

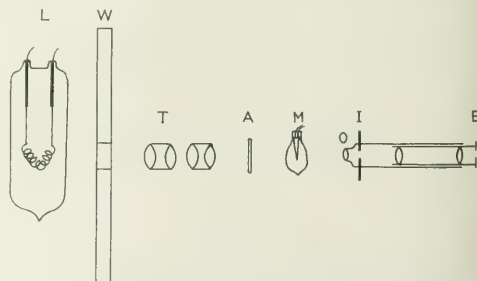


FIG. 1—ARRANGEMENT FOR ADJUSTING FILAMENTS TO THE SAME EMISSIVITY

the second objective. An absorption screen of Schott's black glass was placed at *A*. It was necessary to use some device to reduce the intensity of the nitrogen-filled lamps so that measurements could be made with the comparison lamp *M*, which was a "40-watt" vacuum-type tungsten lamp. The intensity of the nitrogen-filled lamps might have been reduced by means of a rotating sector, or a nitrogen-filled lamp might have been used at *M* if one having homogeneous glass walls had been available. The lamp at *M* served, of course, simply as an intermediary in the substitution method of calibration of the lamps placed at *L*. The glass screen *A* is, of course, slightly selective in its transmission, so that when the image of the filament is viewed through red, green and blue glass at *E* one experiences the same difficulties that are found in any optical pyrometer. This, however, does not interfere with the calibration so long as use is made of the same kind of wire in all the lamps. Of course, one need not attempt to set the lamps to the same emissivity in more

<sup>1</sup>Bulletin Bureau of Standards, page 339, 1908.

than one part of the spectrum, say the green. However, it seemed desirable, and it was very interesting, to calibrate the lamps in red, green and blue light. This was a triple check on the accuracy of the calibration, so long as one used the same kind of tungsten wire in the lamps. However, when using a nitrogen-filled lamp containing a more highly polished tungsten wire (lamp No. 3) which had a differently shaped spectral energy curve in the visible spectrum it was not possible to cause the comparison lamp *M* to disappear (in red, green and blue light) against the image of the nitrogen-filled lamp, on the same voltage as obtained in the first-mentioned lamps. Perhaps this matter will appear clearer by citing numerical data. The first step in the calibration is, of course, to set the comparison lamp *M* to the same emissivity (the same intrinsic brilliancy as viewed through the absorption screen *A*) as the hairpin filament (nitrogen-filled lamp No. 1) at *L*. The latter is, of course, operated at some predetermined temperature, giving a maximum emission at, say,  $\lambda_{max} = 1.06\mu$ . It was found that the comparison lamp *M* disappeared against the hairpin filament when operated on 41.3 (to 41.4) volts when viewed through red glass, on 43.6 (to 43.7) volts when viewed through green glass, and on 45.1 (to 45.2) volts for blue glass. The spiraled filament (lamp No. 2) was then substituted for the hairpin filament at *L*, and its temperature was raised until the comparison lamp on 41.3 volts (red glass) disappeared against the image of the outside surface of a turn in the spiraled filament. It was then found that there was a disappearance of the filament on 43.6 volts (green glass) and 45.1 volts (blue glass), which were the exact voltages for disappearance against the image of the hairpin filament. Making similar settings on the brightest part of the inside surface of a turn in the spiraled filament, the voltage of the comparison lamp had to be raised to 48.6 volts for disappearance in red light and to 52.4 volts in blue light. This showed that some parts of the inner surface of the turn had a higher apparent temperature than the outside surface of a turn of the spiral. In both sets of measurements, on the inside and on the outside surface of the turn, the difference in voltage for disappearance when viewed through red and blue glass is 3.8 volts. If the radiations emanating from the inside surface of a turn in the helix had been seriously modified by internal reflections, thus producing a "blackening" of the radiations, then there would have been a difference in the selective emission, and the difference in voltage for disappearance in red and in blue light would not have been the same (3.8 volts) for the inside and the outside surface of the spiraled filament.

Maintaining the comparison lamp *M* at 41.3 volts (red glass) and raising the temperature of the highly polished spiraled filament (lamp No. 3, placed at *L*) sufficiently to cause the filament of the comparison lamp to disappear against the outside surface of a turn of the helix it was found that the filament did not disappear at 43.6 volts for green glass and 45.1 volts for blue glass as was observed when calibrating the spiraled filament—lamp No. 2. In other words, this filament radiated selectively in comparison with the other filaments, and, as will be shown presently, its selective emission was such as to raise the luminous efficiency.

#### An Unlooked-for Result

As already mentioned, these lamps had been set to a color match with a Lummer-Brodhun photometer, using lamp No. 1 as a standard. The great surprise was to find that the same currents (to within from 0.01 amp to 0.02 amp) which were required to produce a color match with the hairpin filament were required also to produce the same intrinsic brilliancy on the outside of

the spirals. This shows that the composite radiations from the spiraled filament observed in a color match are not markedly different from that of the hairpin filament. The amount of light coming from within the helix is probably from only one-fifth the total area (in each turn) viewed from the side. The spectral energy curves of the straight and the spiraled filament at color match were found in coincidence in the visible spectrum.

A further test, showing that there is no marked difference in the quality of the light emanating from the straight and the spiraled filaments of tungsten in nitrogen was made by sighting upon them with a vacuum-type tungsten lamp, which was operated as an ordinary pyrometer. Of course, the nitrogen-filled lamp had to be operated at a temperature comparable with that attainable in the vacuum-type lamp. It was found that the same current through the hairpin filament caused the filament to disappear against the helix when viewed in red, green and blue light. When sighting within the helix it required, of course, a higher current through the hairpin filament in order to obtain a disappearance indicating an apparently higher temperature. However, the importance of the observation lies in the fact that the quality of the radiation is not sufficiently

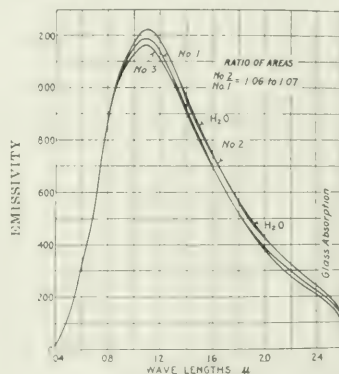


FIG. 2—SPECTRAL-ENERGY DISTRIBUTION OF NITROGEN-FILLED LAMPS 1, 2 AND 3

modified by a black-body effect to require different currents in the hairpin-filament lamp in order to cause the filament to disappear in red, green and blue light when sighting within the helix. If the quality of the light had been appreciably modified within the helix, then raising the temperature of the hairpin filament by a definite amount would not have been sufficient to cause disappearance of the filament against the inside surface of the helix in red, green and blue light. A familiar experience is observed in sighting a pyrometer lamp upon a black body. If the filament is selective in emission, then it will require different currents in the lamp to cause the filament to disappear against the black body when viewed through red, green and blue glass. This test is of interest also in showing that, at the lower temperatures at least, the surface condition of the tungsten wire in nitrogen is not appreciably different from that observed on the filament in a vacuum, namely, the hairpin filament.

Of course, it must be admitted that there is some modification ("blackening") of the radiation within the helix as shown in the curves in Fig. 2. However, it remains to be shown whether this is attributable to internal reflection, to crimping of the inside of the filament, or to cracks in the surface.



In Fig. 2 curve No. 1 gives the spectral-energy distribution of the hairpin filament (nitrogen-filled lamp No. 1) operated at its normal temperature. Curve No. 2 gives the spectral-energy distribution of the composite radiations from the spiraled filament (nitrogen-filled lamp No. 2) when the outside surface of a turn is set to the same emissivity as that of the hairpin filament (lamp No. 1). The ratio of the areas is 1.06 to 1.07, showing that the spiraled filament emits about 7 per cent more infra-red energy than does the straight filament. The luminous efficiency of the straight filament is, therefore, about 7 per cent higher than that of the spiraled filament. The "specific consumption" of the spiraled filament is perhaps from 15 to 20 per cent higher than that of the straight filament. This is attributable to the fact that the spiraled filament acts as a very thick, short filament as regards elimination of convection currents. In other words, by sacrificing 7 per cent in the luminous efficiency there is obtained a very marked gain in the total specific consumption of the spiraled filament as the result of elimination of convection currents. If the loss of 6 to 7 per cent which is to some extent black-body radiation can be avoided in the helical filament, then the luminous output (in lumens per watt) will be increased.

This particular filament had numerous scratches—conspicuous as bright streaks (see Fig. 3); perhaps inclusions of graphite having a higher emissivity—on the outside of the turn of the spiral. A deep scratch or crack is a miniature black body, which, as is well known, is the least efficient emitter of luminous

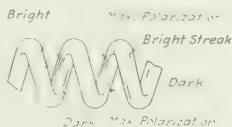


FIG. 3—INSIDE OF HELIX

radiations. Of course, some of the black-body radiation, manifested by an excess of radiation (lack of coincidence) on the long wave-length side of the spectral energy curve (Fig. 2) may be attributable to some extent to a modification of the radiations emanating from within the helix. It would be difficult to attempt to determine spectrophotometrically on one filament how much of the black-body effect is contributed from within the helix. That the amount is small is shown by the behavior of lamp No. 3 (Fig. 2), in which the spiraled wire appeared very smooth and highly polished. Within the helix the surface appeared to be more crimped and mottled than that of lamp No. 2. Nevertheless, the spectral-energy curve (see Fig. 2, curve No. 3) coincides with that of the (straight) hairpin filament, showing that it is possible to avoid the production of deleterious "black-body" radiations by using smooth, highly polished wire which is free from graphite and which is kept free from scratches while winding and mounting. Although operated at a 15 per cent overload, the outside surface remained smooth, but within the helix the surface seemed a little more mottled. The specific consumption of these lamps has not yet been accurately determined. The hairpin filament was operated at close to 0.5 watt per candle, and the spiral filament at considerably lower than 0.5 watt per candle. The great saving (perhaps 20 per cent) in the power input in the spiraled filament is due to elimination of "black-body" radiation and heat losses by convection currents.

This analysis of the radiations from the straight and the helical filaments is very instructive as regards the

great difference between the "specific output" and the "luminous efficiency." The latter is the ratio of the "visible" to the total amount of radiation emitted. It affords no idea of the energy that must be expended in order to produce the radiations which are emitted. The hairpin filament and the spiraled filament (No. 3) have practically the same luminous efficiency. Nevertheless, the candles-per-watt output is perhaps from 15 to 20 per cent higher in the spiraled filament owing to the elimination of convection losses. In the same manner, the high "luminous efficiency" of the firefly is deceptive, for we do not know how much power had to be used originally to store up the energy which is expended in a few brief flashes. This statement is based on the assumption that the brief flashes are simply a liberation of energy previously stored. It is in agreement with the observation that after a prolonged period of flashing the ability to continue to flash seems suddenly to come to an end.

It may be that the inner surface of the spiral is hotter than the outside, partly as the result of slow heat conduction from the center of the wire. The inside of the turn is the shorter; it takes the greater current; it has the smaller surface; convection losses are no doubt small, and hence one would expect the inside to be the hotter. However, if the difference in the spectral-energy curves (Fig. 2) were due to a difference in temperature only, then the two energy curves would intersect more symmetrically on the two sides of the maximum emission, instead of intersecting in the violet, as observed. The unsymmetrical energy distribution is to be considered due in part to black-body radiation. Excellent illustrations, as observed in tungsten, tantalum and carbon filaments, have been published elsewhere.<sup>1</sup> The black body is the least efficient radiator to produce a high luminous efficiency. However, the spiraled filament furnishes an example in which it appears profitable to sacrifice 6 per cent in efficiency by producing a black-body effect in order to eliminate some 20 per cent in convection losses.

#### Value of the Wave-Length

The wave-length of the maximum emission,  $\lambda_{max}$ , was computed by the methods given in previous publications. For the straight hairpin filament (lamp No. 1) the maximum emission occurs at about  $\lambda_{max} = 1.06\mu$ . For the spiraled filament (lamp No. 2) the value is  $\lambda_{max} = 1.07\mu$ . For the spiraled filament No. 3,  $\lambda_{max} = 1.05\mu$ , and at a 15 per cent overload the maximum emission is shifted to  $1.01\mu$ . Lamp No. 2 when set to a color match with the straight-filament lamp has its maximum emission at  $\lambda_{max} = 1.22\mu$ . As explained in the previous paper, this is the minimum value of the computed wave-length.

The inside of the helix (Fig. 3) showed dark streaks which were regularly repeated in successive turns of the spiral. The dark part as seen on the lower outside part of the turn extended well around toward the inside, corresponding to the same part of the wire that appeared bright as viewed across the edge, with the rest of the turn to the rear. From this it is evident that much of the increased brightness within the filament is an optical illusion owing to difficulties in focusing upon the (rear) inside of the turn by sighting across the part of the turn nearest the objective.

An examination was made of the light from within the helix by using a nicol prism in the eyepiece *E* (Fig. 1) of the microscope. As shown in Fig. 3, there are two regions on the inside of the turn which show marked polarization. This, no doubt, is the region of reflection of the light emanating from an adjacent turn. As already stated, the inner surface of the turn

<sup>1</sup>Bulletin Bureau of Standards, 5, page 360, 1909.

shows bright and dark streaks which are quite regularly repeated within the successive turns. Using a high-power eyepiece, the whole appears quite uniformly bright owing to poor definition. Much of the brighter appearance within the helix is no doubt an optical illusion. Sighting across the front side of a turn of the spiral upon the inside of the rear of the turn, there is a bright line ("bright" in Fig. 3) on the part of the front turn which elsewhere appears darker. This is attributable partly to the inability to focus on the curved edge. As the focus is changed this bright streak changes in intensity. The whole aspect of the inside of the turn of the spiral is such that the writer is in doubt whether the inside is really much brighter than the outside.

In conclusion, it is not irrelevant to add that in view of the fact that the average "practical" man sometimes asks the question "Of what earthly use is your spectrometer anyway?" it is a matter of some gratification to be able to point to the present analysis of the radiations from these tungsten lamps as a specific example of information gained which has a direct bearing upon one of the most vital questions now occupying the attention of experimenters.

## THE COOPER HEWITT OSCILLATOR

### Preliminary Work on New Developments Involving Improvement of the Vacuum-Type Rectifier Now Completed

As noted on page 988 of the *Electrical World* dated Nov. 21, Dr. Peter Cooper Hewitt has announced completion of the preliminary work on a new development of his well-known mercury-vapor lamps and rectifiers. The new inventions involve improvement of the vacuum-tube rectifier for feeble high-frequency currents such as occur at the receiving station of a radiotelegraph or radiotelephone system and the development of an oscillator or converter which efficiently transforms direct current of low or high voltage into sustained alternating current of any frequency. Although the rectifier is now said to be in such form that it may be used as a radio receiver of sensitiveness considerably greater than that of the most delicate electrolytic detectors, since the incoming energy is not only rectified but amplified, it is the oscillator which Dr. Hewitt believes to be of the greater commercial importance, both in radio signaling and in the transmission of power. At the present time the technical and physical details of the apparatus cannot be disclosed.

During the experimental study of various peculiar phenomena which occasionally accompany the operation of the mercury-arc rectifier Dr. Hewitt encountered nearly a year ago an entirely novel set of conditions. Close investigation of these developed the fact that under certain circumstances the relations between current, voltage and resistance in the vapor conductor were of a kind absolutely outside the limits of his previous experience. Research into these curious effects resulted in the new oscillator, which Dr. Hewitt states is dependent upon electrical principles quite different from any hitherto used.

Not only is the physical basis of the invention a departure from earlier work, but the results already achieved have not previously been obtained through any other instruments. Even in its laboratory form, the oscillator has been found capable of producing, from direct current, sustained alternating currents of any frequency up to 100,000 or more cycles per second. The efficiency of conversion is excellent, and the low internal losses of the apparatus indicate that commercial use in numerous ways will be entirely feasible. In

contrast to oscillators which have heretofore been suggested, the device is inherently capable of handling large amounts of power.

A characteristic of the device is that the frequency of oscillation may be varied instantaneously over a wide range of values, which feature should increase the importance of the oscillator in its application to radio transmission. Similarly, the output in power may be altered easily and quickly, and through this property Dr. Hewitt anticipates that the apparatus will find extended use as a generator for radiotelephony. The instrument appears to be extremely rugged and to a large extent self-protective when subjected to potentials much above the normal values used in operating.

### Outlook for Commercial Use

Several distinct modes of operation are possible for the oscillator, and at the present time exhaustive researches, including oscillographic studies, are being made into the complicated electrical actions in the circuits of the apparatus. The correlation of these data now being obtained with the results of earlier investigations into gas and vapor conduction phenomena should assist in the rapid growth of the new oscillator into a commercial machine. Dr. Hewitt has expressed the belief that after a reasonable period of development, such as was required to bring the mercury rectifier to its present forms, the oscillator should find extended practical use in many fields besides that of radio signaling.

In the transmission of electric energy by wire over long distances it has been usual to employ high voltages for the purpose of reducing the heat losses in the lines. Although means for generating high-voltage direct current have been available for a number of years, the difficulties of utilizing efficiently such high pressures in continuous current at the receiving end of the line have prevented its widespread adoption. The ease with which the voltage-current ratio of alternating current may be transformed with stationary apparatus has given alternating-current transmission an almost exclusive place in long-distance transmission. This may be very different in the future, Dr. Hewitt points out, since by placing a high-voltage rectifier at the generating end of a line and a high-voltage oscillator at the terminus it will be possible to distribute in useful form the power received and yet to transmit it as direct current over the long lines. Such direct-current transmission would, of course, permit operation under unvarying line conditions, and harmful capacity and induction effects would be so greatly minimized that even for great distances underground transmission might prove practicable.

On the whole, the oscillator gives promise of starting extensions in application to various electrical fields. The invention is a logical outgrowth of Dr. Hewitt's earlier work, since it is an exact inverse of his rectifier and therefore a complementary device.

### Battery-Operated Locomotive Headlamps

Battery-operated headlamps are being used with success on the Southern Pacific Railroad. Nitrogen-filled tungsten units rated at 140 cp are mounted in standard oil-lamp reflectors. Each headlamp takes 13 amp at 6 volts and is operated from a 300-amp-hr. lead-cell storage battery which is capable of furnishing energy to the headlamp, the three cab lamps and two "blizzard" lamps for thirteen hours. The cells are carried on the top of the boiler and at the end of each trip are lowered for the purpose of charging, with the assistance of a small crane.



# Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods and Current Practice Among Successful Utilities

## Vicissitudes of an Electric Automobile

Some time ago a private garage in Indianapolis, containing four gasoline cars and a Waverley electric brougham, was destroyed by fire. The coach body of the electric automobile was burned off and the aluminum battery-box covers were melted, but the battery itself,



TRANSFORMATION OF AN ELECTRIC BROUGHAM

the frame and the chassis were practically uninjured. The gasoline cars were a total loss. The electric car was acquired by a baker, who fitted it with a huge model of a loaf of bread, as shown in the accompanying illustration, and used it for advertising purposes.

## Concerning Public Courtesy—"It Pays"

The following expression to its employees on the subject of courtesy to customers and public has been posted by the Central Illinois Public Service Company in its business offices and indicates the attitude of the company on a subject which is of vital importance to its patrons:

"The possession in marked degree of any worthy faculty should always be an incentive to develop that faculty. This company considers that its employees possess the faculty of being courteous to the public above the average. To those who cultivate and exercise this faculty the company extends its congratulations and its thanks. To those who have not fully appreciated its importance thoughtful consideration of the following is suggested:

"First—The principle that underlies courteous treatment of others is simply that of doing unto others as you would they should do unto you.

"Second—In a highly complex and technical business such as that of the public service company there are many things that you, with your training and daily experience, understand with perfect familiarity but which the public does not understand; therefore do not assume that the people should comprehend them without asking questions, but when they make inquiry of you give them the courtesy of a reply just as full and clear as you can make it, and without any suggestion of superiority born of a greater knowledge.

"Third—Words are only one means of expression, and manner is quite as important; therefore, remember that a kindly and gracious manner is not only the sign and mark of a self-respecting man but is to your words what oil is to machinery in making them move effectively to their purpose.

"Fourth—True courtesy is no respecter of persons. It remembers that 'a man's a man for a' that,' and it gives the civil word and the helping hand quite as readily to the ill-clad stranger as to an official of the company.

"Fifth—Courtesy is not only something the public has a right to expect of you, but it pays.

"It pays in the friends it makes you personally and as a representative of the company.

"It pays in minimizing the friction of your life as well as that between the company and its patrons.

"It pays in raising your standing with the company.

"It pays in the personal satisfaction resulting from having done the right and kindly thing by your 'neighbor.'

"It is the wish of the management of this company that all of its representatives whose work brings them in contact with the public may appreciate and fully measure up to their duty and privilege in this respect."

## Attractive Placards for Street-Car Advertising

The Society for Electrical Development, Inc., has prepared a number of attractively colored placards for street-car advertising which are shown herewith. All

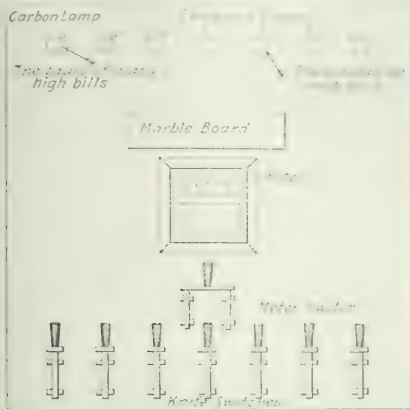


ELECTRICAL POSTERS FOR STREET CARS

of them are in keeping with the "Do it electrically" propaganda, space, of course, being left for the name of the member company. An appeal is made to the domestic side of life, and the illustrations suggest the comfort and efficiency which are available to those who have their homes wired. The cards are of standard size to fit the advertising space in street cars, trains, etc.

## Showing Customers the Cause of High Bills and the Remedy

A marble panel about 18 in. square hangs in the Wichita (Kan.) office of the Kansas Gas & Electric Company, and on the panel are attached several lamps and switches and a watt-hour meter. All of the lamps except one contain tungsten filaments. The exception is



METER BOARD USED TO EDUCATE CUSTOMERS IN THE ECONOMY OF TUNGSTEN LAMPS

a 16-cp carbon-filament lamp, and beneath it is an arrow pointing to the carbon lamp as "the cause of many high bills." At the opposite corner of the panel another arrow points to a medium-sized tungsten lamp as "the remedy for high bills." Knife switches at the base of the board connect each lamp with the meter, and customers are invited to operate the switches and observe the different speeds of the meter disk for themselves.

## Old Coffee Pots Bring \$1 Each at Springfield, Mo.

The new-business department of the Springfield (Mo.) Gas & Electric Company, under the management of Mr. S. R. Gallagher, has been conducting an electric-percolator campaign along the same lines as those which have proved so successful in selling electric irons. In beginning the campaign the electric company used considerable newspaper advertising, heading the advertisements "Wanted—Every Old Coffee Pot in Springfield." Following this attractive headline was the company's liberal offer. The price on a seven-dollar percolator has been reduced to \$5.98, and an additional \$1 is allowed if the purchaser brings in an old coffee pot. The company considers the percolator a good revenue producer.

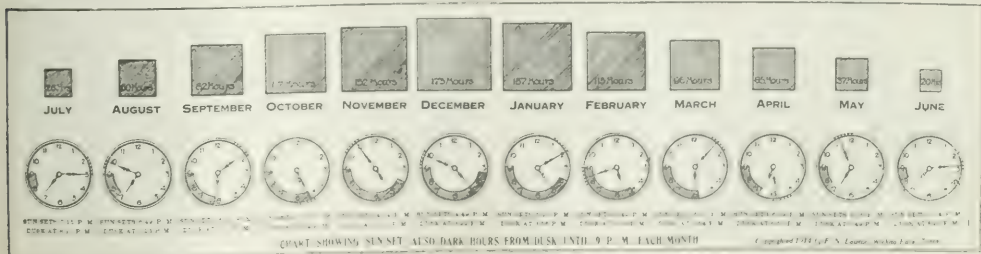
## Central-Station Ice-Making in Massachusetts

In connection with a hearing at Boston recently on the proposal to place the ice business under commission regulation, Mr. Charles T. Grout, of Fitchburg, Mass., discussed at length the advantages of central-station ice-making. He said that about 200 central stations are successfully manufacturing ice in various parts of the country on an off-peak basis, and urged the commission to recommend enabling legislation in its forthcoming report in the interests of reducing the cost to the consumer of this necessity of civilization. He stated that the admirable organization, financial strength, and above all the off-peak generating capacity of central stations, peculiarly fitted them to undertake this work. Mr. Grout said that artificial ice is rapidly superseding the natural product, and he emphasized the short duration of the yearly and daily peak loads in relation to the length of time during which that part of the plant investment demanded by them stands idle. In lesser degree there is a large daily unused capacity in plant which could be employed in supplying energy for ice-making, even with a temporary interruption of the freezing process during the extreme peak load. The speaker said that as the bulk of the business comes in summer, it would be of great economic benefit to have the central stations take up the work.

## Why Electric Light Bills Grow

Many forms of charts have been devised and used by central-station managers to illustrate to customers the effect of shortening days and advancing twilight in increasing the bills of the electric-light company. Clock dials have been employed with effect by Mr. F. N. Lawton, manager of the Wichita Falls Electric Company, Wichita Falls, Tex., who has had the sketch reproduced herewith protected by copyright. The clock hands show the average time of sunset for each of the twelve months of the year, and the shaded segment of each dial represents the period during which electric light will be required each day from dusk until 9 p. m.

The diagram is also unusual in taking into account—very correctly—the fact that during the summer months dusk follows forty-five or sixty minutes after sunset, owing to the sloping path of the sun beneath the horizon. On the other hand, during the winter months clouds and mists often obstruct the sun's disk so that even long before the sun has sunk below the horizon the illumination in the sky has fallen to a value comparable to that of the summer twilight above referred to. It is this effect, often overlooked, which contributes to the purely astronomical effect of the shortening days. The reverse side of the card, which has been widely distributed by the Texas Power & Light Company, carries a practical lesson in reading the dials of a kilowatt-hour meter and bears the inscription, "Tack this card up near your meter."



CARD SHOWING THE VARIATION OF LIGHTING HOURS DURING WINTER AND SUMMER MONTHS



## Illumination and Wiring

### Milwaukee Street-Lighting Survey

Plans for the illumination of all the streets of Milwaukee, Wis., within the 28-sq. mile area of the city, are being prepared by the local supervisor of public lighting, Mr. F. G. Vaughn, and his associates, Messrs. Arthur Sweet and H. J. Meyer. In the business districts lamps will be mounted on 30-ft. and 22.5-ft. standards, and in the residential sections 22.5-ft. posts will be used at the corners, with smaller units on 15-ft. standards at 120-ft. intervals along the curb, preserving an eight-to-one ratio between the distance between lamps and the mounting height. Series-type nitrogen-filled incandescent lamps will probably be favored for general use, on account of their efficiency, simplicity and freedom from the need for constant attention, although magnetite and flame-arc lamps are receiving consideration on account of the claims made for them of slightly lower operating cost, including trimming, electrodes, etc. The nitrogen-filled lamps are expected to require about four renewals per year and have the advantage that units of different sizes may be used interchangeably on the same circuit. Both concrete and steel posts have been designed for supporting the lamp units, which will be inclosed in special refractors mounted on harp-bracket arms of pressed metal. The plans and recommendations for Milwaukee's new street lighting, which will be submitted to the local council about March 1, will show detailed locations for about 14,000 lamps with specifications for a complete distribution system beginning at the busbars. A flexible arrangement is being studied so that the plans will be available whether energy is purchased locally or manufactured in the city plant which it has been proposed to build. Consideration is also being taken of gas for lighting parts of the residence sections where such service is already installed.

### Automobile Military Projectors for the French Army

It has been truly said that the automobile is playing a very important part in the great war that is at present taking place in Europe. Not only are motor vehicles being employed for the transportation of soldiers and supplies of all kinds, gun haulage and ambulance work, but they are also being used in many other directions, interesting among which from an electrical point of view is that of automobile projector plants. The accompanying illustrations depict various views of the plant of this type which is being used in connection



FIG. 2—AUTOMOBILE SEARCHLIGHT IN OPERATION

with the operations of the French army. The search-lamps, which are of the Breguet pattern, are mounted on light, independent trucks so arranged that they can either be used on the 18-hp De Dion motor trucks on which they are transported or can be dismounted from the latter and placed at any desired point within a range of 100 yd. of the truck, the vehicle being pro-



FIG. 3—DYNAMO BOX, CABLE DRUM AND PROJECTOR-DISMOUNTING GEAR

vided with sloping channels and tackle for the purpose. The necessary energy for the operation of the search-lamps is provided by a dynamo on the truck at the rear of the driver's seat and driven by the main engine. The projectors are mounted on turntables so that they may be instantly swung round to any desired position. They are also adjustable as to the angle at which the



FIG. 1—AUTOMOBILE SEARCHLIGHT PLANT

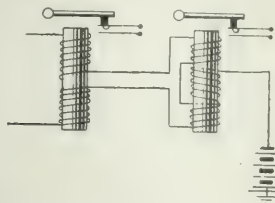


FIG. 4—PROJECTORS DISMOUNTED FROM TRUCKS

powerful beam of light is projected. When the search-lamps are used at some distance from their wagon the energy is conveyed by a cable mounted on a reel which forms part of the equipment. It is stated that the French army possesses no less than fifty machines of the type illustrated.

### Recent Telephone Patent

In automatic systems there are two selecting functions to be carried on over the subscriber's line. First, there must be some differentiation so that the various selecting means will be effective in proper sequence, and, second, current impulses must be set up to control the advance of the wipers. In order to accomplish the former functions Mr. W. R. Binkley, of New Bedford, Mass., has devised a combination of two differential



AUTOMATIC TELEPHONE EXCHANGE SYSTEM

relays, one with two windings and one with three. One end of one of these windings is connected to a grounded battery while the other end is connected to both of the remaining windings. The free ends of these windings are connected respectively to the two windings of the second two-winding differential relay and thence to the two-line limbs. The three-winding relay is arranged so that the two end windings balance, while the lower one will also balance the middle with the same current flowing. These relays have three joint conditions for different applications of ground to the subscriber's line. If both sides are grounded, the double-wound relay fails and the triple-wound relay operates in response to the unbalanced middle winding with double current. If the upper side alone is grounded, both relays operate, the upper-end winding of the triple-wound relay augmenting the middle winding. If the lower-line limb is grounded, both relays operate. This combination of conditions offers opportunity for operating, circuit-change and release actions.

## Letter to the Editors

### Public Service Commissions and Demand Rates

*To the Editors of the Electrical World:*

SIRS:—It is desirable to direct attention to some of the benefits of commission regulation.

The principal point is in the matter of rates, particularly electrical rates. The principle of charging for electrical energy is changing slowly from the kilowatt-hour basis to the demand basis. That is to say, instead of charging all consumers on the basis of only the quantity used, their demand on the peak is also provided for. This has come about through the operation of an economic law which has been crystallized into the civil law and provides that the charge for service shall be as near as practicable to the cost of service. In making rates some commissions have followed this law. The result has been the introduction of the demand

rate, usually stated in the form of a primary, secondary and excess charge for certain specified "hours" use per month of the active connected load." Sometimes this is stated as the "kilowatt-hours per month per kilowatt of active connected load."

Some central-station managers have not yet awakened to the fact that this rate is a business-building rate because it is equitable and scientifically and economically correct. It is based on the theory that the cost of service is divided into demand costs and output costs. The rate to any consumer is automatically reduced in proportion to the number of kilowatt-hours he uses per month or to the number of hours he uses his demand.

It is acknowledged that at first sight a rate of this kind is not simple. The expressions "thirty hours' use of active load per month" and "30 kw-hr. per month per kilowatt of active load" are confusing to the person who has not given them some thought. They resemble the expression for acceleration, "feet per second per second," which is not understood easily without some thought.

It would be as absurd to condemn this system of rates because one refuses to take the time to understand it as it would be to refuse to consider the purchase of a prime mover which would save him money because he did not at first understand its operation.

The theory of this type of rate schedule is one thing and its practical operation quite another. At first sight it looks as if it would keep the accounting department up nights figuring bills. It will be found that it lends itself to the use of tables as easily as any straight rate, so that bills do not have to be calculated at all but simply copied from a table made once and for all.

One of the most prominent public utility commissioners expressed the opinion that if operators do not educate themselves and their consumers to the understanding of this rate complications will follow. The tendency of legislatures is to establish straight uniform rates. In some legislatures every session calls up one or more of such bills, which are usually killed in the committee room by those who know that they would be bad for both the consumer and the utility. It is evident that business could not be built on a rate of this kind any more than eggs could be sold at a given constant price regardless of the quantity purchased.

It is therefore desired to sound a note of warning in connection with this matter. The sooner operators educate themselves to the thorough understanding of the demand system of rates and adopt them, the sooner will they reap the benefits of commission regulation and head off legislation for uniform rates.

Another point to which attention is directed is the attitude assumed by some operators regarding complaints on service, bills, etc., in commission-regulated states. They take "the easiest way" and explain that the commission established the rate or rule and that they have nothing to do with it. This attitude is certain ultimate suicide. It will eventually deprive the central station of such benefits as may have existed by virtue of the commission, however small they may be believed to be. Besides, it is a confession on the part of a manager that he is not able to run his own business. Commissions are not appointed to manage but to regulate. The public utility operator should be jealous of his right to operate his business in his own way so long as he is within the law.

When a rate adjustment is necessary the utility should take the offensive and seek to establish its own rates and not permit the commission to establish them. Of course, they must be approved by the commission by law, but the utility should conduct its own affairs in this respect.

Milwaukee, Wis.

HARRY G. D. NUTTING.

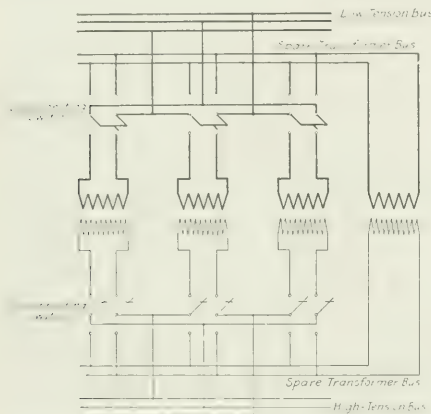


# Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

## Spare Transformer Connections to Shorten Service Interruptions

Where the voltage of a three-phase circuit must be stepped down by single-phase transformers to feed very large loads it is usual to install one spare unit which



TRANSFORMER CONNECTION TO FACILITATE RAPID REPLACING

can be connected in place of one of the regular transformers if it becomes disabled. While always having an extra unit convenient often saves considerable delay in restoring service if one of the regular ones becomes inoperative, interruptions could be considerably shortened if the spare transformer could be instantly connected in place of the defective one without waiting to install wires. The accompanying drawing indicates an installation in which the spare unit is permanently connected to primary and secondary spare buses. In each regular transformer's leads are double-throw disconnecting switches whose hinges are connected as shown to the low-tension and high-tension buses as the case may be. The lips on one side of the hinges are connected to the spare buses and the remaining lips are connected to their respective transformers. This arrangement was described in a paper presented recently before the Association of Iron and Steel Electrical Engineers by Mr. Saul Lavine.

## Exhaust Valve Repaired While Engine Runs

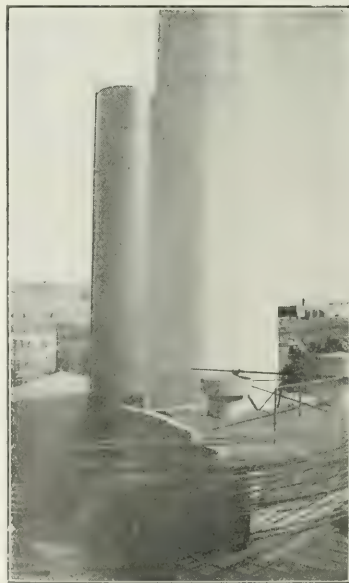
The main prime mover in the generating station at Independence, Kan., is a double-acting, twin-cylinder Strait gas engine, and at one time when this machine was needed to help carry the load an exhaust valve began to give trouble. Shutting off the gas and ignition from the cylinder affected, the men on duty opened the valve chest, took out the defective valve and replaced it in less than three hours without stopping the engine.

The greatest difficulty experienced came from exhaust gases which backed up through the manifold from other cylinders. This trouble was overcome, however, by placing a small motor-driven forge blower in such a position that its blast drove these foul gases away from the workman's face.

## Discarded Smokestack Makes a Serviceable Water Tank

When the increasing load on the station of the Topeka (Kan.) Edison Company made it necessary to supply more draft for the boilers, a new concrete stack was erected to replace the old steel stack, which had been doing service for many years. When used as a smokestack this steel tube was 200 ft. high and 8 ft. in diameter, but as soon as the duties of supplying draft were transferred to the new concrete stack the steel stack was greatly reduced in height, as indicated in the accompanying picture.

A 0.625-in. plate made of reinforced boiler iron was also placed inside and near the base of the stack, converting it into a 35-ft. by 8-ft. water tank. Now water from the wooden tanks of the company's water-treat-



OLD STACK USED AS WATER TANK

ing system is pumped into this steel retainer and later is delivered to the feed-water heaters by gravity. Mr. S. R. Saylor, acting chief engineer, says that the old steel stack has become a very useful part of the company's water system.

### Encouraging Firemen to Do More Efficient Work

In the electric-lighting station at Emporia, Kan., an improvised economy chart is being used to show firemen the comparative operating results obtained through proper and improper firing. A corner of the chart.

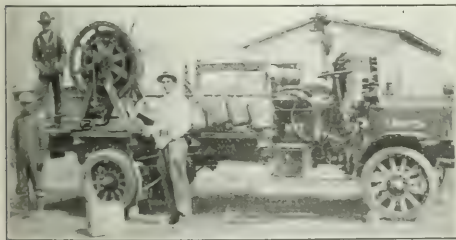
[illegible]

PORTION OF A HOME-MADE ECONOMY CHART

which is kept from day to day on a ruled blackboard, is reproduced in the sketch herewith. Opposite each fireman's name in a horizontal line are data indicating whether or not his work has been carried out as efficiently as that of his fellows. Watching the chart with interest, each fireman is stimulated by a spirit of rivalry to make his period on duty appear favorably on the blackboard.

## Reeling Up Line Wire with Auto Truck

The accompanying illustration shows one method used by the Washington Water Power Company, Spokane, Wash., for reeling up old line wire. According to Mr. Lewis A. Lewis, of that company, who contributed the



REELING WITH AUTO TRUCK

arrangement as a "wrinkle" to the recent convention of the Northwest Electric Light and Power Association, the auto truck is propped up so that the rear wheels are clear of the ground and the reel is driven from the truck wheel by means of a rope belt and a belt tightener.

## The Mercury-Steam Turbine

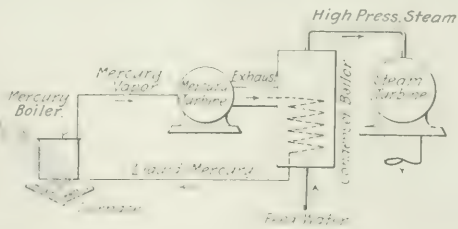
I understand that a turbine using mercury vapor as the expansive fluid is now being developed for commercial use. Does the plan contemplate the replacement of the steam in the ordinary boiler by mercury vapor, or will the mercury be used as an adjunct to the present steam-turbine equipment? What is the proposed scheme of operation and what will be the advantages in increased efficiency, etc., of the mercury turbine as compared with present steam units?

E. M. L.

E. M. L.

The efficiency of any heat engine depends, of course, on the range in temperature between inlet and exhaust. With the lower limit of exhaust temperature fixed by that of the cooling water, efficiency improvements must result from higher inlet temperatures, taking advantage of the high temperatures available in the fue gases. But

steam temperatures and pressures cannot be raised indefinitely, for steam at a temperature of 390 deg. Fahr. has a pressure of 200 lb. per sq. in., and much beyond this it is impracticable to go on account of operating difficulties. Mercury, however, boils at 675 deg. Fahr., at atmospheric pressure, and condenses in a 28-in. vacuum at 415 deg. Fahr. In addition to its high boiling point and operating range, mercury has a high atomic weight and high vapor density. The volume of its vapor is about one-eighth that of steam, thus reducing the necessity for high velocities. Its heat conductivity is almost equal to that of copper, and a mercury boiler may be operated absolutely without scale. The low spouting velocity of mercury vapor as compared with steam also makes possible the use of simple impulse wheels for utilizing the energy of the vapor. In comparison with a theoretical steam velocity of 40,000 ft. per second, the spouting velocity of mercury vapor is about 1000 ft. per second. Principal among the objections which have hitherto stood in the way of mercury as an expansible fluid is the cost of the liquid metal. One pound, having a volume of about 2 cu. in., costs 60 cents. Mercury vapor is, moreover, poisonous, and it is insidious in its effects on the human system if allowed to escape into the air. Evidently, therefore, from reasons of both safety and economy, some means must be provided for collecting and returning the exhaust from a mercury turbine. To take advantage of the high-temperature operating range of mercury vapor already referred to, the proposal has been made to install a mercury boiler in the hottest part of a furnace setting, using the mercury vapor from this boiler to drive a single-stage mercury turbine. The exhaust from the mercury turbine would then be conducted to a condenser apparatus, where the mercury would be condensed to liquid form ready for use again. In condensing, however, at a temperature above 400 deg. Fahr., the mercury vapor would liberate heat capable of generating high-pressure steam in the shell of the condenser apparatus. The latter would, therefore, serve both as a condenser for the mercury cycle and as a boiler for generating steam. Steam from this boiler would then be led off to a steam turbine and utilized in the usual way. The scheme of operation will be made clear by the accompanying sketch. The interposition of the mercury system between the furnace and steam boiler obviously makes available the energy in the furnace gases between the temperature of the mercury vapor and that of the maximum practical steam pressure. There would be effected, therefore, a net saving of the power generated by the mercury turbine. The proposal has also been made to install such unit mercury turbines on existing boiler units. The



MERCURY-TURBINE SYSTEM AND METHOD OF GENERATING STEAM FOR USE IN STEAM TURBINE

mercury equipment is compact, and after extracting the quota of energy secured through the mercury turbine the full steam rating of the boiler would be available as before. Experimental boilers have been built up of groups of copper tubes with small, flat passages.



# Digest of Current Electrical Literature

## Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

### Generators, Motors and Transformers

**Shunt Three-Phase Commutator Motor.**—H. K. SCHRAGE.—An English translation in abstract of his recent German paper on a new type of three-phase commutator motor with shunt characteristics. Instead of the usual complicated controller, the speed is regulated by shifting the brushes, so that no transformer whatever is needed in the new arrangement.—*London Electrician*, Oct. 30, 1914.

**Polyphase Motor with Unity Power-Factor.**—ALEXANDER HEYLAND.—An English translation in abstract of his recent German article on a new polyphase motor with unity power-factor.—*London Electrician*, Nov. 6, 1914.

**Retardation Tests.**—L. WERNER.—The first part of an article, illustrated by diagrams, in which the author describes the most convenient methods of testing dynamo-electric machines by the retardation method.—*Elek. Rundschau*, Oct. 21, 1914.

### Lamps and Lighting

**Standards of Radiation.**—W. W. COBLENTZ.—In the first part of this paper measurements are given of the radiation from the Hefner lamp and from a standard sperm candle relative to that of a black body. The data are applicable for rough comparison of radiometers in absolute measures. The custom of specifying the radiation sensitivity in terms of the total radiation received from a standard flame per square centimeter of area of the receiver exposed at a distance of 1 m is useful and, on the assumption that the constant of total radiation of a black body is  $\sigma = 5.7 \times 10^{-12}$  watt  $\text{cm}^{-2}$  deg.<sup>-4</sup>, the following radiation relations are given: 1 sperm candle, 29 microcalories per sq. cm; 1 Hefner unit, 26 microcalories (no diaphragm), 23 microcalories (diaphragm with opening 14 mm by 50 mm); 1 Hefner unit, 0.034 sperm candle; 1 microcalorie, 0.0385 Hefner unit (no diaphragm), 0.043 Hefner unit (diaphragm with opening 14 mm by 50 mm). For refined measurements of radiation stimuli a standardized incandescent lamp is recommended for calibrating the radiometer. In the second part of this paper tabulated data are given showing the precision attained in standardizing such an incandescent lamp against a black body by means of three thermopiles having widely different constants.—*Scient. Papers, Bureau of Standards*, No. 227.

**Vapor Pressure of Platinum and Molybdenum.**—IRVING LANGMUIR AND G. M. J. MACKAY.—The rates of evaporation of heated platinum and molybdenum wires in high vacuum were determined over rather wide ranges of temperature. From these data the vapor pressure  $p$  (in dynes per sq. cm) of these metals was calculated. The results are given in the following two equations:  $\log p = 14.09 - (27,800/T) - 1.26 \log T$ , for platinum, and  $\log p = 17.354 - (38,600/T) - 1.26 \log T$ , for molybdenum, where  $T$  is the absolute temperature. The vapor pressure of platinum in millimeters of mercury is  $324 \times 10^{-10}$ , at 1000 deg. absolute; it is  $107 \times 10^{-8}$  at 2000 deg. absolute and 760 mm at 4180 deg. absolute. The vapor pressure of molybdenum is  $6.43 \times 10^{-8}$  mm at 1800 deg. absolute; it is  $43 \times 10^{-6}$  at

2500 deg. absolute and 760 mm at 3890 deg. absolute. These results are found to be in moderately good agreement with an approximate equation derived by Nernst's heat theorem.—*Phys. Rev.*, October, 1914.

### Generation, Transmission and Distribution

**Steam Consumption of Turbines.**—An account of results of recent tests of a 1000-kw Ljungström turbo-alternator at the St. Pancras electricity works. The steam consumptions realized on the tests were considerably better than those guaranteed, as is shown by the figures given in the table. Since this turbine has been

STEAM CONSUMPTION IN POUNDS PER KILOWATT-HOUR

	Full Load	Three-quarters Load	Half Load	Quarter Load
Actual consumption...	12.75	13.57	14.67	17.75
Guaranteed consumption	14.00	14.75	16.50	19.75

in use there is a saving in coal equivalent to about \$8,500 per year. Notwithstanding the high speed of 3000 revolutions per minute and 6000 per minute between the two rotating elements, there is almost complete absence of noise or vibration. The report concludes with some interesting figures showing the progressive improvement in steam consumption with the various types of plant installed in the station since its inception in 1891. Thus, while the full-load consumption of the reciprocating plant improved from 26.6 lb. to 19.5 lb. per kw on full load, the first direct-current turbo-generator in 1906 gave a figure of 17, which was lowered to 16.15 by the 2200-kw turbo-alternator of 1909. Now 12.75 lb. has been reached with the Ljungström set mentioned above, while 11.8 lb. per kw-hr. is guaranteed for the 5000-kw machine which is to be installed, and it is hoped that this will be improved upon when the tests come to be made. The improvement at fractional loads is even more remarkable.—*London Elec. Eng'ing*, Oct. 29, 1914.

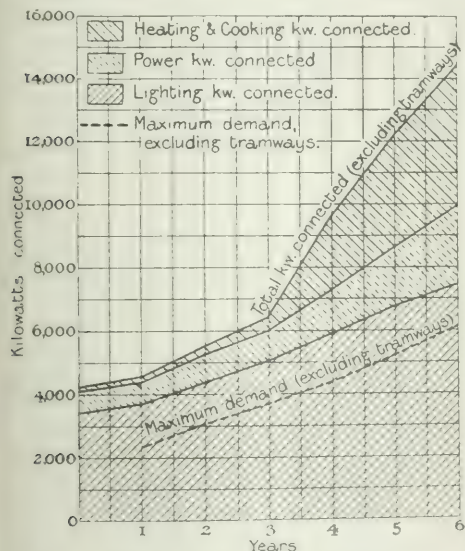
### Traction

**Subways.**—BRUGSCH AND BRISKE.—The first part of an illustrated article on the ventilation of subways and tunnels.—*Elek. Kraftbetr. u. Bahnen*, Sept. 24, 1914.

### Installations, Systems and Appliances

**Bulk Supply, Domestic Supply, Future Prices of Electricity.**—SIR JOHN SNELL.—An abstract of his presidential address to the (British) Institution of Electrical Engineers. In the introduction the author refers to the work of the institution with respect to education, papers, the late industrial committee, lectures, remuneration of young engineers, the national service of British electrical engineers in the present war, and legislation. The author then refers at greater length to the problems of bulk supply, domestic electricity and probable future prices to consumers. With respect to bulk supply he says there is no doubt that were things beginning anew instead of each small local authority installing an independent station considerable waste of money and fuel would be avoided by establishing one

large system for supplying energy to each smaller area for local distribution. While this is often true, there is, however, another side to the question. It may be generally said that once a small station is built and the expenditure has been incurred, then, and so long as the system is kept within defined limits of extension, the extra cost of operating an addition to the small station is often less than the cost of any commercially feasible bulk supply. The author suggests that a complete survey be made by the Local Government Board of the present position of all the electrical authorities, so that in those cases where amalgamation of electrical interests or purchase of energy from some outside source for local distribution ought to be adopted in lieu of a local extension of plant, the board would decline to sanction any loans for the proposed extension of local plant. In discussing domestic electricity supply he urges that the supply of energy for lighting on the one hand and for heating and cooking on the other should not be differentiated in the consumer's installation by two sets of wiring. That a diversity exists between the lighting and cooking loads is clear from the diagram. It gives from



CURVES SHOWING HEATING AND COOKING LOADS

actual practice curves of connection and load illustrating the effect of heating and cooking during six years. While the lamp and motor connections are steadily rising, the heating and cooking connections are increasing at a greatly accelerated rate; but, as will be seen, the maximum load on the system is rising proportionately to the lamp and motor load only and is virtually unaffected by either the heating or the cooking additions. This demonstrates: (a) A greatly improved annual load-factor; (b) the great diversity between the heating and cooking loads and all other classes of supply; (c) not only the consequent better utilization of the generating plant but also that of the feeders and distributing mains. Load curves showed that the daily load-factor in the summer had increased from 26 per cent to 37 per cent for comparable days in three successive years, and in the winter from 38 per cent to 42 per cent. All the rate schedules that have been tried have been really narrowed down to three kinds, namely (1) the assessment system, (2) the fixed-charges system, and (3) a flat rate. The fixed-light system is a special adaptation of

the second kind. For some time to come the two first-mentioned systems will no doubt find increasing favor, because they are more readily and justly adaptable to the various domestic needs, whether lighting alone, heating alone, cooking alone, or any combination of them. The author then takes up the problem of future charges to consumers. He thinks it unwise to speak of such low prices as  $\frac{1}{4}$  cent or  $\frac{1}{2}$  cent per kw-hr. for general supply. He gives figures of generating cost on a large scale under ideal conditions and shows that there are two chief items of cost, fuel and capital charges. Even if the fuel charges could be eliminated, the average cost would be reduced comparatively little. The author finally gives the following figures for capital invested in the electrical undertakings and costs in the British Empire: 310 manufacturing companies, \$233,515,235; 178 miscellaneous companies, \$43,782,085; telegraphs and telephones, \$186,245,440; 269 electrical-supply companies, \$291,824,425; 262 municipalities, \$248,284,755; 110 tramway undertakings, \$280,062,330; total, \$1,283,714,270. This huge total does not include government telegraphs and telephones, power companies, or the capital invested by railway companies in electrification, which would greatly increase it. In conclusion, the author briefly refers to the trend of improvements in various fields of electrical industries.—*London Electrician*, Nov. 6, 1914.

#### Electrophysics and Magnetism

*Production of Soft Roentgen Radiation by the Impact of Positive and Slow Cathode Rays.*—SIR J. J. THOMSON.—A gap of about eight octaves separates the softest characteristic Roentgen radiation yet investigated—that of aluminum—and the shortest waves in the Schumann region—those recently discovered by Professor Lyman; the latter have a wave-length of about  $9 \times 10^{-8}$  cm, the former one of  $3.6 \times 10^{-8}$  cm. Very little is known about any radiation of intermediate wave-length, and yet the study of such radiation is essential for the determination of the structure of the atom. By its aid one might hope to gain a knowledge of the distribution of the electrons in the atom, to determine, for example, how many rings of electrons there are in the atom and the number of electrons in each ring. One associates the K and L types of radiation with the vibrations of the two rings nearest the center of the atom, and the visible spectrum with those of the outermost ring. By using Roentgen radiation ranging in hardness from that characteristic of aluminum to the hardest we can produce we can detect the existence and study the properties of the two rings nearest the center. By using the light of the visible and ultra-violet region we can find out a good deal about the outermost ring, but to study the intermediate rings, and thus get even an approach to the constitution of the atom, we require radiation intermediate between Schumann and ordinary Roentgen rays, a type of radiation which has not hitherto attracted much attention. The author discussed two methods of producing radiation of this type. A description is given of a new method based on the fact that when positive rays impinge against a solid radiation of this type is produced. The second method depends up the production of soft Roentgen radiation by the impact of slow cathode rays.—*Philos. Mag.*, October, 1914.

*Contact Potentials in Vacuo.*—ALBERT E. HENNINGS.—An illustrated account of a study of contact potentials and photo-electric properties of metals (freed from gas or oxide films) in vacuo and the mutual relation between these phenomena. The contact potentials of the metals are not noticeably changed by differences in pressure ranging from atmospheric pressure to that of the best vacuum obtained. All the metals are rendered



more electropositive when polished in vacuo and gradually become more electronegative just as do freshly polished surfaces in air. Prolonged illumination with ultra-violet light greatly modifies the contact potentials of film surfaces, and whatever the direction or magnitude of the change may be, each metal exhibits a tendency to recover its original potential when the action of the light has ceased. With newly prepared surfaces these changes are negligible or unappreciable. On the photo-electric side the results as a whole confirm the point of view adopted by Richardson and Compton in regard to the relation between photo and contact potentials. The photo-sensitiveness of all the metals is very largely increased when the surface films, which in general always exist even in the best vacuum unless the metals have been subjected to special treatment, are removed. Although the order of the metals when arranged according to their photo-sensitiveness in vacuo is usually not at all that of the Volta contact series, the order assumed by freshly cleaned metals approaches very closely that of this series.—*Phys. Rev.*, September, 1914.

**Hysteresis Loss as a Function of Magnetic Density and Maximum Permeability.**—JOHN D. BALL.—K. Zickler has formerly given for sheet iron a mathematical relation between hysteresis loss and maximum permeability and induction. The present author gives numerous tables which show that Zickler's rule fails in many cases and its application is valid only within very narrow limits, within which the properties of the material are exactly known. Within wide limits it is not permissible to assume the hysteresis loss to be inversely proportional to the maximum permeability. In the same issue Zickler replies to the criticism and agrees that his rule was based on experiments with too small a number of sheet-iron samples. He indicates how it may be possible for special alloy sheets containing silicon to take into account the effect of silicon.—*Elek. u. Masch.* (Vienna), Oct. 4, 1914.

#### Units, Measurements and Instruments

**Braun Tube.**—F. C. KOCK.—An illustrated description of a modification of the Braun cathode-ray tube for the direct representation of alternating-current curves so that the tube may be used as an inexpensive substitute for an oscillograph.—*Phys. Zeit.*, Oct. 1, 1914.

**Gold-Leaf Electroscope.**—GIOVANNI COSTANZO.—A brief note stating that the sensitiveness of a gold-leaf electroscope is increased if for the usual rectangular form of the gold leaf there be substituted the triangular form obtained by cutting the rectangle into two halves along one diagonal.—*Phys. Zeit.*, Oct. 1, 1914.

**String Galvanometer.**—W. H. APHORPE.—An illustrated note on an improvement in the Einthoven string galvanometer by which it becomes possible with one instrument to obtain simultaneously two records on the same plate.—*London Electrician*, Oct. 30, 1914.

#### Telegraphy, Telephony and Signals

**Effects of Three-Phase High-Tension Line on Telephone Lines.**—O. BRAUNS.—The first part of a mathematical paper in which the author investigates the effect upon telephone lines of switching operations and accidental earth faults in neighboring high-tension transmission lines.—*Telegr. u. Fernspr. Technik*, Oct. 15, 1914.

**Atmosphere Refraction in Wireless Telegraphy.**—J. A. FLEMING.—An abstract of a (British) Physical Society paper of a theoretical nature on atmosphere refraction and its bearing on the transmission of electromagnetic waves round the earth surface. The author's considerations show how closely the possible

range of long-distance radiotelegraphy is connected both with the size of the planet and the nature of the atmosphere in which it is conducted. Having regard to the great variations which exist in planetary atmospheres, it is quite possible that our earth is unique in this respect, as in many others, in being perhaps the only planet on which long-distance wireless telegraphy is possible.—*London Electrician*, Nov. 6, 1914.

**Cable Telegraphy.**—H. W. MALCOLM.—A continuation of his highly mathematical serial on the future progress of cable telegraphy, in which an analytical study is made of the problem of increasing the speed of the submarine telegraph cable and of rendering it, if possible, distortionless. In the present instalment he gives the theory of the shunted condenser.—*London Electrician*, Nov. 6, 1914.

#### Miscellaneous

**Italy.**—An article giving statistical tables of the imports of electrical goods into Italy in 1912 from various countries, with a comparison with the year 1911. Tables of the export trade are also given.—*London Elec. Review*, Oct. 9, 1914.

**Riveting.**—An illustrated article on two Swiss systems of electrohydraulic riveting machines—those of H. Spillman and of the Oerlikon company respectively. The advantages of the electro-hydraulic system over other systems of riveting are discussed, especially easiness of attendance, high efficiency and low-power consumption.—*Schweizer Bauzeitung*, Oct. 24, 1914.

## Book Reviews

PROCEEDINGS OF THE NATIONAL FOREIGN TRADE CONVENTION. Foreign Trade Council, New York. 474 pages. Price, \$1.50.

The bound volume containing the official report of the National Foreign Trade Convention held at Washington, D. C., on May 27 and 28, 1914, is particularly timely. It contains the papers and discussions, the speeches made at the banquet and the preambles and resolutions adopted by the convention. Among those whose papers are given are Mr. W. C. Redfield, Secretary of Commerce; Mr. James A. Farrell, president of the United States Steel Corporation; Mr. James J. Hill, chairman of the Great Northern Railway Company; Mr. John D. Ryan, president of the Amalgamated Copper Company; Mr. Willard Straight, of J. P. Morgan & Company; Mr. W. J. Bryan, Secretary of State; Mr. Charles A. Conant, Mr. Edward N. Hurley, Hurley Machine Company, and Mr. M. A. Oudin, General Electric Company.

COSTRUZIONI ELETTROMECCANICHE. Vol. II. By Prof. Ettore Morelli. Turin, Italy: Unione Tipografico-Editrice Torinese. 192 pages, 171 illus. Price, paper, \$1.

This is the second volume of the "Electromechanical Construction" series and is devoted to alternating-current machinery, and especially to alternating-current generators. The book is divided into three chapters, relating respectively to types of alternator construction, mechanical parts of the armature and electrical parts of the armature. The treatment of the subject is mainly from the standpoint of mechanical construction, and many prints of machine drawings illustrate the text. The descriptions are clear and the mathematical discussions simple. The work will be of special interest to designers of alternating-current machinery desirous of acquainting themselves with the details of south European practice.

# New Apparatus and Appliances

## An Illustrated Descriptive Record of Recently Developed Manufactured Products of Interest to Electrical Readers

### Lighting Fixture for Garages

In the accompanying illustration is shown a portable fixture for use in garages, which is being made by Frank W. Morse, 516 Atlantic Avenue, Boston, Mass. Use is made of a 16-cp round lamp equipped with a

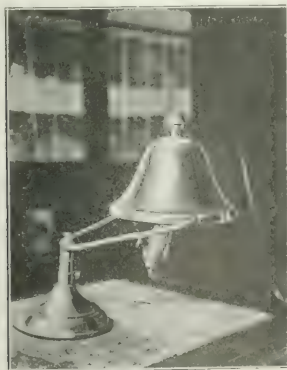


PORTABLE LAMP FOR GARAGES

vaporproof globe, a reflector, a guard and a waterproof socket which is placed in the handle. A cord 12 ft. long and a two-piece plug are used with the lamp.

### Liberty Bell Adjustable Lamp

A portable lamp which can be used as a table, bracket or indirect lighting unit is being manufactured by the Hallbauer-Hardman Manufacturing Company, Schenectady, N. Y. The reflector, which is designed to repre-

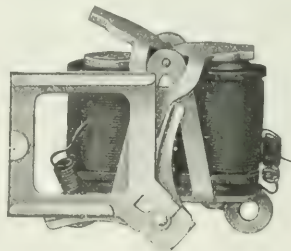


PORTABLE LAMP IN USE WITH PIANO

sent a bell, is free to move about pivots on the ends of a U-shaped jaw fastened to a heavily weighted base. The incandescent lamp, which is supported just within the mouth of the bell, can also be tilted as can the U-shaped jaw. From a reading lamp it can be quickly converted into a bracket lamp by fastening the dis-

### Electrically Reset Annunciator Drop

The electrically restored target-annunciator drop shown herewith is made by Edwards & Company, 140th and Exterior Streets, New York City. The device consists of two electromagnets over which is pivoted a rocker-type armature carrying an arm which transmits its motion to the target by sliding over a V-shaped piece attached thereto. This mechanism is not affected by vibration as the shutter is locked in each extreme position by the end of the armature arm bearing against one side of the V. Upon energizing the right-hand magnet the target is thrown to the left, after which it may be returned to its former position by energizing the other magnet. The reset coils in an annunciator box



ANNUNCIATOR DROP

may be connected to one circuit for simultaneous resetting or may be controlled separately from individual push-buttons. The annunciator can therefore be placed above reach as under normal conditions it never has to be touched.

### Ball-and-Socket-Joint Hickey

Wiremen and fixture hangers occasionally find outlet boxes installed askew or studs and drops inclined from the correct position. To facilitate attaching fixtures when these conditions exist there has been developed recently a ball-and-socket-joint hickey which can be adjusted to align a 6-ft. fixture that is 24 in. out of plumb. By cutting off one side of the cup it is possible to allow for an adjustment of 45 deg., which is very desirable on sloping ceilings such as are found in theaters and buildings having saw-tooth roofs. The device, which is made of malleable iron, can be furnished with a tripod, crow-foot or outlet-box stud. It can also be made to fit either a male or female insulating joint of 0.25-in. or 0.375-in. standard-pipe size and fixture stems of 0.125-in., 0.25-in. or 0.375-in. standard pipe. It is declared that 10 to 25 per cent of the time consumed in hanging a fixture



with the ordinary hickey can be saved by using this device. After the crowfoot or insulating joint has been attached to the hickey the fixture is hung by slipping a bolt through the hole in the ball, swinging up the hinged half of the cup and screwing up the wing nut.

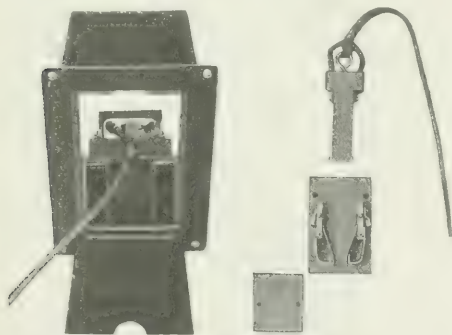


ADJUSTABLE SUPPORT FOR FIXTURES

With the latter tightened the joint is rigid so that the fixture cannot twist or swing. The manufacturer of this device is the Wilton Manufacturing Company, Wrightsville, Pa.

### Stage Receptacle

A stage receptacle and plug has recently been developed by the A. G. Electric & Manufacturing Company, 905 South Howard Avenue, Seattle, Wash. The box is of wrought iron, the front being quite heavy to



FIGS. 1 AND 2--STAGE RECEPTACLE ASSEMBLED AND DIS-ASSEMBLED

withstand wear. The receptacle is shown in Fig. 1 with door open; in Fig. 2 are shown the unassembled parts. A double-break mechanism is provided, preventing danger of short-circuits.

### Automobile Dashboard Lamp

A lamp which can be placed on any part of an automobile dashboard and can be easily removed if desired is shown in the accompanying illustration. When re-

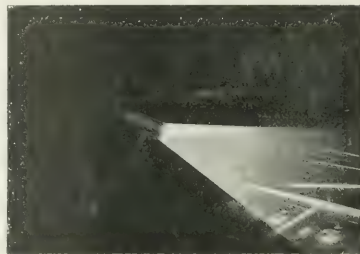


LAMP ON AUTOMOBILE DASHBOARD

moved from the bracket the cord unwinds so that the lamp can be utilized in any part of the car. A crank is provided for winding up the cord when replacing the lamp on the dashboard. The "auto-dashlight," as the lamp is called, is being made by the L. A. Williamson Company, 258 Broadway, New York.

### Adjustable Automobile Searchlamp

A small adjustable searchlamp which can be attached to the wind shield of an automobile and placed at any angle desired has recently been developed by the Pittsburgh Electric Specialties Company, Pittsburgh, Pa. The lamp can be easily detached and used as a trouble

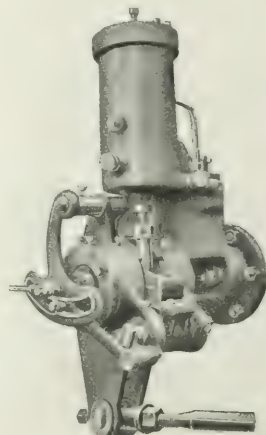


AUTOMOBILE SEARCHLIGHT

finder. The light is supplied by a 6-volt tungsten lamp and passes through two lenses. The device is finished in nickel. In the accompanying illustration the searchlamp is shown in use for inspecting purposes.

### Valve Gear for High-Speed Corliss Engine

In the *Electrical World* of June 6, 1914, was described a long-range valve gear designed to reimburse the fly-wheel of Corliss engines operating at ordinary speeds with energy by taking steam for full stroke until full



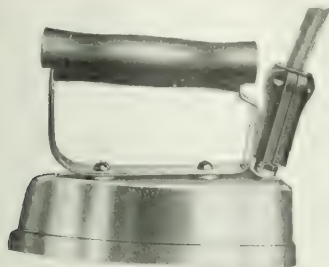
HIGH-SPEED CORLISS-ENGINE VALVE GEAR

control is obtained by the governor. The valve gear shown in the accompanying illustration is designed for Corliss engines operating at a speed of 1500 r.p.m. or more. The entire gear is symmetrical with respect to a central plane, there being no overhanging parts excepting the full-stroke cam. The

valve-arm casting rides on a large bearing formed on the bonnet itself. The valve arm carries two bearings which support the hook, one bearing being on either side of the drop arm. The valve stem has two bearings in the bonnet outside the stuffing box, and the drop arm is keyed to the stem between these two bearings. The end thrust of the stem is taken up by a hardened-steel plate in the bonnet cap. Dash-pots are provided to secure positive and sharp action to the valve gear with short travel. The valve gear is used with high-speed Corliss engines equipped with four-port valves, which are being made by the Nordberg Manufacturing Company, Milwaukee, Wis.

### Electric Iron

A 6-lb. electric iron has recently been developed by the Menominee Electric Manufacturing Company, Menominee, Mich. The iron is designed for either 110



6-LB. ELECTRIC IRON

volts or 220 volts and takes 500 watts. All metal parts are nickel-plated and polished. A 10-ft. cord and attaching plug are used with the iron.

### Vacuum Cleaner with Bag Near Handle

A light-weight electric vacuum cleaner with bag and motor near the handle is shown in the accompanying illustration. The weight complete is less than 7 lb. The cleaner is equipped with a long tube and a swivel-



LIGHT-WEIGHT VACUUM CLEANER

jointed nozzle which enable the operator to clean the tops of window and door frames, molding and pictures with considerable ease. The switch is in the handle. Besides an 8-in. swivel nozzle, the following equipment is also used with the machine: An 8-in. wall brush, an 8-in. hard-wood-floor plate, a 4-in. nozzle, a radiator

nozzle and a library brush. The cleaner is being made by the Pittsburgh Electric Specialties Company, Pittsburgh, Pa.

### Socket for Large-Sized Incandescent Lamps

The keyless porcelain socket shown herewith is designed for use with high-efficiency tungsten lamps. At 600 volts its rating is 1500 watts. The socket is equipped with a stamped brass cap, the diameter of



SOCKET DESIGNED FOR LARGE LAMPS

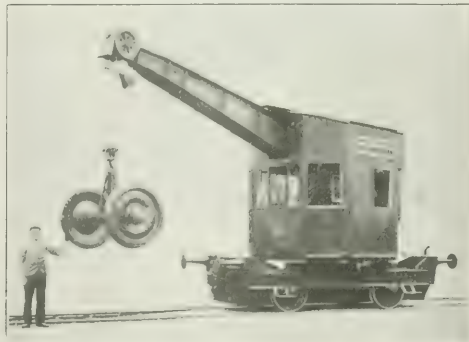
which may be 0.375 in., 0.5 in. or 0.75 in. A sealing compound, called "arrowax," which hardens with the application of heat, is used in the construction of the device. The socket is being made by the Arrow Electric Company, Hartford, Conn.

### Storage-Battery Locomotive Turning Crane

A crane of the revolving-post type operating on storage batteries has been developed by the L. von Roll'schen Eisenwerke, Berne, Switzerland. It may be equipped with a hook for carrying a load, as shown in the accompanying illustration or with a bucket for carrying loose materials. The crane is designed to carry a maximum load of 5 tons at a mean radius of 19.78 ft.

The battery is rated at 185 amp-hr. and will discharge for a period of five working hours. It contains eighty elements, the output being 30 kw-hr. The battery is charged by dividing it into two groups of forty cells each, the initial pressure being from 80 volts to 85 volts, which is gradually raised until it is from 105 volts to 110 volts. The two groups of cells are connected together in series, and a discharge pressure ranging from 160 volts to 170 volts is attained.

Five series-wound motors are used, the lifting motor being rated at 17 hp, the turning motor at 4.5 hp and the two traction motors at 12.5 hp each. The total rating is, therefore, 25 hp. The hoisting speed is 0.39 in. per minute, the turning speed is 39.37 ft. per second, and the traveling speed is 78.74 ft. per second.



REVOLVING-POST CRANE OPERATING ON STORAGE BATTERIES



### Electrically Operated Rotary Mimeograph

The motor-driven mimeograph shown herewith is being made by the A. B. Dick Company, 730 West Jackson Boulevard, Chicago, Ill. The motor is designed for operation on both alternating current and direct cur-

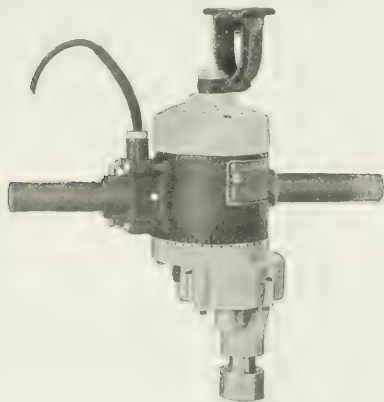


MOTOR-DRIVEN MIMEOGRAPH

rent, and the speed of the machine can be regulated by means of a rheostat from 20 r.p.m. to a maximum of 100 r.p.m. The belts from the motor to the large pulley and the reducing pulley to the far side of the cylinder are held taut by mounting the pulleys in the manner shown in the illustration so that the mounting acts as a hanger. The use of idlers is thereby obviated. An adjustment is provided so that the machine can be driven by hand if desired.

### Portable Drill for Either Alternating or Direct Current

Alternating or direct current may be used to operate the portable drilling machine illustrated herewith. Machines of this type are made for drilling holes in steel



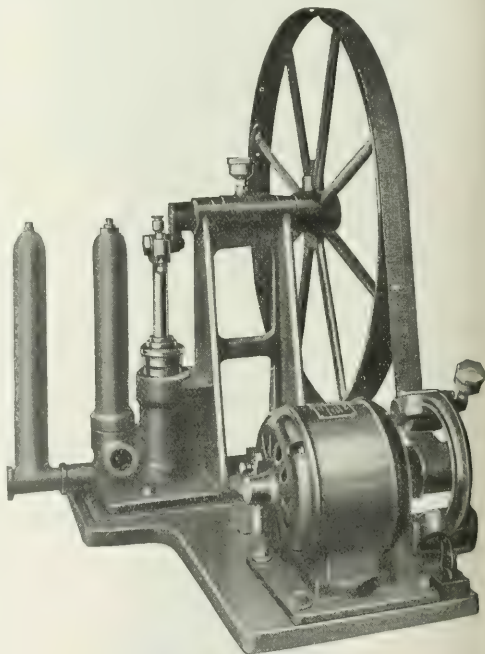
DRILL OPERATING ON ALTERNATING OR DIRECT CURRENT

up to 0.625 in. in diameter. The weights and speeds vary from 6 lb. and 2200 r.p.m. for 3/16-in. holes to 18.5 lb. and 500 r.p.m. for 0.625-in. holes. Cable connections can be made directly to the switch mechanism without disassembling the machine. A simple, quick make-and-break, multiple-type switch is employed which, it is declared, reduces arcing to a minimum.

The commutator is easily accessible for surfacing or renewing brushes. All of the gears run in a lubricant, and the bronze bearings are oiled by forced lubrication. Ball bearings are employed for the armature shaft and thrust bearings. The casing, being made of aluminum, is extremely light, and ventilation for the motor is afforded through a perforated sheet-metal cover. Either chuck or socket tools can be used with this machine. It is manufactured by the Van Dorn Electric Tool Company, Cleveland, Ohio.

### Automatic Water Pump

An automatic motor-driven pump is illustrated herewith which is especially adapted to direct-pressure systems as it eliminates the use of storage tanks. It can be employed to pump water into the house-service pipes or may be used to increase the city-water pressure. The



MOTOR-DRIVEN WATER PUMP

pump is simple in construction and is declared to be noiseless in operation. With a 1/6-hp motor which is ordinarily furnished with the set 150 gal. of water can be delivered in an hour against a pressure of 35 lb. per sq. in. gage. Either direct-current or alternating-current motors are supplied which will start under full load and will operate even with a voltage variation of 10 per cent. The automatic switch, which is operated by a pressure controller, stops the motor when the pressure in the expansion tank reaches a predetermined value and starts it again when water is drawn from the pipes. The pump is vertical, single-acting and consists of a cylinder cast in one piece with the base containing a heavy bronze piston. Only two valves are employed, which are accessible and operate without noise. Two vertical air chambers connected with the cylinder and delivery pipe prevent water hammer. The outfit is manufactured by the Bishop-Babcock-Becker Company, Cleveland, Ohio.

# Electrical Merchandising for Christmastide

Necessity of Attractive Window Displays, Brightly Lighted and Appropriately Decorated Stores, Department-Store Methods and Service—Christmas Gift Suggestions

## PREPARING FOR CHRISTMAS SHOPPING

Show-Window Displays and Exterior and Interior of Electric Shops Should Suggest Spirit of St. Nicholas

By A. J. EDGELL

**A** PROGRESSIVE selling policy, including competent salespeople and attractive displays of goods in show windows and store interiors, is the method that must be used by the merchant of to-day not only for the Christmas shopping season but in addition through the whole business year. The most successful are those who have put aside the frigid dignity with which the

improvement possible in many electrical stores, due, no doubt, to the fact that the dealer has been too busy with other matters to give much thought to the public at large as possible customers.

### Preference Given to Electric Shops

People would prefer to buy electric merchandise from an electric shop. That is a fundamental advantage that the electric merchant has over other merchants selling this class of merchandise. The public has more confidence in the statement of the electric salesman. It feels that he knows, while in other stores electric goods are part of a conglomerate stock, and the salesman sells galvanized washtubs, silver polish, grass seed or electric appliances with equal gusto. If the public can make its purchases from an electric shop under service conditions it will never procure many of its needed electrical appliances elsewhere. Right now when Christmas is approaching is the very best time to take a stand on the service basis.

### Electrical Gifts Are Practical

Electrical gifts are sensible, useful and acceptable. There are more arguments in favor of electrical gifts than for all others combined, and the door of opportunity is wide open to the electrical dealer. The manner of his merchandising will show whether by Christmas Eve the cash-register is so full of greenbacks that the

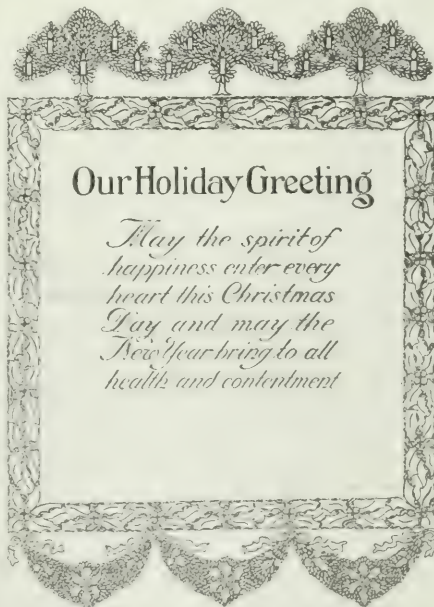


CHRISTMAS GIFTS MUST BE APPROPRIATELY WRAPPED

large storekeeper of a few years ago was wont to clothe himself.

In every line the most stately and dignified firms have had to get closer to the people. Every one who deals with the public must come to a "Public be pleased" basis. The firm operating with this policy need not worry much about its competitors, for it has an asset that often will overcome the lower-price argument of a rival. A lasting success cannot be built in the retail field without this foundation.

Big advertising will bring results for a while. Cut prices will also attract the economical, and good displays will draw a possible customer into the store. But it is the manner in which he is treated in the store that counts; for it is in the store itself and in its sales force that the final decision of the customer as to whether he will make this store his source of supply for future needs will lie. This is why the word "service" has become so big a talking point of merchants in advertising. "Service," however, means more than that. The appearance of the store exterior, the window displays, the advertising, the keeping of promises made and the aspect of the store interior are all parts of the store's "service" in the customer's mind, and it will pay every dealer in electrical merchandise to give this idea of service his best thoughts, whether he is selling appliances or supplies. There is a goodly amount of



HOLIDAY GREETING CARD FOR CUSTOMERS

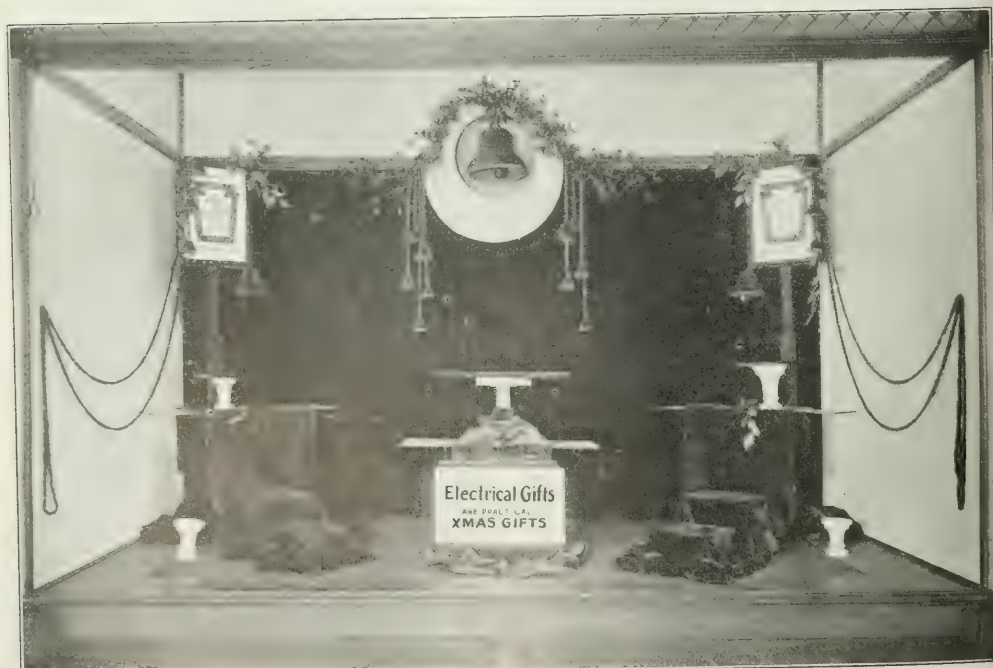
drawer won't close. There are still more than three solid weeks available for gift-buying business.

In their homes people are scanning the newspapers and magazines for suggestions, so that newspaper advertisements should be made up of Yuletide talk. It





WINDOW DECORATED FOR HOLIDAY SEASON



SIMPLE SETTING OF WINDOW BEFORE DECORATION

is a poor time for cold facts and prices. Christmas buying is done to a considerable extent on sentiment, so that it is advisable to make all advertising breathe the Christmas spirit to be in harmony with customers' thoughts. A touch of sentiment will first arouse interest in gift suggestions, and the practical side can be brought out later.

#### Attractive Exteriors and Interiors Necessary

The business district are crowded with Christmas shoppers, and the store exterior should be made attractive. People get their idea of what is within from the appearance of the store front. A clean-cut front attracts business, and during the holiday season especially the store front should be brightened up until it sparkles. Strings of colored lamps and a "Merry Christmas" electric sign with laurel roping strung across the building will impart a genuine holiday

must be closely linked with the mechanical attraction if the whole is to succeed as a sales producer. The show window's function is to sell goods, and this should not be lost sight of in an endeavor to produce some startling mechanical effect. The lighting of the window must be



CARD FOR SHOW WINDOW

especially intensive for nearly every merchant in order to compete with the other merchants who have "brightened up" for the occasion. Care should be taken that there be no light to dazzle and blind the eye so that the merchandise cannot be seen.

Displays should be changed on an average once each week, as the majority of the people will pass a store within a week's time. Even though the same devices are used, a change of arrangement should be made to give a different appearance. It is the constant change that makes the passer watch show windows in order to see what is new. Show cards embellished with a spray

**THE  
EDISON  
SHOP**

360 PEARL STREET BROOKLYN

**T**HE Edison Electric Illuminating Company of Brooklyn invites you to an exhibition of Electrical Giftware at the Edison Shop, from Monday, December Seventh until Thursday Evening, December Twenty-fourth.

The display will embrace the latest conceptions in goods electrical including many new, attractive and inexpensive electrical gifts.

Of especial interest will be the Electrically Lighted Christmas Tree. In fact, the Edison Shop, with its Christmas decorations, is fully characterized as, "The most beautiful showroom in New York."

**MUSIC**  
Opera Songs

**Refreshments**  
Electrically Heated

INVITATION ISSUED BY BROOKLYN EDISON COMPANY TO ITS PATRONS

appearance that will make the public feel that here is a Christmas store.

#### Show-Window Displays

In the show-window display the best opportunity of all is to be had, for there the gifts themselves can be seen. No printed description can quite equal the sight of the article itself. If the display is properly arranged and has the necessary setting, the devices appear even more attractive than usual. Displays can easily be made attractive at this time of the year because of the many decorative materials that are to be had. There are poinsettia, holly and mistletoe, laurel, Christmas bells, stars, and wreaths in white, green and red, the Christmas colors. A display need not be elaborate to be effective; in fact, a simple arrangement of merchandise with a little touch of color given by a wreath, a few bells, holly spray and roping will frequently be found to produce better selling results than a complicated mechanical display. Motion in a display will attract attention, but the rest of the display, the merchandise,

**Let The  
Children  
Light The  
Tree**

**C**HRISTMAS is Children's Day, the more so if they get out of it, the happier are we.

This year, why not bring their pleasure to a fitting close by having them light the tree on Christmas night? Let them "press the button." A fairyland will open its doors as they watch the wonderful light come forth from the miniature electric fruits, flowers, snowmen, and even old Santa himself!

The Electric Christmas Tree Outfit not only pleases the youngsters, but we "grown-ups" are happy, too, for we know there's no danger of the tree catching fire, as it oftentimes did in the days of tallow candles.

At the Edison Shop is a wonderfully beautiful Christmas tree lighted with more than five hundred lamps. Here will be found a variety of Electric Christmas Tree Outfits at prices from \$2.15 to \$14.40.

**THE EDISON SHOP**  
360 Pearl Street, Brooklyn, N. Y.

And at Edison Branches:  
844 Broadway 1208 Fulton Street 5114 Fifth Avenue  
Telephone 8000 Main

**Safety First**

APPEALING CHRISTMAS ADVERTISEMENT WITH MORAL

of holly, a cut-out figure of Santa Claus, etc., should be used with the displays.

#### Interior Decorations

The store interior should be so arranged that a visitor cannot turn around without seeing some reminder of



Santa Claus. There are many people who will visit the store to make everyday purchases without any thought that Christmas is so near. The show cards and decorations should give them no chance to forget that they have their Christmas shopping to do.

The decorations make the customer more cheerful, and a cheerful shopper is a good buyer. The same kinds of materials are available that may be had for the window displays. Holly paper can be had to cover the floor and shelves of showcases, and a bright red crêpe-paper bow adds life to a display. Interior displays and stocks should be made to appear full, so as to make the customer feel that he has plenty to choose from. Reserve stock should be brought to the salesroom that there may be a big show of appliances to impress this idea on the purchaser. It is surprising to see what articles can be sold as gifts if placed where they can be seen.

#### Value of Courtesy

Getting a customer into the store is but half the battle; treating him right after he is in completes the conquest. Courtesy to customers is a commodity that is never cheapened by over-supply. No matter how

## WHAT SHALL IT BE?

Timely Suggestions of Christmas Gifts Suitable for the Whole Family—Opportunities for Electric Shops

BY H. W. ALEXANDER\*

The season of the loosened pursestring is here. Millions of people are asking, "What shall the Christmas gift be?" These people are swarming through the big stores looking for something to buy. They are scanning the magazines for gift suggestions. They are eagerly searching the newspapers for ideas of what to buy for dad, mother, sister, brother, sweetheart and the baby. And the sidewalks are crowded with a swelling army of "window shoppers" who are trusting to luck that the clever display men will suggest something different.

There is a growing desire for more sensible Christmas gifts. Here is where the live central-station men and the electrical supply dealers step into view. With an "Electrical Christmas" as a slogan and a vast throng to sell to, the dealer should lay his sales plans determined that at least a portion of the money to be spent shall flow his way.

#### Electrical Gifts Practical

And, really, why shouldn't it? There are no more practical gifts than electrical gifts. The general line of handsome electric heating and cooking devices represents a class of products of unequalled suitability as gifts for the whole family. Imagine how many a man would rather receive an electric shaving mug than a necktie he wouldn't wear. Certainly most women would rather be presented with a useful electric iron than gloves too large or too small. And the actual differences in costs are not enough to scare away the prospective buyer.

What would please grandma more than an electric teakettle? The boy at college would find considerable use for an electric radiator to take the chill off after the rub-down. The bachelor maid has frequent use for an electric grill. Unless it is something that can be enjoyed, a Christmas gift is a mere waste of money. Most people would much rather receive a post card of remembrance than something disappointing. Everyone, even the baby with its toys, can be pleased with a "gift electrical"—for it is a practical present that never loses interest or value.

#### Household Electrical Devices

For the housewife there is the greatest assortment of all to choose from. For her it is but a question of "What shall I buy first?" Undoubtedly the electric iron stands among the real leaders of the gifts for her. The greater part of the drudgery of ironing day is banished when the electric iron is used. Hot, stuffy kitchens and the constant tramp, tramp, tramp between the kitchen range and the ironing board, carrying in the aggregate tons of steel and iron, are unnecessary. All such labor vanishes on the advent of the electric iron.

Then, too, consider the convenience afforded users of one of these labor savers. When rain takes the fluffiness out of the frocks and the little frills and ruffles which surround a woman, or when it takes the crease out of a man's trousers, it is necessary only to attach an electric iron to a nearby lamp socket, smooth out the wrinkles and everything is in proper shape again. Indeed, an electric iron should be right at the top of the gift list for the housewife, unless something else electrical is considered more important.

Next consider the electric percolator. It takes an electric percolator to make "real" coffee. And, too, it saves money, for by using this modern device it is pos-



BOOK OF GIFT SUGGESTIONS ISSUED BY N. E. L. A.

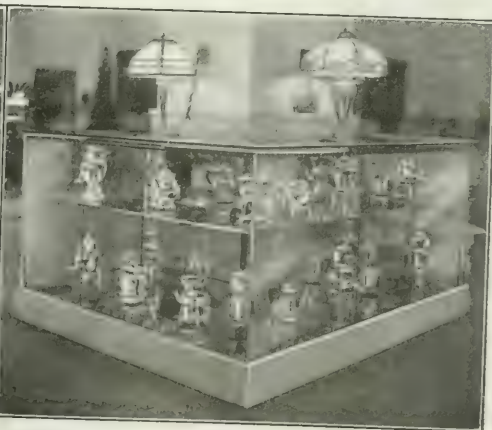
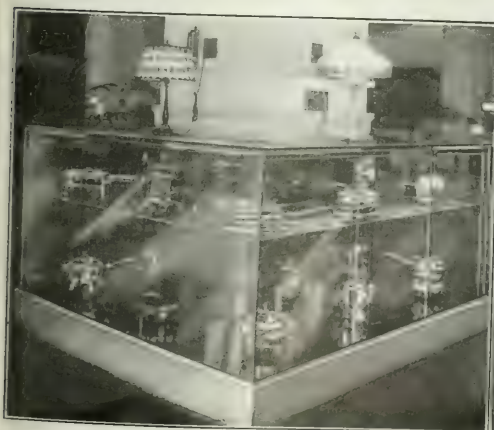
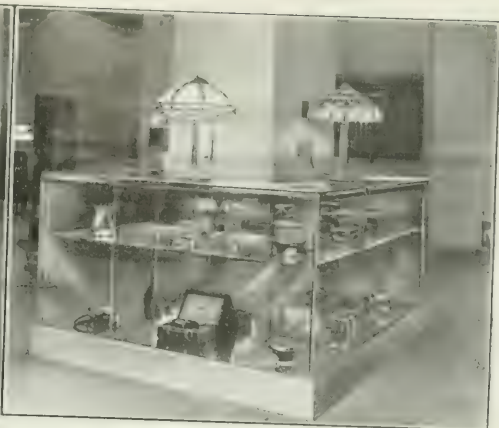
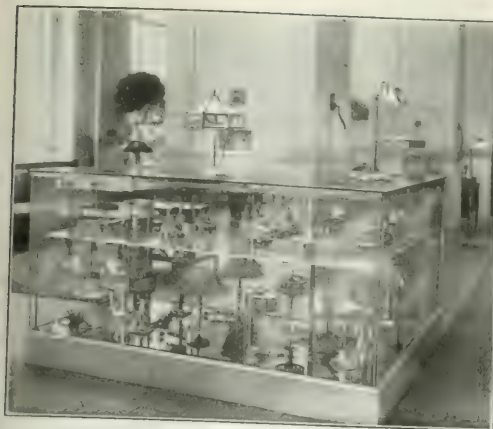
excellent goods may be or how cleverly advertised, a careless, incompetent sales force can drive away far more trade than advertising and display can bring.

One of the critical points in retail selling is that of promptness in serving customers. People dislike to wait, and when a man has money to spend he wants prompt attention, and is entitled to it.

Another detail that makes for good will is the manner in which packages are done up. This may seem a small thing, but it counts greatly at Christmas time. Every package that leaves the store during December should carry with it some little symbol suggestive of the season. This applies particularly to small packages containing gifts. What are known as "holly boxes" are not expensive and add much to the attractiveness of the gift. For tying them holly tape or narrow red ribbon should be used, and to large packages a holly poster should be affixed.

Keeping delivery promises and a courteous delivery man will carry the sale to a satisfactory conclusion. Not all of these improvements can be accomplished at once, but any one of them will do its share toward putting the balance on the right side of the ledger.

\*Publicity and sales manager Federal Light & Traction Company.



ELECTRIC DEVICES SUITABLE FOR CHRISTMAS GIFTS DISPLAYED BY THE NEW YORK EDISON COMPANY



sible to cut one-third off the coffee bill. It takes only eight minutes to make five cups of delicious coffee. Costs less than a cent for the electricity. And handsome percolators sell for \$5 and upward. What better sales argument could anyone want?

Winter is here. Almost any evening unexpected company is likely to call. What then? For the wife to start a fire and fuss around to prepare a bit of evening lunch, if only a "snack," takes time, causes trouble and possibly spoils an otherwise enjoyable evening for her. She has to leave the parlor; "hubby" must entertain the guests alone. And there is no end of muss. But when an electric grill is in the house things are different. She can fix up a bit of chicken, prepare a little toast, or cook many other tidbits on the "parlor range," right in front of the assembled guests. It is considered quite proper. The guests will enjoy the evening as much as the good wife. Such successful evenings in modern homes go far toward educating non-users of electrical appliances in the manifold advantages of utilizing the "little electric servants."

The convenience of using an electric grill does not stop with evening parties. For the breakfast an electric grill is most handy. It is possible to fry eggs, fix up what is left over from the night before, cook a bit of steak, and prepare any number of edible things. An electric grill will do almost anything that a big stove will do, except bake, so why not consider a grill as the "next buy"?

Before passing evening parties entirely it is well to remember that an electric chafing dish is quite "the" thing for Welsh rabbits. Such an appliance will make a most acceptable gift for any woman.

When there is a baby in the house and the little one wakes up in the night, there is no need of "taking a chance" of catching cold, running around the house barefooted, when it is possible to use an electric milk warmer and heat the milk at the bedside. Many an otherwise sleepless night will be saved if a bottle of milk is kept at the bedside; when baby cries "twitch the switch," and in a jiffy hot milk is ready for the wee one.

SEWING MACHINE

#### Electrical Men Should Use Electrical Appliances

It may seem strange, but there are any number of workers in different branches of the electric industry who know little or nothing about such electrical devices as those mentioned in the foregoing. They have paid little attention to the progress in the development of these appliances; many haven't one electrical appliance in their home. If these men of the industry would only become interested and learn of the multitudinous advantages of utilizing the splendid devices, this vast army of electrical workers would most wonderfully assist the sales by educating "outsiders" and by showing their belief in the devices by purchasing them themselves. It would be of mutual benefit to all concerned—the

manufacturers, the dealers, the workers and the public.

Think of the number of electrical men who have not considered the handiness of the electric toaster. It will make piping hot, golden, nut-brown toast right at the table. No need of the housewife absenting herself from the dining-room while the head of the house dines alone. A united family breakfast is made possible by an electric toaster and other appropriate electrical cooking devices.



RADIATOR

#### Appliances for the Boudoir

Leaving cooking appliances to consider, for the moment, other "gifts electrical," there are such devices as electric curling irons, vibrators, hair driers, etc., which will always be appreciated by women. A heating pad for cold nights, for the aches and pains that come with winter, will be of good use to any member of the family. They make most suitable gifts. Such an improved device will do away with the old-fashioned hot-water bag with its many faults.

#### Gifts That Contribute Atmosphere to the Home

To get that "comfy" appearance about the home nothing lends so much enchantment as an artistic table lamp. No matter how simple or elaborate the home, there is always a place in it for additional lamps, and to-day, with so many homes wired, the electric lamp is a logical gift for the whole family.

A hanging lamp for the dining-room, a bedside or chair-side lamp for those who indulge in the habit of reading in bed—these always make charming gifts. When in doubt about other things electrical, you cannot go wrong if you give an artistic electric lamp.

Unfortunately for them, there are many persons who cannot use electrical devices for the very good reason that they haven't electricity in their home. Of all modern conveniences the greatest is electric light. Certainly, a most satisfactory Christmas present for the whole family would be to wire the house for complete electric service. It will then be possible to use any number of "little electric servants" to make housework easier.



ELECTRIC STOVE

#### Gifts That Lighten Household Burdens

Now come the larger-sized electrical devices. In the up-to-date list of Christmas gift suggestions perhaps no more valuable device can be mentioned than the electric washing machine. Sometimes the central-station salesman will say, "Not enough energy consumption for us to bother with selling it." But stop! Is this a true statement of facts? Decidedly not. A washing machine will never be relegated to the corner of forgotten things, for the novelty will not wear off; it will always be useful and will be used. Fifty-two weeks a year is the average use of an electric washing machine.

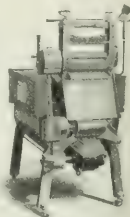
Household experts admit the washing machine to be one of the greatest labor savers of all electrical appliances intended for women. It stands as a leader alongside the electric iron. The use of an electrical washer will probably go farther toward stimulating interest in the residential use of electric service than any other energy-consuming device sold.



ELECTRIC IRON



VACUUM CLEANER



WASHER



COOKING UTENSILS

Those in a position to know say that an electrical washing machine in the neighborhood will be of more advertising value to the central station and to the dealers than many hundreds of dollars spent in publications. A woman can see with her own eyes just



ELECTRIC TOASTER

what it will do. She will show her neighbors. The machine actually sells itself.

There is another useful member of the "big" electric family. It is the vacuum cleaner. Like the washing machine and iron it frees woman from hours of back-breaking labor, which she can easily devote to resting that she may retain her health

and youthful beauty long after her children grow up.

Give a woman an electric vacuum cleaner and her home will be freer from dust and from germs; it will

radiator—with its glowing, cheerful light—is a gift for man, woman or child.

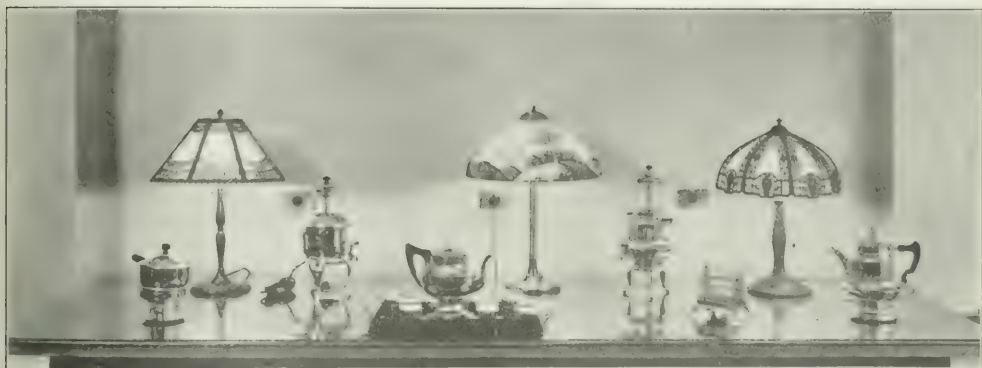
For the men, too, are electric cigar lighters, shaving mirrors, shaving mugs, etc., any one of which will be most acceptable.

And so on down through the long list of suggestions for gifts electrical that please one might go, naming the big sales points of each device, what they will do, how they will save, how they will benefit the purchaser. Those who do it electrically will profit in many ways every day of their lives.

There is a point well worth remembering in marketing electric heating and cooking devices; that is, although present energy consumers fully realize the convenience of such devices and the cleanliness they afford, they are somewhat skeptical in many instances as to the economy. It is this doubt that has prevented the wholesale equipping of American homes with the wonderful labor savers. When selling appliances every care should be taken to explain the moderate costs of using the devices, and in advertising the economy should always occupy prominent space in the argument.

#### Children's Electrical Toys

Now for the children. Modern electric Christmas



PORTABLE ELECTRIC LAMPS MAKE USEFUL AND ATTRACTIVE GIFTS

be better, sweeter, more healthful in every respect than ever before. It will be truly home.

It is said that 30,000 stitches can be made for one cent when the electric-sewing-machine motor puts an end to pedaling and backaches. And they are not expensive to buy. It is certainly a great boost for electricity to get a sewing-machine motor in the household.

Now about electric ranges. All housewives would much prefer electric ranges for cooking if it were not for the supposedly high cost of operation. Many cities offer exceptionally low rates for electric cooking, in which event an electric range would be a most appropriate gift. They are being reduced in price every day. Where rates are 3 cents and 4 cents per kw-hr. it is not impossible to sell a number of electric ranges at Christmas time.

#### Gifts Suitable for Men

There is a present which will be most welcome to the man of the house. Make his little den cozier by getting for him an electric radiator. At the home or in the office a "modern fireplace" will bring good cheer and warmth. For the old folks whose hair is silvery and whose bodies need warmth there is nothing more pleasing to give than an electric radiator. It is ever ready to chase away chills and colds. An electric

trees will be lighted with tiny electric lamps of many colors, completely eliminating the fire risk of the old-fashioned days when so many holidays were spoiled by disasters due to fires caused by lighting trees with candles.

To fill these Christmas trees there are any number of electrical toys which will bring delight to the heart of the boy or girl. And this year more than ever before should be most opportune to sell electrical toys.

Here are some good reasons for this assertion. Germany has for many years led the world as a maker of toys, exporting \$15,000,000 worth of all kinds of playthings a year. France has been second, with \$7,500,000. This country is the largest purchaser of toys. Last year the United States imported 12,000,000 toys and dolls and spent \$30,000,000 for foreign and home-made playthings.



HEATING PAD



Isn't this a good reason for the supply dealer stocking up and pushing electric toys, such as electrically operated trolley cars, toy motors and generators, trains, etc.? Europe cannot supply them. United States manufacturers will. The demand has been created. It is but a question of pushing the sale.

#### Electrical Devices Necessary

Progressive women consider electrical devices absolutely necessary in the home. But, at the same time, arguments are advanced that electrical goods are higher priced than corresponding articles which serve the same purposes but are not electrical. True enough. So it is cheaper to walk down town than to take the electric car. But which is more convenient? Which is really cheaper in the long run? And, compared to the old-fashioned sadiron with its penalty of backaches, isn't the more expensive electric iron actually cheaper for the woman? And the same comparison applies to the broom and the vacuum cleaner, and so on.

This is the opportune season of the year in which to sell electrical goods. Already the first rivulets of that great flood of stored-up Christmas wealth are beginning to appear. Money is even now flowing into the coffers of the enterprising merchants and manufacturers. Some say not so much as in former years. Possibly this is true, but this year more than any other recent year much money will be spent for practical "made in America" gifts, and electrical goods stand pre-eminent as useful gifts for everyone.

Authorities say that 90 per cent of the annual sales of "ordinary" percolators, chafing dishes and similar articles occur at this time of the year. The holiday chafing-dish sales alone amount to ten to every thousand inhabitants. Why not make a major portion of these sales "electrical," instead of allowing the "ordinary" chafing dishes and percolators to preponderate?

There is but one answer to all the foregoing. Everything in the household that it is possible to modernize should be electrified. Everyone in the electrical industry should willingly co-operate to that splendid conclusion, that this nation-wide "do it electrically" movement may be wonderfully successful. It is the individual worker in the great army of employees of manufacturing concerns, central stations, dealers, jobbers and contractors that should put his shoulder to the wheel to electrify the industries and modernize the homes of the nation.

Christmas is an opportune time to "make good" the resolutions of assistance. To show their good faith in the "do-it-electrically, buy-a-practical-present" movement workers in the industry should urge their friends to purchase Christmas gifts electrical; they should themselves buy electrical gifts to show that they believe in their assertions and in their labors. By so doing all



**Beautiful Electric Giftware**

THE permanent usefulness of Electric Giftware is no better-illustrated than in this season's holiday models of Electric Portable Lamps on exhibition and sale at the Edison Shop. All are moderately priced, several types of bedroom lamps selling as low as \$2.25.

The gift of an Electric Library or Table Lamp expresses the real Christmas spirit. It brings to the home the soft, cheerful brilliance of a perfect illumination combined with wonderful decorative possibilities—A gift that will be appreciated and used for many years to come.

The display at the Shop includes Library Lamps, Desk Lamps, Piano Lamps, Student Lamps, Boudoir Lamps, Table Lamps. Prices \$2.25 to \$100

**THE EDISON SHOP**  
360 Pearl St, Brooklyn, N. Y.

#### CHRISTMAS-LAMP ADVERTISEMENT OF BROOKLYN EDISON COMPANY

will profit—the dealer, the contractor, the jobber, the manufacturer and the central station—and here the pendulum will swing back to the employee, who profits most because of increased production. Let this be a glorious "electrical Christmas." To that praiseworthy, mutually beneficial end, an excellent slogan is: "Give something electrical, the best gift of all."



PORTABLE-LAMP DISPLAY OF NEW YORK EDISON COMPANY

# Industrial and Financial News

## Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

**Busy Season for Flashlamps.**—The American Ever Ready Works, 304 Hudson Street, New York, are very busy at present. This concern has recently placed on the market a vest-pocket flashlamp which opens like a cigarette case, a colored toy lantern, a special house lamp and a nickel-plated tubular flashlamp. The demand for flashlamps, it is said, is largest in the autumn.

**Useful Christmas Gifts.**—Mr. J. F. Hemenway, of the Smith & Hemenway Company, 150 Chambers Street, New York, manufacturer of tools, declares that on account of the supposedly hard times people will more seriously consider useful gifts for Christmas presents this year than ever before. The above company is sending out to dealers easels with various tools, such as pliers, attached to them to suggest to the trade the suitability of tools as Christmas gifts.

**Supply Company's Christmas Campaign.**—The Manhattan Electrical Supply Company, 17 Park Place, New York, has issued a catalog which contains information on electrical devices suitable for Christmas presents. These catalogs are being sent to a large number of possible purchasers through its branch stores in New York, Chicago, St. Louis and San Francisco. The business of this company is very good at present, and prospects for an active holiday campaign, especially in reference to its battery-operated devices, are good.

**Heating Company's Holiday Preparations.**—Since Oct. 1 the Hotpoint Electric Heating Company's stationery has had a holly-leaf border on it, and at the bottom of each sheet is the caption "Let's all join hands and make it a 'Hotpoint' Christmas." Folders listing various types of heating appliances are being sent out to dealers. The dealers' imprints are put on these folders if desired. Special invitation letters, containing gift suggestions, lantern slides and directions for making window displays, are also being supplied to dealers.

**Electric Time Recorder.**—Automatic electric apparatus for recording the time of arrival and departure of workmen has been developed by the Stromberg Electric Company, Chicago, Ill. The system is operated by a master clock which is self-winding and which sends electrical impulses to the secondary apparatus, such as secondary clocks, cost-keeping recorders, employees' time recorders, time stamps or program machines. An order has recently been received by the above concern from the Crane Company, Chicago, Ill., for forty employees' recorders, forty-six secondary clocks and a large tower clock.

**Business in Small Motors Good.**—The Fort Wayne Electric Works of the General Electric Company are receiving orders for a large number of fractional horse-power motors. These motors are used chiefly with washing machines, vacuum cleaners, etc. It is said that 70 per cent of the electric washers made in this country are operated by motors made by the above concern. During the past calendar year, it is reported, over 100,000 small motors were manufactured by the Fort Wayne Electric Works. Apparatus for use with motion-picture machines made by the Fort Wayne Electric Works is also being used to a considerable extent.

**Orders for Generating Equipment.**—Escher, Wyss & Company, of Montreal, Canada, have been awarded the contract for two 2250-hp waterwheels, with accessories, by the Hydro-Electric Power Commission of Ontario, for the new hydro-electric generating station at Eugenia Falls. Under a head of 540 ft. these wheels run at a speed of 900 r.p.m. The above company has also received the contract for a 12,000-kw turbo-generator set for the city of Leeds, England. This contract had previously been awarded to a German firm, but after the war it was given to Escher, Wyss & Company. A Sie-

mens three-phase, fifty-cycle, 6750-volt generator will be used. The speed of the set will be 1500 r.p.m.

**Remote-Control Switches.**—The A. G. Electric & Manufacturing Company, Seattle, Wash., is making a remote-control switch which is designed for service in cities where ordinances require that there be means for opening the electric circuit in a building near the main entrance. The switch is operated by a spring and opened through a coil which is controlled by a push-button switch near the entrance of the building. Recently the above company made a switchboard with seven of these switches mounted on it for the Electric Construction Company, San Francisco, and also two 800-amp, three-pole switches and one 600-amp switch of the same type for the National Electric Company, San Francisco. The latter order was for the Gaiety Theater in San Francisco. The switches control three service lines and are operated from one push-button switch in the entrance of the theater. The A. G. Electric & Manufacturing Company has recently been very busy.

**Radial-Flow Reaction Steam Turbines.**—In the *Electrical World* of Nov. 29, 1913, was described a radial-flow steam turbine of the reaction type designed by Messrs. Birger Ljungström and Fredrick Ljungström of Stockholm, Sweden, and manufactured by the Brush Electrical Engineering Company, London, England. This turbine is manufactured in Sweden by the Svenska Turbinfabriks Aktiebolaget Ljungström, the works of which are at Finspong, Sweden. The Swedish company was founded early in 1913 and has obtained the patent rights for manufacturing the machine in the Scandinavian countries and in Russia and Finland. The company is also manufacturing turbo-generator sets in connection with the steam turbines. Economy in steam consumption and comparatively small weight and dimensions are claimed for this type of turbine. The Swedish company is now building a 10,000-hp turbo-generator set for the Willesden power station in London, which will be an addition to a 1500-hp set installed in the station in 1913. A 1000-hp set for propelling a Swedish passenger ship has just been completed and another marine set rated at 1100 hp is being built for William Beardmore & Company of Glasgow, Scotland. The total rating of Ljungström turbines now installed or being constructed amounts to about 60,000 hp.

**Orders for Electrical Equipment.**—The Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., has recently received orders for the following apparatus: Two 300-kw rotary converters; two 300-kva transformers and one six-panel switchboard, Ithaca Traction Corporation, Ithaca, N. Y.; two 300-kw rotary converters and one five-panel switchboard, Cleveland, Youngstown & Eastern Railroad, Cleveland, Ohio; three 185-kva transformers, Cleveland & Eastern Traction Company, Cleveland, Ohio; one 400-kw rotary converter, three 125-kva transformers and one three-panel switchboard, Standard Electric Construction Company (Johnson & Company, Inc.), New Orleans, La.; one 300-kw motor-generator set, and one five-panel switchboard, Sioux City Service Company, Sioux City, Ia.; one 100-kw direct-current generator, Tunbridge Realty Company (Hotel St. George), Brooklyn, N. Y.; one 250-kw direct-current generator, Jacob Epstein (Baltimore Bargain House), Baltimore, Md.; two 20,000-kw steam turbo-generator units, two 200-kw motor-generator sets, three 5500-kva transformers, three 1000-kva transformers, three 5000-kva transformers, three 1000-kva transformers and one thirteen-panel switchboard, United Electric Light & Power Company, New York City; two 150-kw rotary converters, two 165-kva transformers and one three-panel switchboard, Wilmington & Philadelphia Traction Company, Wilmington, Del.



## Corporate and Financial

**Philadelphia Company Dividend Scrip.**—The Philadelphia Stock Exchange announces that the dividend scrip of the Philadelphia Company, issued on Nov. 2, has been admitted to the unlisted department.

**Unusual Utility Investments Made Possible by War.**—William P. Bonbright & Company, of New York, in recommending the purchase of electric-utility bonds said: "The war has made possible unusual investments in the bonds and preferred stocks of public utilities in this country, but it has not decreased their earnings."

**Commonwealth Power, Railway & Light.**—Mr. D. E. Pomeroy, vice-president of the Bankers' Trust Company, has been elected a director of the Commonwealth Power, Railway & Light Company to succeed Mr. Benjamin Strong, Jr., who resigned to take his place as governor of the Federal Reserve Bank of New York.

**United Light & Railways.**—The United Light & Railways Company, Grand Rapids, Mich., has compiled a chart showing the intercorporate relations of the company and its subsidiaries as of June 30, 1914. The total outstanding capitalization was \$24,655,000. Of the \$220,000 of 6 per cent notes due Jan. 1, 1915, \$100,000 have been retired. These notes were in part payment of properties purchased.

**Byllesby Sees Improvement.**—Mr. H. M. Byllesby, upon returning to Chicago after a trip to the Pacific Coast, said: "After a three weeks' absence I find a decided improvement in the demand for investment securities. Purchasing orders received for bonds, coupon notes and preferred stocks are gratifyingly large in volume compared with the market for three and one-half months past. This indicates not only that considerable amounts of capital in the United States are awaiting investment, but returning confidence in our immediate commercial future."

**A War-Time Investment.**—Mr. Albert H. Bickmore, of A. H. Bickmore & Company, New York, in speaking of the merits of lighting-company securities as a war-time investment, said: "Lighting companies are but little affected by general business conditions. In previous periods of depression the gross and net earnings of most lighting companies increased somewhat while nearly every other class of public or private business experienced a decreased income. Lighting companies are the one great class of enterprises that can be relied upon to maintain at least present earnings."

**Kentucky Utilities First Mortgage Bonds.**—A. H. Bickmore & Company, of New York, are offering \$564,000 of first mortgage five-year 6 per cent gold bonds of the Kentucky Utilities Company, dated Oct. 15, 1914, at 95.84, to yield 7 per cent. The authorized issue is \$3,000,000, of which \$1,500,000 is outstanding. The remaining bonds will be offered later at a higher price. The proceeds from the bonds have been used in paying for some properties acquired and to reimburse partially the treasury for improvements. The outstanding capital stock of the company is owned or controlled by the Middle West Utilities Company.

**Consolidated Gas \$25,000,000 Bond Issue.**—The Public Service Commission of the First District of New York has authorized the Consolidated Gas Company of New York to issue \$25,000,000 convertible debenture bonds and \$25,000,000 additional common stock to replace such debentures, provided no legal difficulties result from a previous issue of debentures of the company. The bonds are to replace money used to acquire the New York Edison Company and the Astoria Light, Heat & Power Company, to discharge \$5,000,000 of eight-month collateral trust notes and to discharge demand notes issued in 1906 and 1907 for \$2,500,000.

**Baltimore Company's Exchange of Stock.**—The Consolidated Gas, Electric Light & Power Company, of Baltimore, has notified preferred stockholders that the offer of the company to exchange, share for share, 7 per cent common stock for 6 per cent preferred stock, which expires on Dec. 19, 1914, calls for the deposit of preferred shares on or before that date. The preferred shares so deposited will rank with the existing common stock for the dividend accruing for the quarter ending Dec. 31, 1914, thereby giving the preferred shareholders making the exchange the advantage of one-fourth of 1 per cent additional income for the

quarter. The *Electrical World* of Aug. 22, 1914, contained an account of the plan in which the former time limit of Sept. 19 was given.

**Massillon Electric & Gas Notes.**—The Massillon (Ohio) Electric & Gas Company is offering at 99, to yield 7 per cent, a \$75,000 issue of one-year 6 per cent collateral-trust notes. The notes are to be dated as sold and interest is payable six months thereafter and at maturity. The notes are issued under a trust indenture dated Oct. 19, 1914, which provides for the deposit with the trustee of the first mortgage 5 per cent sinking-fund gold bonds of the Massillon Electric & Gas Company, on the basis of 150 per cent in bonds of the total amount of notes issued. The purpose of this issue of notes is to provide a part of the funds required for increased plant and equipment to supply power to the Central Steel Company, and the American Stamping & Enameling Works, whose plants are now building, and to supply additional power to the Massillon Rolling Mills, the plant of which is now being enlarged. The Massillon Electric & Gas Company has contracted with these companies to supply 3000 hp, beginning Jan. 1, 1915, and the additions to its plant and equipment to care for this new business will require the investment of approximately \$100,000.

**Southern Power Company Bond Offering.**—Perry, Coffin & Burr of Boston, Harris, Forbes & Company of New York and the National City Bank of New York are offering at 97 and interest \$800,000 of first mortgage 5 per cent gold bonds of the Southern Power Company of North and South Carolina. The bonds are twenty-year bonds dated March 5, 1910. The company was incorporated in 1905 and is capitalized for \$10,000,000 in stock and \$5,800,000 in funded debt. The earnings for the year ended Sept. 30, 1914, showed a balance, after deducting operating expenses, taxes and rentals and annual bond interest, of \$1,107,663. The company served a region in which there are 420 mills, having an estimated equipment of 6,000,000 spindles and 125,000 looms. The bond issue is secured by the first and only mortgage upon the company's hydroelectric development, aggregating 118,000 hp, on steam development, aggregating 44,000 hp, and on the company's system of high-tension transmission lines and distributing systems. The authorized issue is \$10,000,000, of which \$5,800,000 is outstanding, the remaining \$4,200,000 bonds in escrow to be issued for 70 per cent of the cash cost of additions and extensions to the property, provided that the net earnings for the preceding twelve months shall equal at least twice the annual interest on all first mortgage bonds outstanding, including those supposed to be issued. The company is controlled by Messrs. J. B. Duke, B. N. Duke, R. H. Wylie, W. G. Wylie and W. S. Lee and associates.

**Brady Estate Includes Large Utility Holdings.**—The estate of the late Anthony N. Brady, as shown by the appraisal filed in the New York State Controller's office, was \$77,042,443. Among the many holdings were 22,029 shares of the Brooklyn Rapid Transit Company, valued at \$1,935,798; 3960.8 shares of Commonwealth Edison Company, valued at \$566,304; 9200 shares of Consolidated Gas Company of New York, \$1,205,200; 6501.6 shares Consolidated Gas, Electric Light & Power Company of Baltimore (preferred), \$650,160; 5439.2 shares of Consolidated Gas, Electric Light & Power Company of Baltimore (common), \$516,724; 4803.2 shares Dayton Power & Light Company (preferred), \$336,224; 10,324.8 shares Dayton Power & Light Company (common), \$103,248; 9614 shares Electric Storage Battery Company (common), \$432,630; 36,185 shares Kings County Electric Light & Power Company, \$3,799,425; 6989 voting trust certificates Kings County Power Company, \$384,395; 14,150 shares Memphis Consolidated Gas & Electric Company, \$920,400; 6240 shares Merchants' Power Company, \$405,600; 3667 shares Municipal Gas Company, \$1,081,765; 11,200 shares Utica Gas & Electric Company, \$1,680,000; Kings County Electric Light & Power Company convertible 6 per cent bonds and interest, \$698,133; Memphis Consolidated Gas & Electric Company 5 per cent bonds and interest, \$791,059. The appraisal of the Brady estate brought out an interesting side of Mr. Brady's character. At the cost of \$6,000,000 he kept his word and continued the work on the Chattanooga & Tennessee River Power Company. When finished the plant will not be worth more than \$2,500,000, the original estimate being less than \$1,000,000.

## ATLANTIC UTILITIES REPORT GAINS

## September Operations of Central Stations in Atlantic States Show Increase Over Previous Year

The returns received by the *Electrical World* from over 70 per cent of the central-station industry of the Atlantic States for September show that the utilities were ahead of 1913 both in gross income from energy sales and in energy output. September was worse than August for this territory. Almost every industry with the exception of the electric utilities experienced a curtailment in some way. Some companies in large industrial centers experienced a slight decrease in output, but these were rare cases. The figures in Table I show that the companies have kept up their income growth and that the output increase is comfortably ahead of last year. Some large companies in the South, in anticipation of an industrial depression, have been devoting their efforts to building up a strong demand for high-priced energy. The success of their efforts is well seen in Table I. The figures in Table II showing the September operations of three large companies in the Middle Atlantic States, while they do not show as large percentage increase as in previous months, are exceptionally good. These companies sell the greater part of their energy in large industrial centers, which are always the first to feel any serious depressions. The competition of large cities causes such a small margin of profit that any stringency of money means a shutting down to save expenses.

## Small Companies Do Well

Comparative figures have been made up of companies of different sizes, for convenience called large, medium and small. The large companies experienced a growth in income of 9.7 per cent in July, 7.5 per cent in August and 4.3 per cent in September. The output growths for the same

TABLE I—RETURNS RECEIVED FROM CENTRAL STATIONS IN THE ATLANTIC STATES OVER AN EIGHT-MONTH PERIOD

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN K.W.-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
February (54 per cent of industry)....	\$7,288,792	\$6,655,011	9.8	231,790,165	205,726,060	12.6
March (60 per cent of industry)....	6,021,269	5,661,027	6.4	246,306,123	223,156,161	10.5
April (65 per cent of industry)....	6,731,495	6,106,634	10.3	261,133,882	252,069,127	3.7
May (68 per cent of industry)....	6,492,767	5,628,718	14.5	259,098,542	238,733,320	8.4
June (70 per cent of industry)....	6,067,780	5,728,311	6.0	244,936,886	221,315,464	10.8
July (70 per cent of industry)....	6,152,169	5,583,309	10.0	263,500,299	235,068,939	11.8
August (71 per cent of industry)....	6,224,896	5,755,515	8.2	264,717,319	237,984,895	11.2
September (71 per cent of industry)....	6,608,221	6,221,000	6.1	270,974,533	252,648,350	7.0

three months were 9.7 per cent, 8.3 per cent and 2.8 per cent respectively. The medium-sized companies showed a growth in income of 10.7 per cent in July, 7.6 per cent in August and 8 per cent in September, and in output of 16 per cent in July, 15.7 per cent in August and 13.2 per cent in September. The small companies for the months of July, August and September showed income growths of 16.4 per cent, 18.7 per cent and 9.7 per cent and output growths of 9.3 per cent, 19 per cent and 13.4 per cent. Thus, so far as the effects of the war are concerned, the medium and small-

sized companies have felt little or no effects. The larger companies, as above stated, owing to their environment, cannot be expected to grow as rapidly as under normal conditions. The significant fact is that these companies are growing.

The percentage growths by states for September, according to our figures, are: Pennsylvania, 7.2 per cent in income and 10.8 per cent in output; New Jersey, 8.6 per cent in income and 5.6 per cent in output; North Carolina, 11.2 per cent in income and a 3.4 per cent decrease in output; South Carolina, 19.3 per cent in income and 22.2 per cent in output; West Virginia, 9.3 per cent in income and 15.3 per cent in output; Florida, 16 per cent in income and 10 per cent in output; Virginia, 3.8 per cent in income and 3.2 per cent in output; Georgia, 17.7 per cent in income and 36.8 per cent in

TABLE II—COMPARATIVE FIGURES SHOWING THE MONTHLY OPERATIONS OVER AN EIGHT-MONTH PERIOD OF THREE LARGE COMPANIES IN THE MIDDLE ATLANTIC STATES, REPRESENTING 35 PER CENT OF THE CENTRAL-STATION INDUSTRY OF NEW YORK, NEW JERSEY AND PENNSYLVANIA

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN K.W.-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
February.....	\$3,760,823	\$3,497,948	7.8	112,892,266	108,302,262	4.2
March.....	3,492,149	3,386,190	3.1	118,897,901	114,136,574	4.2
April.....	3,437,634	3,194,160	7.6	112,894,803	105,328,705	7.2
May.....	3,113,526	2,476,781	28.2	108,171,896	104,267,718	3.8
June.....	2,952,454	2,844,643	3.7	103,013,271	97,628,941	5.7
July.....	2,933,019	2,648,625	10.8	106,607,151	97,459,526	9.5
August.....	2,906,057	2,692,408	8.0	107,656,963	100,753,254	6.8
September.....	3,083,956	3,003,008	2.8	109,732,933	108,123,057	1.5

output; Maryland, 14.8 per cent in income and 13 per cent in output, and New York, 3 per cent in income, the output remaining the same.

## Industrial Conditions

The industrial tone of the month, while decidedly full of optimism regarding the future, was nevertheless very conservative. In the Middle Atlantic States during the first week of the month several lines began to show an increased activity. Cloak and suit factories were busy. The anthracite coal mining was normal, but bituminous was quiet owing to unsettled prices. Cotton mills, while optimistic and expecting improvements in the near future, were for the most part on half time. The glove trade was affected by strike conditions. Iron and steel mills were running 60 per cent of normal output and cotton and knit-wear mills 75 per cent of normal output. The second week saw a tendency for betterment, but with slow progress. The manufacturers of clothing were fairly well engaged. The window-glass and coal trade were better, the latter being nearly normal. Paint manufactories were very busy. Pig-iron furnaces were operating 60 to 65 per cent normal capacity. In the third week there was little change, but an increasing confidence. The buying was cautious. The manufacturers of hosiery were busy, and those of waists and dresses were moderately busy. Iron and steel were slowly developing. The last week saw more activity in some lines, but generally little change. Clothing manufacture was falling off in all lines owing to one thing or another. Iron products were quiet.

In the South Atlantic States the tone of the month was conservative. In the first week manufacturing of clothing was quiet with many factories on half time. The second week was also quiet. Manufacturers were suffering from lack of raw material from Europe, dyes and an export market. The third week saw some change. There was a favorable market, but money was not plentiful. Most plants were running, even if not on full time. The fourth week saw conditions more improved. Machinery manufacture was active and clothing factories were doing well.



## Business Notes

**Ellsworth Haring.** 684 Hancock Street, Brooklyn, N. Y., for sixteen years with Hermann Boker & Company, has organized an establishment for marketing tool-steel devices and various specialties.

**The Jeffrey Manufacturing Company.**—M. W. Sherwood has been appointed sales manager of the Jeffrey Manufacturing Company, Montreal, Quebec, and he succeeds H. W. Scott, who has resigned to establish himself in the engineering contracting business. Mr. Sherwood was formerly assistant sales manager of the above company.

**Harrington, Howard & Ash,** Kansas City, Mo., a firm of consulting engineers recently formed, will be engaged in hydroelectric developments, municipal work, etc. J. L. Harrington has been associated for eight years with Waddell & Harrington, a firm of consulting engineers which has recently been dissolved. E. E. Howard has been connected with the latter concern, and L. R. Ash has been city engineer for Kansas City.

## New Industrial Companies

**The Continental Electric Welding Company,** of New York, N. Y., has been incorporated with a capital stock of \$20,000 by Hugo Tessensohn, William Steiger and Heinrich L. J. Siemund, all of 29 Broadway, New York, N. Y.

**The Learned-Tompkins Electric Company,** of Boston, Mass., has been chartered with a capital stock of \$50,000 by A. W. Learned, Clarence G. Tompkins and William B. Phipps. The company intends to manufacture and deal in electrical apparatus.

**The Funk & Grupe Company,** of Hoboken, N. J., has been incorporated with a capital stock of \$50,000 for the purpose of manufacturing electrical appliances, manufacturers' and mill supplies. The incorporators are N. E. Funk, W. F. Grupe and E. Jrlison, of Hoboken, N. J.

**The S. I. L. Electrical Company,** of New York, N. Y., has been incorporated by G. H. Mallory, H. T. Lillendahl and F. C. Duey, of New York, N. Y. The company is capitalized at \$250,000 and purposes to manufacture electrical devices and machinery and self-starters, igniters and lighters in connection with internal combustion.

## Trade Publications

**Cut-out Boxes.**—The Western Electric Company, New York, has issued a folder listing various types of cut-out boxes.

**Electric Washer.**—A dolly-type electric washing machine is described in a folder sent out by the Altorfer Brothers Company, Roanoke, Ill.

**Lamp Cord.**—Various kinds of lamp cord are listed in Booklet No. B-3317 issued by the General Electric Company, Schenectady, N. Y.

**Insulated Canopy.**—A recently developed insulated canopy is described and illustrated in a leaflet issued by the F. W. Wakefield Brass Company, Vermilion, Ohio.

**Electric Iron.**—A leaflet recently published by the Menominee Electric Manufacturing Company, Menominee, Mich., contains a description of a 6-lb. electric iron.

**Electric Time-Recording Machines.**—The Stromberg Electric Company, Chicago, Ill., has issued a catalog which describes and illustrates electrically operated time-recording machines.

**Electric Vehicle Battery-Charging System.**—The Klingelsmith Electric Truck Company, 79 West Monroe Street, Chicago, Ill., has issued a catalog describing its "multi-battery" system for electric vehicles.

**Effect of Illumination on the Eye.**—"Light and Your Eyes" is the title of a treatise on the effect of illumination on the eyes which has just been issued by the Cooper Hewitt Electric Company, Hoboken, N. J. "What Users of Cooper Hewitt Light Say About It" is the subject of a folder also published by the above company.

**Dashboard Lamp.**—An automobile electric dashboard lamp is described in a leaflet put out by the L. A. Williamson Company, New York.

**Fixture Studs.**—Stamped-steel fixture studs are the subject of a leaflet recently published by the National Metal Molding Company, Pittsburgh, Pa.

**Kerosene Torch.**—A lineman's kerosene torch is described in a leaflet issued by the Hauck Manufacturing Company, 140 Livingston Street, Brooklyn, N. Y.

**Paint.**—The Dielectric Manufacturing Company, Chicago, Ill., recently issued Bulletin No. 2, which describes a paint called "graphon," used to protect metallic surfaces.

**Barbed Anchor.**—The construction and advantages of a barbed anchor are given in a pamphlet prepared by the Barbed Anchor Manufacturing Company, Louisville, Ky.

**Material for Technical Magazines.**—Walter B. Snow, 136 Federal Street, Boston, Mass., has issued a folder listing various kinds of material supplied to technical magazines.

**Portable Lamps.**—The Beardslee Chandelier Manufacturing Company, 216 South Jefferson Street, Chicago, Ill., has issued an attractive booklet entitled "The Gift of Gifts."

**Wiring Devices.**—In a supplement to Catalog No. 16 issued by the Arrow Electric Company, Hartford, Conn., are described and illustrated various new and improved wiring devices.

**Toy and Bell-Ringing Transformers.**—In a folder issued by the Electric Manufacturing Company, Baltimore, Md., are described several different types of toy and bell-ringing transformers.

**Electricity in the Woodworking Industry.**—"Helping the Woodworker" is the subject of a bulletin recently issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

**Sewing-Machine Motor.**—Folder No. 4152 sent out by the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., describes a small motor designed for use with sewing machines.

**Rigid Conduit.**—The Western Conduit Company, Youngstown, Ohio, has issued a booklet on its enameled and galvanized conduit which goes into the detail of protecting the threads during the pickling process.

**Kerosene Oil for Resistance Measurements.**—Bulletin No. 402 published by the Leeds & Northrup Company, 4901 Stenton Avenue, Philadelphia, Pa., describes the uses of kerosene oil for resistance measurements.

**Vertical Rectifier.**—A vertical rectifier, known as the "rexolux," designed for use with motion-picture apparatus, is described and illustrated in a bulletin published by the Electric Products Company, Cleveland, Ohio.

**Electricity in Flour Mills.**—The Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., has recently published Folder No. 4287, which describes various types of electrical equipment designed for use in flour mills.

**Electric Heating Apparatus.**—The Simplex Electric Heating Company, Cambridge, Mass., has issued a ninety-six-page catalog which describes and illustrates the various heating appliances manufactured by the company.

**Electric Steam Radiator.**—A portable electric steam heater resembling an ordinary steam radiator is the subject of two leaflets published by the Electrical Steam Radiator Company, 644 Congress Street, Portland, Maine.

**Electric Coal-Mining Machinery.**—"Central-Station Power in Coal Mines" is the subject of Catalog No. 3002-A, Section No. 3078, recently issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

**Radial-Flow Steam Turbines.**—"Stal Steam Turbine-Generators" is the subject of an attractively illustrated fifty-two-page catalog published by the Svenska Turbinfabriks Aktiebolaget Ljungström, Finspong, Sweden. The radial-flow turbine made by this company was described in the *Electrical World* of Nov. 29, 1914.

**Electric Railway Apparatus.**—In an attractively illustrated thirty-page bulletin designated as No. 44,003, recently issued by the General Electric Company, Schenectady, N. Y., are described various types of electric railway apparatus. Bulletin No. 44,300, issued by the same company, describes gas-electric motor cars and locomotives.

**Magnet Wire.**—The Western Electric Company has recently issued a folder which contains a price list of various types of magnet wire.

**Rosettes and Receptacles.**—The Western Electric Company has recently published a leaflet describing canopy-type rosettes and receptacles.

**Alternating-Current Motor.**—The Century Electric Company, St. Louis, Mo., has issued a folder which describes and illustrates a new 1/6-hp alternating-current motor.

**High Candle-Power Incandescent Lamps.**—A folder which shows several types of nitrogen-filled lamps, together with fixtures, is being sent out by the Western Electric Company, New York.

**Small Motors.**—Bulletin No. 41,500 issued by the General Electric Company, Schenectady, N. Y., describes and illustrates small direct-current and alternating-current motors of the drawn-shell type.

**Decorative Portable Lamps.**—"The Curtis Portable Lamp" is the title of an attractively illustrated catalog sent out by the National X-Ray Reflector Company, 235 West Jackson Boulevard, Chicago, Ill.

**Wiring Devices.**—The Steel City Electric Company, 1207 Columbus Avenue, Pittsburgh, Pa., has issued a catalog which describes various types of small wiring devices manufactured by the above company.

**Cable-Testing Ammeters.**—The Metropolitan Engineering Company, Forty-second Street Building, New York, has issued a leaflet, designated as Section 17, which describes a direct-current cable-testing ammeter.

**Steel Pipe.**—The National Tube Company, Pittsburgh, Pa., has issued an illustrated forty-six-page catalog, designated as No. 11C, which describes in detail various types of steel pipe which it is manufacturing.

**Small Motors.**—Catalog No. 24 published by the Western Electric Company, New York, is entitled "Knapp Motor Specialist," and it describes small motors operating on batteries and ordinary lighting circuits.

**Single-Phase Motors.**—In two folders entitled "Stop It" and "Single-Phase Facts" are enumerated certain features of the single-phase motors made by the Wagner Electric Manufacturing Company, St. Louis, Mo.

**Heavy Machinery.**—The E. W. Bliss Company, Brooklyn, N. Y., has issued an illustrated cloth-bound 840-page catalog which contains information on presses, punches, shears, lathes, sheet-metal-working machines, etc.

**Electrical Apparatus.**—The Western Electric Company has recently issued folders describing watt-hour meters, luminous radiators, an electric curling-iron heater, automatic time switches and ceiling receptacles.

**War Names.**—H. F. McConnell & Company, 25 Pine Street, New York, have published a circular listing names of European cities which are now interesting on account of the European war. It also gives the pronunciation.

**Alternating-Current Generators.**—The General Electric Company, Schenectady, N. Y., has issued a bulletin, designated as No. 40,500, which describes alternating-current generators for direct connection to reciprocating engines.

**Excess Indicators.**—The Pittsburgh Electric Specialties Company, 927 Pratt Street, Pittsburgh, Pa., has published a circular which describes two types of excess indicators and contains descriptions of various installations of these devices.

**Incandescent Lamp Fixtures.**—Various types of fixtures for high-candle-power incandescent-lamp fixtures are described and illustrated in Catalog No. 43, entitled "The Maxolite," issued by the Central Electric Company, Chicago, Ill.

**Rheostats.**—The Ward Leonard Electric Company, Bronxville, N. Y., has issued three circulars, designated as E-9, E-10 and E-11, which describe over-load, under-load and no-voltage circuit-breakers designed for small motors and batteries.

**Wiring Devices.**—In an attractive quarto-size, cloth-bound, 238-page catalog, which is illustrated in colors and which is designated as No. 1000, are described various types of electrical devices placed on the market by the Crouse-Hinds Company, Syracuse, N. Y.

## Personal Mention

**Mr. John M. Eshleman**, president of the California Railroad Commission, has been elected Lieutenant-Governor of California and will therefore resign from the commission.

**Mr. Douglas S. Martin**, formerly with the *Electrical World*, which paper he left to join the British troops in the European war, has been badly wounded in the leg by a fragment of shell in the fighting around Ypres and is now in hospital at Boulogne. He was with the Sixteenth Lancers, one of the crack English cavalry regiments.

**Mr. Oscar C. Turner**, one of the best known electrical supply men in the country, is at present energetically at work on the arrangements for the forthcoming meeting of the electrical supply jobbers in Birmingham, Ala., since it

was owing to his importunities that the jobbers decided to hold their forthcoming meeting in that city. Mr. Turner was born in Atlanta, Ga., June 1, 1874. He was educated in the schools of Atlanta and in the University of Georgia, and began his electrical career in 1891 with the Atlanta Railway & Light Company. He afterward went into the contracting business and later became general contracting agent for the Georgia Electric Light, Railway & Steam Heat Company. In 1898 he left Atlanta and joined the Chicago staff of



O. C. TURNER

the Western Electric Company, being later made manager of that company's apparatus department in Cincinnati. He left the employ of the Western Electric Company to become vice-president and general manager of the Southern Electric Company at Nashville. He was tempted to leave that position when the Peerless Lamp Works, of Warren, Ohio, offered him their managership. About five years ago Mr. Turner went to Birmingham to make it his home. He bought an interest in the Southern Wesco Supply Company, and about eighteen months ago he and his brother purchased the entire stock of the company and changed its name to the Turner Electric Supply Company. Mr. Turner is the eighth past-Jupiter of the Jovian Order and one of its most active workers. He has taken a prominent part in civic work in Birmingham and is a member of all the clubs, a director in the Fair Association, Business Men's League, Board of Trade and Chamber of Commerce, and was president of the Oscar W. Underwood Marching Club during Mr. Underwood's campaign for the Democratic nomination for the Presidency.

## Obituary

**John C. Lott**, manager of the New York office of the Fort Wayne Electric Works of the General Electric Company, died at his home in Freeport, N. Y., Nov. 24. Mr. Lott was born March 19, 1865. He began his work in the electrical industry with the Fuller Wood Company, Brooklyn, N. Y. Mr. Lott was also connected with the following concerns: The American Electric Manufacturing Company, New York; the Fort Wayne (Ind.) Jenney Company, the Chicago Arc Light & Power Company, the Citizens' Light & Railroad Company, Oswego, N. Y., and the Fort Wayne Electric Company, which later became the Fort Wayne Electric Works of the General Electric Company. Mr. Lott was employed by the latter company for over thirty-one years. His experience with the various companies with which he was connected was that of mechanic, mechanical and electrical expert, salesman and district office manager. He also at one time was electrical expert in the Brooklyn Navy Yard. Mr. Lott recently received a service medal from the Quarter Century Club of the General Electric Company. He was an associate member of the American Institute of Electrical Engineers and also a member of the Jovian Order and several societies and lodges.



## Construction

### New England

**MUNICIPAL** electric-light plant has been awarded to the Perichell Construction Co. of Lewiston, Maine. Contracts for equipment have not yet been awarded. Arrangements have been made with the village of West Burke to purchase that village with electricity next summer.

**NORWICH, CONN.**—The Electric Light Commissioners expect to purchase within the next few months a 100-hp. foot-water pump connected to a Providence Water Co. pump. J. Kehoe is superintendent.

**PLAINFIELD, CONN.**—Within the next two months the Danielson & Plainfield Gas & El. Co., of Plainfield, expects to build a large addition to its turbine, boiler and pump rooms; also to purchase a 1000-kw. General Electric turbine, a Wheeler surface condenser and one upright boiler, valued by 23½ in. J. H. Burdick is superintendent.

**SOUTH NORWALK, CONN.**—The question of doing some underground work is under consideration by the South Norwalk Electric Works, municipal utility. The city is considering ornamental street-lighting may be taken up during the coming year. As yet nothing definite has been decided upon. Albert E. Winchester is general superintendent.

### Middle Atlantic

**BATAVIA, N. Y.**—The Board of Aldermen is considering a proposal submitted by H. K. Stern, superintendent of the Genesee El. & Pwr. Co., of Batavia, to supply electricity to operate the municipal electric-lighting system. If the city should decide to abandon the municipal generating plant, new equipment involving an expenditure of \$125,000 will be required.

**GENEVA, N. Y.**—The Central New York & Gas Co., of Geneva, has entered into a contract with the Geneva, Seneca Falls & Auburn Ry. Co. whereby it agrees to supply energy to the amount of 100 kw. to operate the railway between Geneva and Seneca Falls for a period of 10 years. Electricity will be obtained from the plant of the Tracy Development Co., now under construction in Watertown.

**HUDSON, N. Y.**—Bids will be received by Miss Mary Hinckley, president of board of managers New York Training School for Girls, Hudson, N. Y., until Dec. 19 for construction of a new building including heating, plumbing, elevators and electric work; construction of contagious hospital, including heating, plumbing and electric work; construction of schoolhouse, refrigerating plant and equipment, heating and plumbing and electric work at the New York Training School for Girls, Hudson, N. Y. Drawings and specifications may be obtained at the Department of Agriculture, Capitol, Albany, upon deposit of \$10 for each branch of the work, which will be refunded upon return of same. Lewis F. Titcher is state architect.

**POUGHKEEPSIE, N. Y.**—The Central Hudson Gas & El. Co., of Poughkeepsie, is contemplating extensions and improvements to its plant in Poughkeepsie at a cost of \$125,000, and will include the installation of an 8000-kw. turbo-generator, a large electric crane, extensions to transmission lines and erection of substations, etc.

**NEW YORK, N. Y.**—Bids will be received by the board of trustees of Bellevue and Allied Hospitals, Bellevue Hospital, 415 East Twenty-sixth Street, New York, until Dec. 4 for furnishing labor and materials required for excavation, masonry, carpentry, steel and iron work, metal work and roofing, painting and glazing, hardware, electrical work, plumbing and drainage, water and all other work in connection with the alterations to the present main building of the Harlem Hospital, 136th and 137th Streets and Lenox Avenue, borough of Manhattan. Bids will also be received at the same time and place for labor and materials for the masonry work, carpentry, ornamental iron work, structural steel and iron work, metal work and roofing, painting, hardware, electrical work, gasfitting, heating and ventilating, plumbing and other work in accordance with drawings and specifications for the alterations to the power house and ambulance station of the Harlem Hospital. Blank forms and further information may be obtained at the office of the contract clerk and auditor, 100 East Twenty-ninth Street, borough of Manhattan. John W. Brannan, M.D., is president.

**ALLENTOWN, PA.**—The Kolb Co. is erecting a large bakery in Allentown, at a cost of about \$100,000. Approximately 50 hp. in motors and 200 lighting fixtures are installed; electricity to maintain same will be supplied by the Lehigh Valley Lt. & Pwr. Co., of Allentown.

**PHILADELPHIA, PA.**—Among the new lighting projects contemplated by Chief Pike of the Electric Bureau for the next year is the installation of a new lighting system on the Northeast Boulevard the entire length from Broad Street to Rhawn Street, to cost about \$90,000. The plans provide for erection of 250 ornamental standards in the middle of the central driveway, each carrying twin electric lamps of 2000 cp each. An appropriation of \$25,000 for the erection of new electric lamps is also part of the city as needed is also asked.

**WILLIAMSPORT, PA.**—The Citizens' El. Co., of Williamsport, which was recently awarded the contract for street-lighting, is preparing plans for the installation of a new lighting system. The system will cost \$20,000. The present plans provide for 225 4-amp magnetite-arc lamps and 36 4-amp series incandescent lamps. The system will be maintained by overhead wires. J. Fisher is president.

**REHOBOTH, DEL.**—Within the next two months W. S. Truitt, owner of the local electric-light plant, expects to erect about 4000 ft. of line wire for additional street lamps; also to purchase within the next six months an additional 100-kw., 220-volt generator directly connected to engine.

**CANTON, MD.**—The Hubbard Fertilizer Co., Fifth Avenue and Clinton Street, Canton, is contemplating the installation of an interior electric railway for fertilizer factory. W. H. Chapman is superintendent.

**ABINGTON, VA.**—The Bristol Gas & El. Co., of Bristol, Tenn., and Va., which was recently granted a franchise to supply electricity in Abington, will erect a 33,000-volt transmission line from Bristol to Abington (a distance of 15 miles) as soon as possible; also to erect at the station at Abington a 1000-kw. generator. The plant at Abington (capacity 750 hp.) and wire the town to distribute electricity for lamps and motors. S. M. Vance, of Bristol, is general manager.

**WASHINGTON BARRACKS, D. C.**—Bids will be received at the United States Engineer Depot, Washington Barracks, D. C., until Dec. 1 for furnishing 32 12-in. exhaust fans and six 16-in. exhaust fans, 1000-volt, single-phase motors, complete with speed regulator. For further information address Joseph E. Kuhn, Lt.-Col. Corps Engineers, United States Army.

**WASHINGTON, D. C.**—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Dec. 8 for furnishing the various navy yards and naval stations supplies as follows: Boston, Mass., Schedule 7590—one electrically driven dish-washing machine, 1000-watt motor, 115-volt, 172-in. soft sheet copper; Schedule 7585—semi-annual supply prismatic reflectors, types J, K and L, semi-annual supply of clear and frosted glass lenses, 182- and 200-in. diameter, 182-in. light attachment plugs, without tips, 15,400 tips for 5-amp watertight attachment plugs, Norfolk, Va., Schedule 7598—33,300 lb. admiralty metal, seamless drawn, condenser tubes (¾ in. outside diameter, 13 ft. 2¼ in. long), 3600 lb. hard drawn seamless brass tubing, 12-ft. lengths, Brooklyn, N. Y., Schedule 7591—Six 4-in. flanged brass reducing valves, 1900 lb. weight, 12-in. soft sheet copper; Schedule 7598—1600 lb. round hard drawn bar copper, 12 ft. lengths, Schedule 7598—450 ft. galvanized soft steel, 1½-in. outside diameter, 18-in. inside diameter, 18-in. galvanized communication cable, 900 ft. galvanized soft steel, leaded and armored, 11,000-cir. mil. twin conductor wire, Schedule 7586—75 ft. steel-armed, single-conductor cable, marine cable for 600 volts and less. Bids will also be received until Dec. 15 as follows: Mare Island, Cal., Schedule 7595—150 complete sets of Edison battery cells, type 10, 1060 brass key sockets ¾-in. and ¾-in. caps, 34 lb. nickel chromium alloy wire, Brooklyn, N. Y., Schedule 7606—two, single-shielded, motor-driven screw drills, one motor-driven flat turret, 2-in. by 24-in. lathe, two motor-driven 3-ft.-bed, one 1-in.-swing screw-cutting engine lathes, one universal motor-driven lathe, one lathe with geared friction head, 18-in. swing, 6-ft. bed, one motor-driven winding armature and field coil machine, f.o.b. works; Schedule 7598—One electrically driven five main hauling, equalizer and back-haul sheaves and one main sheave outrigger, Newport, R. I., Schedule 7604—one motor-driven electric helical-gear shaft, Brooklyn, N. Y., Schedule 7605—one 125-volt variable-speed, motor-driven lathe, with extra attachments. Applications for schedule designations designate the schedule desired by number.

### North Central

**ALPHA, MICH.**—The contract for lighting the village, it is reported, has been awarded to the Manitowoc El. Co., of Manitowoc. The company is erecting a power plant in Alpha.

**DETROIT, MICH.**—Bids will be received by Charles A. Gadd, secretary board of education, Detroit, until Dec. 7 for the installation of electric wiring in a number of school buildings.

**FREMONT, MICH.**—The proposal submitted by the Muskegon-Grand Rapids Pwr. Co., of Grand Rapids, in regard to taking over the municipal electric-light plant will be submitted to the voters at an election to be called early in December.

**NORTHVILLE, MICH.**—The municipal electric-light plant has been leased to the Eastern Edison El. Co., of Detroit, for a period of four years at \$2,520 per year. At the end of four years the company has to take over the plant for a consideration of \$36,000, or turn it back to the village.

**CINCINNATI, OHIO.**—The board of directors of the University of Cincinnati will receive bids until Dec. 1 for the electrical work in the chemistry building, in accordance with plans and specifications on file in the office of Tietig & Lee, architects, Lyric Theater Building, Cincinnati. Further information may be obtained upon application to the city engineer, H. Franz, engineer, Union Trust Building, Cincinnati, Ohio.

**HOLMESVILLE, OHIO.**—The Brown & Harris El. Co., recently incorporated with a capital stock of \$3,500, is planning to install a small electric-light plant.

**YOUNGSTOWN, OHIO.**—H. W. Jones, consulting engineer, of Cleveland, has submitted his report to the City Council, which includes plans and approximate cost of a new street-lighting system, general distribution of electric power, and distributing system and plans of a municipal electric plant and equipment; also plans for a hydroelectric plant at the Milton dam to light the city, and plans for a new lighting system for the city provide for 3200 tungsten lamps for lighting the residential section of the city, mounted on brackets, swing lamps, and on poles along the street. The cost of the installation is estimated at \$160,000 and maintenance at about \$49,280 per year. In the business district it is proposed to use 16 lamps mounted on ornamental standards. Of these 173 would be of 600 cp and 143 of 1000 cp. The cost of installing these lamps is estimated at \$350,000, and for the year to maintain 1000-cp lamps and \$46.20 per year for the 600-cp lamps. To build a municipal plant it would be necessary to issue \$900,000 in bonds. The cost of the hydroelectric plant at the Milton dam is estimated at \$36,900, which would develop about 560 kw.

**ZANESVILLE, OHIO.**—The Southeastern Ohio Traction Co., it is reported, has been granted a franchise to furnish electricity for lamps and motors in Zanesville for a period of 35 years. Under the terms of the franchise the company is to light the city bridges free of charge.

**CORBIN, KY.**—At an election held recently the proposal to issue bonds for the installation of a municipal electric-light plant was carried.

**HENDERSON, KY.**—The City Council has appropriated \$3,500 for repairs to the municipal electric-light plant. The boiler was destroyed by a tornado last summer.

**LOUISVILLE, KY.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Dec. 18 for a vacuum-cleaning machine for the United States post office and post office at Louisville, Ky. For details see previous columns.

**PADUCAH, KY.**—Plans are being considered, it is reported, by the Kentucky Southwestern El. Ry., Lt. & Pwr. Co., of Paducah, to erect a new power house, three substations, repair shop, carhouses, 1800-ft. trestle and several smaller ones in connection with a railway from Paducah to Murray, a distance of about 58 miles. H. C. Rhodes is president.

**NEW PALESTINE, IND.**—The Indiana & Cincinnati Lt. & Pwr. Co. has been granted a franchise to furnish electricity for lamps and motors in New Palestine. The company, it is understood, has secured a contract for lighting the streets of the town.

**CHICAGO, ILL.**—During the next four years the Chicago, Milwaukee & St. Paul R. R. Co. will expend about \$13,000,000 to equip its railroad in the Rocky Mountain section with electric power. The contract has been made with the General

Electric Co., of Schenectady, involving a preliminary expenditure of \$100,000. A. Greenwood is in charge of the work.

**GENEVA, ILL.**—Bids will be received by the board of administration, Capitol Building, Springfield, Ill., until Dec. 7 for one farm cottage at the State Training School for Girls, Geneva. Separate bids will be received for general work, electric wiring, heating and plumbing. Plans and specifications may be obtained upon application to James B. Dillha, state architect, 29 South LaSalle Street, Chicago, Ill.

**KANKAKEE, ILL.**—Bids will be received by the Board of Administration, Capitol Building, Springfield, until Dec. 14 for the erection of a contiguous disease building at the Kankakee State Hospital. Separate bids will be received for general work, heating, electric wiring and plumbing. Plans and specifications may be obtained upon application to James B. Dillha, state architect, 29 South LaSalle Street, Chicago, Ill.

**SPRINGFIELD, ILL.**—The City Commissioners have decided to reject the offer of the Springfield Utilities Co. to take over the municipal lighting plant and light the streets of the city for \$30,000 less a year. It is now being the city. The city has recently purchased a 150-hp. turbo-generator, which will be installed in the auxiliary pumping station. The present municipal electric-light plant will eventually be abandoned.

**MADISON, WIS.**—Bids will be received by M. E. McCaffrey, secretary of the University of Wisconsin, Administration Building, Madison, until Dec. 15 for the entire construction of Physics and Chemistry buildings at the University of Wisconsin. Plans may be seen at the Builders' Exchanges in Milwaukee, Wis.; Chicago, Ill.; Minneapolis and St. Paul, Minn.; Madison, Wis. Plans may be obtained at the office of the architect of the University of Wisconsin, Administration Building, Madison, upon return of \$10, to be refunded upon return of same.

**SHEBOYGAN, WIS.**—The Milwaukee Northern Ry. Co., it is reported, is preparing plans for installing a substation in Sheboyan to supply electricity for lamps and motors in the surrounding country. Arrangements, it is understood, have been made to furnish electricity in Random Lake.

**HIBBING, MINN.**—The Home El. Co., it is reported, has been awarded the contract to erect a transmission line from Hibbing to Alice, at a cost of \$7,200.

**MADISON, MINN.**—J. C. Bang, superintendent of the municipal electric-light plant, would like to receive information on prizes on a motor-driven feed-water pump for 300-hp boilers.

**ST. PAUL, MINN.**—All bids submitted for electric lighting have been rejected by the City Council. In an attempt, it is understood, will be made at a conference between the purchasing committee and technical officers of the city and Paul Doty, manager of the St. Paul Gas Light Co., to reach an agreement before further bids are asked. The city, it is announced, wishes to maintain all the lamps owned by the city. It hopes to get the company to submit bids for energy to maintain 300 ornamental lamps and 425 new nitrogen-filled lamps, of which it is proposed to install 425 the coming year.

**SLATON, MINN.**—The Slaton Pwr. Co. expects to purchase replacement posts for five-lamp clusters 60-cp. type "C" series 6.6-amp lamps, and underground cable and conduit to connect the center lamps on one circuit and the lower lamps on the other circuit; also 22 lamps of 50-cp center suspension type to be maintained by the same circuit, with transformers and necessary equipment for same. F. H. Eddy is manager of the company.

**NORA SPRINGS, IA.**—At an election held recently the proposal to grant M. True, of Ladysmith, Wis., a 25-year franchise to supply electricity in Nora Springs was carried.

**OWELWEIN, IA.**—The Fayette Utilities Co., of Owelwein, has awarded a contract to Schmidt Brothers Construction Co., 105 North Park Street, Chicago, Ill., for construction of a power plant.

**MICHIGAN, N. D.**—Preparations, it is reported, are being made for the installation of a municipal electric-light plant in Michigan, for which bonds have been voted.

**MINOT, N. D.**—Bids will be received at the office of the supervising architect, Treasury Department Building, Bismarck, N. D., until Dec. 14, for installation of an electric passenger elevator in the United States post office and court house, Minot, N. D., in accordance with plans and specifications, copies of which may be obtained at the above office. O. Wenderoth is supervising architect.

**SPANLEY, N. D.**—The Board of Commissioners of Mountrail County at the office of the county auditor, Stanley, until Dec. 23 for furnishing electric-light fixtures and decoupling for the county court house in Stanley, for which separate bids will be received as follows: (A) Furniture; (B) decorating; (C) electric fixtures. Plans and specifications may be seen at the office of W. C. Gibb, county auditor, Stanley, and at the office of Buechner & Orth, architects, 500 Shubert Building, St. Paul, Minn.

**CHAMBERLAIN, S. D.**—The power house of the Northern Gas Light & Power Co. at Chamberlain was damaged by fire recently. The plant, it is understood, will be rebuilt.

**ASHLENE, KAN.**—The Riverside Lt. & Pwr. Co., of Ashlene, expects to purchase the next six months a 250-hp. water-tube boiler. C. L. Brown is manager.

**CANTON, KAN.**—The municipal electric-light plant was recently destroyed by fire, causing a loss of about \$5,000.

**HANOVER, KAN.**—Within the next two months the town of Hanover expects to purchase a transformer and motor for the municipal electric-light plant. J. G. Granzer is superintendent.

## Southern States

**AMERICUS, GA.**—The Americus Pwr. Co. and the Public Utilities Co., both of Americus, have consolidated under the name of the Americus Pwr. Ser. Co. The plant of the Americus Pwr. Co. will be dismantled and sold in about three and one-half months. J. Emory Mathias, manager of the Americus Pwr. Co., has assumed the management of the consolidated properties.

**FLORENCE, ALA.**—Arrangements, it is reported, have been made whereby the Lauderdale Pwr. Co. and the Allenton Pwr. Co. have been consolidated under the name of the Lauderdale Pwr. Co. The new company is capitalized at \$400,000 and proposes to develop the water-power in Cypress and Shoal Creek. The officers of the company are: Sloan Jacobs, president; Alan Jemison, vice-president; Thurston Allan, secretary and general manager, and T. W. Pratt, treasurer.

**MOBILE, ALA.**—W. M. Weems, of Dayton, Ohio, it is reported, is contemplating the construction of a vitrified-brick factory and electric-light plant in Mobile.

**FORN SMITH, ARK.**—Arrangements are being made for the merchants on Third Garrison Avenue to install an electric-light plant to light the stores and business houses from Sixth to Ninth Street on Garrison Avenue.

**LAKE CHARLES, LA.**—Plans are being considered by the Commercial Club for the installation of an ornamental street-lighting system in the business district.

**DUNCAN, OKLA.**—The Duncan El. & L. Co., of Duncan, Okla., the Southwest Cities El. Co., is contemplating the installation of gas engines in the near future. John C. Keyes, of Lawton, is president.

**TEMPLE, TEX.**—The City Council has awarded the Texas Pwr. & Lt. Co. a new street-lighting contract. The contract is for a period of five years and provides for 43 additional lamps.

## Pacific States

**ARLINGTON, WASH.**—The Jim Creek Water, Lt. & Pwr. Co., of Arlington, has petitioned the County Commissioners of Snohomish County for a franchise to erect and operate electric transmission lines along certain county roads from Arlington, Springfield and Everett to the McIntosh to McMurray to the north line of the county, also from Arlington to Norman, through Silviana; also from Arlington to Oso, through Traflet and Crosero. The company proposes to supply electricity to the above-named towns and to ranchers along the line.

**EVERETT, WASH.**—The Riverside Business Men's Association has appointed a committee to investigate the feasibility of installing an incandescent street-lighting system on Hewitt Avenue east of the viaduct.

**RIDGEFIELD, WASH.**—John L. Brattle and William McClelland, of the Brattle-McClelland Shingle Mill Co., of Ridgefield, have applied to the City Council for a franchise to supply electricity to Ridgefield. Preparations are being made by the company to enlarge its power plant at the mill on Lake River. A new boiler and additional generating machinery will be installed. This equipment has not yet been purchased.

**TACOMA, WASH.**—The City Council is contemplating the installation of new luminous-arc lamps on South D Street from Seventh to Twenty-first Street, work on which will probably start soon after the first of the year.

**SILVERTON, ORE.**—The City Council is considering the installation of a complete electric-lighting system to cover the entire city. It is proposed to erect cluster lamps in the business district and single lamps in the residential district. Bids for the equipment will soon be asked for furnishing equipment and installing the same. Bids will also be asked for furnishing energy to maintain the system for a period of five years.

**NEWPORT BEACH, CAL.**—The contract for the ornamental street-lighting system in Newport Beach has been awarded to the F. O. Engstrom Co., of Los Angeles, at \$17,725. The plans provide for 158 ornamental standards.

**SAN FRANCISCO, CAL.**—Bids, it is reported, are being received by the Board of Public Works for the proposed street-lighting equipment in the city center power plant to be situated at McAllister and Larkin Street and to cost about \$16,000.

**STOCKTON, CAL.**—Plans adopted by the City Council for the street-lighting for the coming year provide for 600 or more nitrogen-filled lamps. At present there are few over 500 lamps in use. The new lamps will be erected in the recently annexed territory. Included in the plans for 1915 are electroliers for the business district.

**TULARE, CAL.**—Plans have been presented to the City Council by a committee from the Merchants' Association for an ornamental street-lighting system for the business district. The plans provide for the erection of 50 electroliers and for laying of about \$800 of cost of conduit.

**TUCSON, ARIZ.**—At an election to be held Dec. 1, the Board of Public Works in bonds for street-lighting will be submitted to the voters.

**BOZEMAN, MONT.**—Bids will be received by A. M. Branderburg, city clerk, until Dec. 15 for furnishing electricity for lighting the city during the coming year.

## Canada

**OTTAWA, ONT.**—The erection of a duplicate transmission line to the Lemieux Island pumping plant has been recommended by the Board of Control.

**PETERBOROUGH, ONT.**—The installation of a new street-lighting system is reported to be under consideration by the Utilities Commission.

**SWANSEA, ONT.**—The Council has adopted a resolution to enter into a contract with the Hydro-Electric Commission for energy for street and commercial lighting.

**YORK, ONT.**—The Toronto Hydro-Electric Commission has been authorized by the York Township Board to install incandescent lamps in the Runnymede and Swansea districts of Toronto.

## Miscellaneous

**NOME, ALASKA.**—Arrangements are being made by the Seward Peninsula Pwr. Co., of Nome, for the improvement of its power house and extensions to its system. A. J. McConnell is superintendent.

**PANAMA.**—Bids will be received at the office of the general purchasing officer, Lithman, Caswell, Washington, D. C., until Dec. 7 for steel cable, boiler tubes, miscellaneous pipe fittings, clean-outs, bibbs, elbow, sheet copper, soft-rolled copper, structural steel work, etc. Plans and general information relating to this circular (No. 575) may be obtained at the above office or the offices of the assistant purchasing agents, 24 State Street, New York, N. Y., 614 Whitney-Central Building, New Orleans, La., and 1086 North Point Street, San Francisco, Cal. Major F. C. Boggs is general purchasing officer.

## New Incorporations

**MALTA, MONT.**—The Malta Lt. Co. has been incorporated with a capital stock of \$10,000 to construct and operate an electric-lighting plant.

**LOCUST GROVE, OKLA.**—The Locust Grove Lt. & Pwr. Co. has been incorporated with a capital stock of \$10,000 by H. O. Long and O. W. Kilgus, of Locust Grove, and Thomas McCrowsky, of Webb City, Mo.



# Weekly Record of Electrical Patents

NOV. 17, 1914.

Exchange Place, New York, N. Y.]

- 1,117,156. SECRET TELEPHONE EXCHANGE: R. M. Beard, New York, N. Y. App. filed May 2, 1904. Prevents "listening in."
- 1,117,184. CONTROLLER: H. E. Goldberg, Chicago, Ill. App. filed Nov. 23, 1910. For copying, typesetting and sorting machines.
- 1,117,185. ELECTROLYTIC CELL: A. M. Griffin, Kansas City, Mo. App. filed April 27, 1914. The hydrogen and oxygen produced are collected and stored.
- 1,117,191. MOTOR-STARTING RESISTOR: G. McD. John, St. Louis, Mo. App. filed Oct. 28, 1909. Centrifugally operated.
- 1,117,198. ELECTRIC-CIRCUIT-CONTROLLING APPARATUS FOR TRAIN-LIGHTING AND SIGNAL SYSTEMS: E. H. M. Lohrman and E. W. Price, Birmingham, Eng. App. filed July 24, 1911. Special switch construction.
- 1,117,201. INTERNAL-COMBUSTION ENGINE: R. H. Libke, Chilton, Wis. App. filed June 13, 1914. Magneto is geared to the crank shaft at a speed ratio of 2½ to 1.
- 1,117,211. LINEMEN'S CHAIR: F. W. Mayes, Hopkinsville, Ky. App. filed May 5, 1912. Accidental displacement from the messenger wire is prevented, the chair having a cable-supporting roller.
- 1,117,212. AUTOMATIC TELEPHONE EXCHANGE APPARATUS: F. R. McBERTY, New Rochelle, N. Y. App. filed April 20, 1909. Testing connection and restoration in a final selector are performed automatically.
- 1,117,215. TELEPHONE-TOLL DEVICE AND CIRCUITS THEREFOR: J. L. McQuattie, Montclair, N. J. App. filed Oct. 12, 1912. Improved and reliable system for charging the number of successful calls.
- 1,117,231. LOUD-SPEAKING TRANSMITTER: J. C. R. Palmer, Brooklyn, N. Y., and A. P. Pinkler, Veehawken, N. J. App. filed Nov. 13, 1911. Special construction for long-distance work.
- 1,117,240. METHOD OF INSULATING WIRE OF ALUMINUM AND THE LIKE: E. Presser, Berlin, Germany. App. filed May 31, 1911. Passes wire through an electrolyte while conducting high-tension current through it.
- 1,117,266. FLUOROSCOPIC APPARATUS: H. C. Snook and E. W. Kelly, Philadelphia, Pa. App. filed Dec. 26, 1911. For shielding physician from X-rays emanating directly from the source and from secondary sources.
- 1,117,267. VACUUM REGULATION: H. C. Snook, Philadelphia, Pa. App. filed June 18, 1912. Uses a mixture of asbestos and powdered cleveite.
- 1,117,277. HEATING APPARATUS: S. G. Supple, East Orange, N. J. App. filed May 12, 1914. Heating element adjustably supported in a liquid container.
- 1,117,290. SEMI-AUTOMATIC TELEPHONE SYSTEM: A. W. Weiss, Chicago, Ill. App. filed March 28, 1908. Switchboard has no answering jacks and no signals individual to the lines terminating in the board.
- 1,117,293. INDUCTION COIL: D. H. Wilson, Chicago, Ill. App. filed March 25, 1909. For telephone systems.
- 1,117,296. IMPULSE TRANSMITTER: J. A. Votton, Montclair, N. J. App. filed June 1, 1912. Includes special clockwork mechanism.
- 1,117,297. TELEPHONE EXCHANGE SYSTEMS: J. L. Wright, Washington, D. C. App. filed May 18, 1906. Full-automatic system in which the double-selective motion of the switch is eliminated.
- 1,117,329. TIRE-PRESSURE INDICATOR AND ELECTRIC SIGNAL: C. C. Cleveland, Boulder, Col. App. filed May 6, 1912; renewed March 28, 1914. Signals deflation of any tire.
- 1,117,335. SPEED INDICATING AND SIGNALING DEVICE: J. L. Koplon, Buffalo, N. Y. App. filed May 1, 1912. Speedometer closed circuit indicates exceeding of speed limit.
- 1,117,339. ELECTRIC REGULATION: J. L. Cravelling, New York, N. Y. App. filed Feb. 16, 1912. For charging storage batteries.
- 1,117,347. ELECTRICAL THERMOSTATIC FIRE-ALARM CONTACTS: H. Dixon, Toronto, Ontario, Can. App. filed Dec. 28, 1912. Contacts enclosed in hermetically sealed chamber.
- 1,117,361. SPEED CONTROL FOR MOTORS: S. K. Evans, Elmstorf, N. Y. App. filed Nov. 8, 1913. Speedometer shuts off motor at a speed which is predetermined by a key-controlled lock.
- 1,117,376. CIRCUIT-CONTROLLER: C. O. Harrington, Edgewood, Borough, Pa. App. filed Dec. 28, 1912. Applied to an electric bell of the solenoid and plunger type.
- 1,117,378. COMBINED GENERATING AND STARTING APPARATUS FOR GAS ENGINES: J. A. Heany, Flint, Mich. App. filed July 28, 1910. An auxiliary engine, after being started by the motor dynamo, drives the main engine.
- 1,117,392. FUEL-VAPORIZING DEVICE: C. F. Johnson, Detroit, Mich. App. filed July 3, 1914. Electric heater interposed in engine intake to collect and vaporize any condensed fuel.
- 1,117,396. CIRCUIT-CONTROLLING DEVICE: M. M. Kandle, Springfield, Mass. App. filed Nov. 5, 1912. Paper-operated stop for printing presses.
- 1,117,407. TELEPHONE SYSTEM: E. Land and F. L. Fisher, Grand Rapids, Mich. App. filed March 22, 1906. Automatic distribution of calls coming into a central office.
- 1,117,441. THIRD-RAIL CONTACT: S. Przespolewski, Carnegie, Pa. App. filed July 3, 1914. Contact wheel made in independently rotatable sections.
- 1,117,473. STEERING-WHEEL HEATER FOR ROAD VEHICLES: W. P. Barton, Idaho Falls, Idaho. App. filed May 5, 1914. Made in segments readily applicable to an ordinary steering wheel.
- 1,117,484. ELECTRIC BELL: C. W. Dunham, Swissvale, Pa. App. filed Feb. 4, 1914. Solenoid and plunger type, with plunger supported on an inclined ball race.
- 1,117,485. ELECTROMAGNET: O. F. Forsberg, Yonkers, N. Y. App. filed Aug. 31, 1911. Positive operation of the magnet is insured; illustrated as controlling a pay-station coin chute.
- 1,117,493. METHOD OF CHARGING SECONDARY BATTERIES: M. E. Hutchinson, West Orange, N. J. App. filed July 6, 1911. Renders impossible charging of the battery with all the cells connected together in series.
- 1,117,511. AUTOMATIC TRUNK SIGNALING SYSTEM: F. R. McBERTY, New Rochelle, N. Y. App. filed Sept. 19, 1910. Manual operator is automatically informed of the designation of the line with which connection is desired.
- 1,117,553. SELECTIVE SWITCHING APPARATUS: E. R. Craft, Hackensack, N. J. App. filed Aug. 10, 1912. For automatic or semi-automatic systems.
- 1,117,559. RAILWAY SIGNALING: W. F. Follett, New Haven, Conn. App. filed Nov. 1, 1914. Uses alternating-current signaling circuits.
- 1,117,588. ELECTRIC HOIST: G. K. Mitchell, Baltimore, Md. App. filed March 13, 1912. Particularly for dumbwaiters.
- 1,117,590. INCLOSED FUSE: W. J. Morgan, St. Louis, Mo. App. filed Aug. 20, 1913. Constructed so as to be readily assembled.
- 1,117,599. LIGHTNING ARRESTER: H. M. Pingen, Toledo, Ohio. App. filed April 27, 1914. Cartridge lightning arrester with an embracing sectional shield having a spark-gap.
- 1,117,610. MAGNETO MACHINE: L. A. Williams, Evanston, Ill. App. filed Nov. 17, 1913. For make-and-break ignition.
- 1,117,633. SIGNALING SYSTEM: C. E. Beach, Binghamton, N. Y. App. filed Dec. 24, 1913. Interference prevented between different alarm-transmitting stations.
- 1,117,646. CIRCUIT CLOSER: V. Durbin, Winton, and H. Ehrismann, Boston, Mass. App. filed May 9, 1913. Push-button of the self-locking type employed in hospital signaling systems.
- 1,117,647. WATERTIGHT ATTACHMENT PLUG AND RECEPTACLE: V. Durbin, Newton, Mass. App. filed Oct. 2, 1913. Toggle-operated closure seals receptacle when plug is withdrawn.
- 1,117,650. DETACHABLE LAMP SOCKET: M. Erlanger, Baltimore, Md. App. filed Dec. 30, 1913. Socket has terminal spurs which pass through conductor wires into a wooden or like support.
- 1,117,675. AUTOMATIC MECHANISM FOR RECALLING CHRONOLOGICAL DATA: D. W. Jewell, Kalamazoo, Mich. App. filed Feb. 18, 1914. For indicating expiration of a prison sentence, recalling engagements, etc.
- 1,117,681. SPARK-GAP FOR WIRELESS TELEGRAPHY: J. Loeffler, Vallejo, Cal. App. filed March 17, 1913. A cooling chamber surrounds the electrode.
- 1,117,689. ELECTRICAL REGULATOR: C. A. Moore, Johnstown, Pa. App. filed May 17, 1911. For boosters used in connection with storage batteries.
- 1,117,706. FIRE-ALARM BOX: E. L. Rowley and G. H. Gibson, Detroit, Mich. App. filed March 5, 1914. Traps and holds the person sounding the alarm.
- 1,117,722. TRACK-CONTROLLED MECHANISM: A. H. Sweetland, Long Beach, Cal. App. filed Dec. 15, 1913. Magnetically operated track switch.
- 1,117,731. DYNAMO-ELECTRIC MACHINE: H. B. Weir, Milwaukee, Wis. App. filed Feb. 14, 1910. Reinforced commutator construction.
- 1,117,738. INTERNAL-COMBUSTION ENGINE: A. Winton, Cleveland, Ohio. App. filed Dec. 13, 1912. For heavy-grade oil; has a commutator by which the amount and the time of admission of the fuel can be controlled.
- 1,117,748. MOLDING OR CONDUIT FOR ELECTRIC WIRES: P. Addison, New York, N. Y. App. filed July 10, 1913. Trough and flanged cover which is narrower than the base of the trough so that water cannot drip down into the joint between trough and cover.
- 1,117,766. SUBMARINE SIGNALING APPARATUS: C. Berger, New York, N. Y. App. filed Nov. 4, 1912. Interiorly supported microphone with jelly-like vibration-transmitting medium.
- 1,117,815. SLEET CUTTER FOR TROLLEY WIRES: H. E. Eager and A. O. Hagle, Tipton, Ind. App. filed Feb. 17, 1914. Supported so as to be thrown into and out of operation.
- 1,117,832. SIGNALING SYSTEM: H. C. Goldrick, San Francisco, Cal. App. filed Jan. 30, 1913. Used in signaling telephone substations.
- 1,117,837. INDUCTION COIL CASING: H. D. Grinnell, Pittsfield, Mass. App. filed April 19, 1911. Coil completely protected from rain and snow.
- 1,117,857. CIRCUIT INTERRUPTER FOR THERAPEUTIC APPARATUS: F. M. and M. H. Kidder, New York, N. Y. App. filed Jan. 19, 1914. Adjustment of armature of the interrupter.
- 1,117,864. SIGNALING SYSTEM: M. E. Laubach, Chicago, Ill. App. filed Oct. 24, 1911. Central station and plurality of substations all used on the same circuit.
- 1,117,872. DYNAMO-ELECTRIC MACHINE AND SYSTEM OF CONTROL: R. Lundell, New York, N. Y. App. filed Nov. 28, 1913. Motor-generator system.
- 1,117,879. ELECTROLYTIC CELL: F. McDonald, Roaring Spring, Pa. App. filed April 20, 1914. Intermingling of the anode and cathode products is prevented.
- 1,117,888. SAFETY APPLIANCE FOR ELEVATORS: J. Mukacsky, Newark, N. J. App. filed March 11, 1914. Trip-breaking device suspended below floor of car.
- 1,117,907. APPARATUS FOR INDICATING THE DIRECTION OF THE WIND: G. T. Richardson, London, Eng. App. filed Dec. 15, 1911. Wind vane controlling an electrically illuminated dial.
- 1,117,950. IMMERSION HEATER: E. J. Ovington, Los Angeles, Cal. App. filed Dec. 1, 1914. Joint between cap and casing of the heater is copper-plated to make it watertight.
- 13,830 (reissue). TRANSFORMER: N. A. Wolcott and W. C. Woodland, Warren, Ohio. App. filed May 13, 1914. (Original patent No. 1,691,395, March 31, 1914.) Special laminated-core construction.

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## Indeterminate Lighting Contracts

The suggestion for an indeterminate form of street-lighting contract which arises from the experience of the Watertown (Wis.) Gas & Electric Company and the Electric Company of Missouri, mentioned elsewhere in this issue, contains features that are worthy of serious consideration. Where the duration of a street-lighting contract is limited by statute it would, of course, be necessary to secure new legislation before the indeterminate principle could be applied in this way. But if the parties most concerned should agree upon the desirability of change, the legislation would follow. Under the usual form of street-lighting contract a material investment is made by the company, partly in consideration of the fact that the arrangement is for a term of years and partly in the expectation that, irrespective of the actual period named in the bond, the arrangement will be continued at satisfactory rates and indefinitely. Without such an expectation the investment should be amortized if the most careful accounting requirements are to be observed. In the degree in which the expectation of renewal is lessened the investment of funds without amortization becomes a speculation. It is not to the interest of either the company or the city that all or any part of an investment of this kind shall be wasted deliberately. It is to the interest of both that it shall be safeguarded. If the investment is lost, the amount of loss becomes a charge upon the property and generally a charge that ultimately falls in some way upon the consumers. If the investment is protected, it is so much tangible property of which the community gets the benefit. Under an indeterminate form of contract no serious waste of capital of this character could take place. The city would have the right to cancel the contract upon payment of fair value. Non-renewal of the contract would not mean loss as it may do under the usual conditions that obtain now.

## The Control of Monopoly

A report of the committee on telephone and telegraph rates and service, presented before the National Association of Railway Commissioners at the recent annual meeting, is in large part an argument for properly controlled monopoly rather than competition in public utilities. The pure truth of this economically sound position should render argument of it unnecessary; but when we see cities like Cleveland resort to competition, though complete regulation is assured through a state commission, it is evident that pains must still be taken so that the public shall want the wiser method to be adopted. The words of the committee are: "There are

demagogues and others who are not true students of economy and believers in efficient regulation who believe that open competition acts as a sword of fear and thereby assists in the maintenance of low rates. The sanction of competition in the local public utility field is but an invitation to final economic loss." The chairman of this committee was Mr. Watson, of the Oklahoma commission. New wine is not to be put in old bottles, but old truths may be put in new words. Competition is undesirable because it is not permanently effective. If the facilities of two plants are available to the public, each is duplicating the service of the other. A duplication of service means a duplication of investment. A duplication of investment means that the public is called upon to pay interest on both investments. Each one clamors for business, for street rights, for profits. Because any other result than the absorption of one plant by the other is uneconomical the most rigorous commissions recognize that consolidation is the inevitable end. They therefore discourage competition. Even if it were possible to have two plants operating in separate districts of a community without competition, the best service for the public would not be obtained by this means. Two plants, with separate organizations, separate overhead expense and separate physical structures, cannot be operated as economically as a single large plant of capacity equal to the two. The fear of competition may have been a spur in the days of haphazard relations between the public and the utilities. This has been succeeded by regulation and, we believe, a very general desire that regulation shall be effective. To make it effective and wholesome is a company duty as well as a public duty.

## Potential Over Series Insulators

When a series of similar suspension insulators are made up in a string, supporting a high-tension conductor, it might at first thought be supposed that the voltage would fall uniformly along the string, and that the difference of potential across each insulator would automatically become the same. Observation shows, however, that such is not the case, and that the difference of potential across the first insulator, nearest to the line conductor, may be two or three times as great as that across the last insulator in the series. The reason for this undue proportion of stress on the first insulator is that the electric flux passes not only through all the insulators in series but also laterally to ground through the air. The condition is similar to that of a leaky conducting line, where the current in the first kilometer is the greatest and it falls off toward the distant end of



the line. It becomes possible, however, by grading the insulators to restore uniform potential differences across them in spite of this lateral flux leakage. Some tests in this direction are reported by Messrs. J. L. Brennehan and Harold M. Crothers in an article appearing elsewhere in this number. It appears that the potential difference across the first of a series of six insulators was nearly double that across the last. The influence of corona over the first insulator was, however, toward diminishing this disparity. The observations reported indicate the difficulty which exists in measuring the potential at any given insulator in the series. The mere approach of a wire to the point whose potential is to be determined has the effect of changing to some extent the entire potential distribution in the system.

### Magnetic Habits of Alloy Steels

It is generally recognized that magnetic retentiveness, or the magnetic quality which goes with permanent magnets, is associated with the mechanical hardness of steel. If steel is very soft, yielding easily to abrasion, it is easily magnetized and also easily demagnetized, so that it is unsuitable for the production of permanent magnets. On the other hand, hard steel, especially hard steel containing a certain amount of chromium, tungsten or other substances in alloy, is likely to make good permanent magnets.

On Ewing's theory of magnetism, the connection between mechanical and magnetic hardness is accounted for by assuming that each individual molecular magnet entering into the structure of iron or steel has a certain amount of friction opposing rotation on its pivot and due to the mechanical hardness of the material. Hard steel, therefore, resists being magnetized or having its individual molecular magnets aligned, but once magnetized the same pivot frictional resistance tends to prevent demagnetization when the magnetizing force is removed. Yet it is not permissible to carry the assumed connection between mechanical and magnetic hardness too far, if only because of chemical complications. The same degree of hardness may exist in two samples of the same steel which have been subjected to different thermal treatment, and yet the magnetic hardness will be very unlike.

In a paper read before the American Society for Testing Materials, Mr. J. A. Mathews proposes, as a measure of the magnetic hardness of a sample of steel, the ratio of coercive force to residual flux density, a ratio which is a mere numeric on the conventional theory of magnetic-unit dimensions, and which comes out between 0.15 and 0.7 per cent in the cases presented. That is, the demagnetizing force necessary to apply to a sample in order to demagnetize it completely varies between 0.15 per cent and 0.7 per cent of the residual flux density or remanence at zero magnetizing force. The larger this numerical ratio, the harder the material is to demagnetize and the harder its magnetism. The author shows that in the cases of a number of alloy steels

water-quenching produces greater mechanical hardness than oil-quenching, and yet the magnetic hardness is greater with the oil quenching. Moreover, a steel which after quenching without annealing might show the same mechanical hardness as a sample of the same material quenched and unannealed might show considerably less magnetic hardness, the mechanical hardness being judged by the Brinell ball test and the Shore scleroscope test, while the magnetic hardness was judged by the above-mentioned ratio of coercive force to remanence. The paper is interesting on account of its wealth of statistical material. It shows, among other things, that the "percentage remanence," or ratio of remanence to maximum cyclic flux density, varies much less with heat treatment than does the magnetic hardness. It is known that in varying ranges of cyclic magnetization in iron or steel the percentage remanence remains approximately constant. A conclusion which may safely be drawn from the paper is that magnetic hardness depends upon other things besides mechanical hardness.

### New A. I. E. E. Standardization Rules

On Dec. 1, 1914, the new Standardization Rules of the American Institute of Electrical Engineers became effective. We congratulate the Institute upon the achievement. The new edition presents a marked advance over the preceding edition of 1911. It covers nearly 100 printed pages and numbers 568 sections. It has called for co-operative work and agreement with several engineering bodies outside of the A. I. E. E., namely, the International Electrotechnical Commission, the Bureau of Standards, the Illuminating Engineering Society, the Institute of Radio Engineers, and the American Society for Testing Materials, all of which bodies are specifically referred to in the way of mutual agreements. Large as this list is, it is to be hoped that future editions will include a yet larger one.

It is not only in extent that the new edition marks an advance over the old, but also in the basis for the rating of machinery, which has undergone complete and radical revision. In the old rules a machine rating was established, from a thermal standpoint, by a standard rise in temperature under specified conditions of load, while, above the continuous rated load, certain provisions were made for an overload of considerable magnitude and duration. In the new edition this is all changed and greatly improved. Not rise of temperature but the actual temperature at the hottest spot in the insulation is made the fundamental consideration in thermally determining the rated load. Under no conditions is the permissible temperature of the hottest spot to exceed an assigned limit, depending on the nature of the insulating material. No thermal overloads are recognized or allowed. Temporary mechanical and commutation stresses in excess of rated load conditions are indeed called for, but if the insulating material is to be heated above the limit of permanent safety, the owner is supposed to apply such overloads entirely at his own risk and responsibility, after the machine has been delivered to him.

The old notion that a machine had a certain continuous-load rating, which was just safe to maintain and which yet might somehow be exceeded for a couple of hours every day was pernicious, both from scientific and commercial standpoints. On the other hand, the new basis of rating permits the user to apply extra loads to his machines intelligently and safely, in cases where the machines are worked at a low room temperature, say in winter time, with abundant ventilation.

### American and Foreign Wiring Rules

We publish in this issue an extended and thorough comparison, arranged by Mr. Hugo Eisenmenger, of the interior wiring rules in force in the United States, Germany and England, with reference as well to practice in other foreign countries. A comparison between these rules is exceedingly instructive. In considering the matter one must bear in mind the fact that the rules of the several nations have a somewhat different origin. Those in the United States are practically dictated by the underwriters to an extent which is not at all true of either Germany or England, although properly enough the underwriters are influential in all countries. The general result is that the American rules "play safe" at every point so far as risks to property are concerned, somewhat irrespective of the real magnitude of the risk or the burden imposed by the regulations upon those who are doing the wiring. The foreign regulations are more concerned with obtaining practically good results under the circumstances of the installation than with obtaining ideal security at any price. Part of this difference is attributable to motives entirely of self-interest and part to the difference of actual structural conditions. The American rules are, in fact if not in principle, formulated for the protection of structures of the most inflammable character possible, frame buildings, generally very lightly built and finished in inflammable materials.

The foreign rules have been formulated for buildings of what we would classify as slow-burning or fireproof construction. This difference of attitude must be read into any discussion of the details of the wiring rules. Moreover, the point of view of the designer of wiring appliances is greatly influenced by the differences in construction to which we have referred. For example, in this country wooden moldings or metal moldings are recognized as legitimate and are freely used. In England wooden molding is permitted under moderate restrictions and metal molding is used hardly at all. In Germany wooden molding is not allowed and metal molding is unused, the customary German construction for the corresponding class of work being knobs on the exterior of the walls. Likewise knob-and-tube work, which is frowned upon here, although with proper care it can be made safe, is used neither in England nor in Germany because frame houses are rare and the construction employed does not lend itself to this particular form of wiring. The general difference in point of view which lies behind the rules is, in this

country, that everything is to be suspected as liable to cause fire until it is proved to be safe. In Germany, England and other foreign countries the constructional features of the buildings are such that there is a reasonable assumption of safety if suitable care is used. There is no doubt that under similar conditions regarding the construction of buildings the American and foreign rules should come somewhat nearer together, yet some of the differences seem not to rest on reasons of this kind but rather on a more critical attitude of mind, influenced probably by the ultimate origin of the rule.

To take up somewhat in detail the variations shown in the paper before us, the most conspicuous one is the difference in the regulations concerning permissible sizes of wire. Under our own national code nothing smaller than No. 14 B. & S. gage is permitted except in fixture work and in pendent cord, which must never be smaller than No. 18. Germany and England both permit wire approximating No. 17 B. & S. gage as the minimum for interior wiring, and in fixtures Germany permits an area half way between No. 18 and No. 19 and England allows wires of sections slightly smaller than No. 21. The latter country, however, protects all its ruling by a specification of minimum permissible drop not to exceed 2 per cent plus a constant allowance of 1 volt. These differences are somewhat important as regards the cost of wiring, particularly so since the general introduction of tungsten lamps. There seems no good reason whatever for using wire as large as No. 14 for a branch leading to two or three 25-watt lamps, provided that the wires are properly fused. In house wiring particularly the American requirement seems somewhat burdensome at the present time. As to general methods of insulation in construction and of making connections, the regulations of the three countries concerned are very similar except that the American requirements are more specifically severe.

As will be seen from the tables, the insulation resistance requirements in America are many times as severe as in foreign countries, with the single exception of England, which, perhaps because of its somewhat damp climate, has requirements somewhat like our own. Many minor points of difference besides those here mentioned are observable, but the tendency in general throughout the respective regulations is such as to increase considerably the cost of installations in our own country as compared with foreign costs. How far this increase is intrinsically justifiable from the standpoint of safety, and how far it is directly related to the differences in building construction, is a matter which ought to have careful attention. Certainly, a distinction should be made here between buildings of slow-burning or fireproof construction and those in which the risk of inflaming the surroundings of a wire are notably increased. If buildings involving unusual fire risks were handicapped not only in the matter of wiring but in other particulars sufficiently to discourage their general construction, the results would be excellent.



# The News of the Week

## Activities and Events in the Electrical Field— Reports of Meetings—Commission Findings, Etc.

### December A. I. E. E. Meeting

A meeting of the American Institute of Electrical Engineers will be held in the Engineering Societies Building, New York, on Dec. 11, at 8:15 p. m. Two papers will be presented, as follows: "Insulator Depreciation and Effect on Operation," by Mr. A. O. Austin, and "Effect of Altitude on the Spark-Over Voltages of Bushings, Leads and Insulators," by Mr. F. W. Peek, Jr. At the close of the technical session a smoker will be held and light refreshments will be served.

### New Street Lamps for Washington, D. C.

Washington's business district will be brilliantly lighted for the Christmas shopping this year. Work has been begun on the installation of 130 1500-cp arc lamps in the section between Pennsylvania Avenue, G Street, Seventh Street and Fifteenth Street Northwest. The lamps, which will replace the present 700-cp inclosed-arc lamps, will be similar to those recently installed on Pennsylvania Avenue. The additional cost of maintaining the illumination of this area will be about \$6,400 a year. Plans are being made to replace other arc lamps by high-efficiency tungsten lamps placed at frequent intervals along the streets.

### Employers' Liability Insurance in California

The manager of the compensation fund of the Industrial Accident Commission of California has issued a report. With the report appears a statement that, barring any unexpected calamity, those who hold State compensation insurance policies will be allowed a return premium of from 5 to 25 per cent of the premiums earned, the amount depending upon the experience in the various hazard groups. This return, however, will not affect the minimum premiums. The California insurance laws require that claim reserves equaling 72 per cent of all earned premiums, less losses and loss expenses paid, be set aside, and this reserve must be maintained for five years. It is thought that there is no possibility that losses and loss expenses will equal that percentage, and that the difference between the reserve and the actual value of claims can ultimately be done away with. This would indicate a further return premium to 1914 policy holders, after a fair catastrophe surplus is set aside.

The initial insurance rates to be adopted for the coming year are the same as those charged by the standard corporate companies, with the exception of the excess premium returns mentioned. All plants are inspected and the merit classification is applied to many. Where allowed, special merit inspections result in rate reductions of 1 to 40 per cent, the average reduction being 10.08 per cent.

The financial statement just issued covers the period from Jan. 1 to Oct. 1, 1914, during which 5360 applications for insurance were received and 2478 accident cases handled. The expenses amount to 8.49 per cent

of the premiums. The totals are as follows: Appropriation (1913 statute), \$100,000; premiums received, less premiums returned, \$462,514; interest received, due and accrued, \$4,503; total, \$567,017; expenses and salaries, \$41,329; compensation and statutory medical payments, \$52,528; outstanding cost, foregoing item, \$110,456; unearned premiums, \$138,684; surplus, \$224,020.

### Company Offer Rejected in Springfield, Ill.

The city authorities of Springfield, Ill., have decided to reject the offer of the Springfield Utilities Company to take over the municipal lighting plant and light the city streets for \$30,000 less a year than the present cost to the city. The plan of city officials is to install a 750-kva turbo-generator purchased recently and light the streets and also furnish energy to some private consumers. The city intends eventually to abandon its present plant.

### American Wood Preservers' Association

The eleventh annual convention of the American Wood Preservers' Association will be held at the Congress Hotel, Chicago, Jan. 19 to 21. Among the papers of interest to electrical engineers will be those on "Temperature Changes in Wood Under Treatment," by Mr. George M. Hunt, of the Forest Products Laboratory, Madison, Wis.; "The Properties of Creosote Oil," by Dr. Herman von Schrenk; "The Economical Use of Steam in Connection with Wood-Preserving Plants," etc., together with a number of committee reports. Mr. F. J. Angier, Mount Royal Station, Baltimore & Ohio Railroad, Baltimore, Md., is secretary-treasurer of the American Wood Preservers' Association.

### Hearing on Water-Power Bill

The public lands committee of the Senate has set Dec. 9 as a day upon which hearings will begin on the so-called Adamson water-power bill, which was passed by the House at the last session of Congress and was referred to the Senate committee.

This bill, it is said in Washington, will meet strong opposition from senators who represent public-land states in the West. Senator Shafroth of Colorado is one of the strongest opponents of a proposed system for the leasing of public lands. He contends that lands containing water-powers as well as others should be opened to entry and ownership by residents of the states. Senator Borah of Idaho will also oppose the bill. A leasing system, he says, would only create another army of government employees and add to bureaucratic government.

The determination of the committee indicates, it is said in Washington, a desire to get the bill before the Senate as soon as possible. Whether the Senate will act upon the bill at the coming session will be determined largely by the wishes of President Wilson. Great stress has been laid by the President upon the need of

enacting this measure, as well as the general coal, oil and phosphate lands leasing bill, a hearing on which has been scheduled by the committee for Dec. 16.

### American Physical Society at Chicago

A lecture entitled "X-Ray Spectra and the Nature of Alpha Rays," by Prof. W. H. Bragg of Leeds University, England, was the feature of the meeting of the American Physical Society held at Chicago University Nov. 27 and 28. The speaker's explanations of the atomic structure of crystals used in diffracting rays of short wave-lengths was made exceedingly clear by the use of carefully constructed models. One half-day session was devoted to discussions on spectroscopic evidence regarding atomic structure. Of the twenty-eight other papers presented, those dealing with experiments on selenium crystals, spark discharges between unlike metals, direct-current corona and the elementary charge of electricity were of particular interest as bearing upon the science of electrical engineering.

### Developments in Cleveland

Chairman P. V. Kalina, of the committee on lighting of the City Council of Cleveland, Ohio, stated recently that he will introduce an ordinance authorizing a special election to vote upon a bond issue for the purchase of the property of the Cleveland Electric Illuminating Company if the company does not reduce its residence rate to 3 cents per kw-hr. The valuation of the property of the company which is under way by the Public Utilities Commission of Ohio will not be completed before next spring. The rates of the company are under consideration by the commission in connection with the valuation. Mr. F. W. Ballard, superintendent of the city lighting department, said he would not like to see a duplication of heating mains in the business district of the city and for that reason had not advocated a heating department for the municipal plant.

The Cleveland Electric Illuminating Company has secured the contract for furnishing energy to the National Power Company. The municipal plant also bid for the business.

A proposal to issue \$500,000 bonds is pending before the City Council to secure funds for converting the Collinwood municipal plant into a substation, erecting a new substation at Woodland Avenue and East Seventy-ninth Street and extending the distributing system of the main plant. An additional issue of \$200,000 is proposed for an ornamental light system in the business district. The Cleveland newspapers have been commenting on the amount of interest payable on the bonds for the new municipal plant. In addition, the state law provides that a sinking fund must be established to retire the bonds.

### Rate Changes in Salt Lake City

Officials of the Utah Light & Traction Company have offered reductions in rates for lighting and motor service in consideration of permission from the City Commission to consolidate the franchise privileges of the Merchants' Light & Power Company and the Utah Light & Railway Company, both of which are controlled by the Utah Light & Traction Company.

The company offers to reduce retail lighting rates from 10 cents to 9 cents for the first 250 kw-hr. and from 9 cents to 8 cents for the second 250 kw-hr.; flat-rate arc lamps from \$5.55, \$6.67 and \$11.11 per month

for 10 p. m., midnight and all-night service respectively to \$4, \$5 and \$8 per month respectively; the base rate on direct current from 11 cents to 9 cents for the first 100 kw-hr. used per month and the base rate on alternating current from 10 cents per kw-hr. to 8 cents per kw-hr. for the first 100 kw-hr. The commission and the company officials have agreed on the major portion of the proposed changes.

### Co-operation in Export Trade

Additional trust legislation may receive attention at the coming session of Congress. Information obtained at the Washington headquarters of the Chamber of Commerce of the United States is to the effect that the trust committee of that organization intends to recommend the passage of an amendment to the Sherman law allowing a greater degree of co-operation in the conduct, and for the protection, of the export trade of the United States than is now possible. The suggested legislation has the support of a large majority of the boards of trade, chambers of commerce and other commercial and financial organizations affiliated in the national Chamber of Commerce.

Following the suggestion of the Chamber of Commerce of the United States, the Newlands act creating the Federal Trade Commission contains a clause instructing the commission to look into combinations in trade abroad with which American exporters are obliged to cope. The commission is instructed to make such recommendations to Congress for a suitable amendment to the Sherman act as will permit American manufacturers in export trade to form combinations and use common agencies to an extent that will put them on a business level with foreign competitors.

The members of the trust committee are as follows: Messrs. R. G. Rhett, Charleston, S. C.; Charles F. Mathewson, New York; W. L. Saunders, Ingersoll-Rand Company, New York; Henry R. Seager, Columbia University; Guy E. Tripp, chairman Westinghouse Electric & Manufacturing Company, and Charles R. Van Hise, president University of Wisconsin. At the Chamber of Commerce of the United States headquarters in Washington it was stated that the committee may urge President Wilson to appoint the members of the Federal Trade Commission as soon as possible.

### Plan for Publication of Commission Decisions

As mentioned previously in these columns, the public-policy committee of the National Electric Light Association has adopted a resolution indorsing the plan for publication of the decisions and rulings of the public service commissions of the country in available form. The complete details of the arrangement have been announced this week.

The Lawyers' Co-operative Publishing Company, of Rochester, N. Y., will have charge of the editing and publication of the decisions, under the title of "Public Utilities Reports Annotated."

The reports will be issued in a series of selected annotated reports similar to the "Lawyers' Reports Annotated," which are published by the same company. The plan is to issue advance sheets in bi-weekly parts. When there is sufficient material in the advance sheets to justify the issue of a bound volume one will be published. It is expected that in the course of a year six bound volumes will be issued. The bound volumes will contain not less than 1200 pages. Each volume will contain tables of cases arranged by cases and also by



states. The cost is to be \$5 per volume, including the advance sheet service.

The work will start with the decisions of commissions rendered, beginning with Jan. 1, 1915, and the first advance sheets will be issued shortly after that date. It is planned to publish all of the important decisions of the commissions in full. Rulings and orders dealing with standards, practices, etc., which are of general interest will also be published in full. The decisions which will be published are those relating to public utilities of all kinds with the exception of steam railroads. It is not planned to publish steam railroad decisions unless they have some incidental bearing on the general public utility situation. Publication will also be made of the decisions of state courts of last resort on public utility commission issues.

The decisions will be so annotated that they may be compared and the harmony or lack of harmony with other decisions in different jurisdictions made clear. The headings, annotations and digest will be so arranged as to provide convenient means of reference, not only for lawyers, but also for engineers and others who are unfamiliar with legal practices.

## MEETING OF MECHANICAL ENGINEERS

### Abstracts of American Society Papers on Cleveland Municipal Plant and Other Subjects

Among the papers presented before the American Society of Mechanical Engineers, which held its annual meeting in the Engineering Societies Building, New York, during the present week, were those of which brief abstracts follow:

#### Cleveland Municipal Plant

Mr. Frederick W. Ballard, commissioner and chief engineer of the division of light and heat of the city of Cleveland, read a paper on "The Design and Operation of the Cleveland Municipal Electric-Light Plant." He estimates that it would be conservative to allow for an average interest rate of 4.5 per cent on the investment value of \$3,000,000. The tax rate can be estimated conservatively at 1.5 per cent. The amortization fund should be taken care of by a rate of 3 per cent as a conservative allowance because 2.92 per cent of the original cost invested annually at 4 per cent compound interest will equal the original investment in twenty-two years. Depreciation, obsolescence, etc., will be taken care of from the maintenance fund. These rates for interest, taxes and depreciation call for an annual allowance to cover fixed charges of 9 per cent on the original investment. Assuming a 40 per cent load-factor and a peak load of 18,000 kw would give a total output a year of approximately 60,000,000 kw-hr. Fixed charges for the entire plant investment of \$3,000,000 at 9 per cent would amount to \$270,000 per year, and on the basis of a 60,000,000-kw-hr. output, the cost per kilowatt-hour to cover fixed charges would be \$0.0045, or \$0.0015 for the station cost and \$0.003 for the distribution cost. The estimate on unit costs for the new Cleveland plant is as follows:

Station costs: Coal, \$0.002; labor, maintenance and sundries, \$0.0015; fixed charges, \$0.0015; total station costs, \$0.005.

Distribution costs: Operation and maintenance, \$0.004; fixed charges, \$0.003; total distribution costs, \$0.007.

Administration charges would be \$0.0005, making a total cost of \$0.0125. The profit required is stated at \$0.004, making the average sale price required per kil-

owatt-hour generated \$0.0165 on the 60,000,000 (estimated) kw-hr. to be generated.

Operation and maintenance costs for the new plant in August were stated as \$4,543 and 809,120 kw-hr. were generated, making a unit cost of \$0.0056. In September the operation and maintenance expense was \$4,446 and 914,850 kw-hr. were generated, making a cost per unit of \$0.0048. Indications are that a better load-factor than 40 per cent will be obtained. Energy for motor service is sold at rates ranging from 3 cents to 1 cent per kw-hr.

### Damages for Loss of Water-Power

Mr. F. W. Dean, of Boston, Mass., in a paper on "Damages for Loss of Water-Power," stated that it is now generally understood that in the determination of the value of water-power consideration must be taken of the cost of making power by steam, which may be spoken of as the standard for comparison. This value is the capitalization of the annual saving by the use of water-power. The theory in a water-power damage case is that the award shall be such that the interest thereof shall be sufficient to equal fully the extra expense caused by the diversion. This rate is usually taken at 5 per cent, but is a subject for argument. It is obvious that the rate has a great influence on the award. In the case of an undeveloped power a higher rate of capitalization, say, 12 per cent or more, may be used as a means of scaling down the value, when estimated in some detail, and as representing the necessary profit of an enterprise.

### Difficulties of Cities in Getting Advisers

Mr. Morris Llewellyn Cooke, director of the department of public works of Philadelphia, presented a paper on "Some Factors in Municipal Engineering." He said that with the growing consolidation of manufacturing and other enterprises, especially in the utility field, there is danger that the cities of the country will be left without proper engineering advice in certain of their engineering questions. He said that he had had unusual opportunities for seeing at close range the professional attitude of those equipped with the technical knowledge required in advisers to cities on utility matters. It has been practically impossible to secure the services of those with reputations already made in the electrical field. He called attention to the danger almost necessarily confronting the engineering of an industry dominated by financiers having no knowledge and little appreciation of such professional standards as engineers are supposed to have.

## DAYTON MUNICIPAL PROJECT

### How the Greater Dayton Association Defeated the Proposition to Erect a Municipal Lighting Plant

The work of a civic organization had much to do with the growth of sentiment that led voters of the city of Dayton, Ohio, to decide not to issue \$500,000 bonds for a municipal lighting plant. Although the movement for a municipal plant was started by the socialists, the city commission which is in charge of the government of Dayton passed resolutions opposing the ordinance. The Greater Dayton Association, composed of 6000 members representing all classes of citizens, which was formed about the same time that the city adopted the city commission form of government through a city manager, took a firm stand against the proposed municipal plant. Besides the proposed issue for a municipal plant, two other bond issues were before the people at the Novem-

her election—one of \$1,000,000 to pay the city share in the elimination of dangerous railroad grade crossings and one of \$250,000 for additional parks and playgrounds.

Mr. C. W. Lee, of New York, was engaged, and charge of the campaign was given to him by the association directors. In the three weeks that remained before elec-

ment. Many correspondents who were unable to report actual improvement insisted upon the prevailing note of confidence which is in marked contrast to the hesitancy and uncertainty of a month ago.

## ELECTRICAL EXPORT DEVELOPMENT

## Possibilities and Problems Incident Thereto Discussed Before Electrical Manufacturers' Club

Mr. William S. Kies, of the National City Bank of New York, read a paper on "Possibilities and Problems of Our Export Trade" before the annual meeting of the Electrical Manufacturers' Club, held at Hot Springs, Va., on Nov. 4 to 7.

Constant popular agitation against business interests, ill-considered restrictive legislation and unscientifically made tariff laws, operating in connection with fundamental economic causes, have caused a serious decline in business during the last few years, said Mr. Kies. With a consequent smaller demand resulting in the contraction of domestic markets, the American manufacturer, in order to keep his plant going and labor employed, has been compelled to seek other permanent markets for his surplus product, and in this effort has been obliged to meet the keen, skillful competition of the most experienced trader in the world, the English merchant, and the most scientific and calculating business man in the world, the German merchant.

To many the European war yet means a horrible nightmare. It is right, however, that we should study the European situation in its effect upon our commercial future. The conclusion is reasonable that the difference in the cost of production of many competitive articles here and abroad in numerous cases will be wiped out, at least during the few years immediately following the war and before the stricken nations recuperate. Now, then, is the time to take advantage of the opportunities which are to be ours, not in a spirit of exultation over the misfortunes of others, but rather in the light of an obligation imposed on us.

Mr. Kies suggested that co-operation in a movement which means so much to the welfare of this country becomes a patriotic duty. Let the electrical industry, for example, retain an expert to study carefully the needs of every foreign market open to this country, to obtain data as to the cost of production here as compared with the cost of production abroad, to ascertain the quality and character of the article needed for a particular market, to obtain figures as to the decrease in net cost if the various plants in the industry are run to capacity, and to obtain for all members of the industry scientifically complete and reliable information concerning all phases of the export problem. Experts representing various industries working in conjunction can accomplish much toward simplifying the mechanical detail of export trade. Then, too, there should be co-operation in sales campaigns designed to introduce to the consumer the American manufactured product.

It was also suggested by Mr. Kies that American manufacturers join in an effort to obtain legislation supplemental to the Clayton and Federal Trade Commission bills, providing that the prohibitions of the Sherman act in reference to competition do not apply in the foreign trade of the United States. If it is not possible to obtain the passage of a provision so general in its nature, it might be provided that such agreements should be legal if approved by the new Trade Commission and that the test of their legality be the question of whether the results to be obtained are beneficial to the trade or industry as a whole and not inimical to the interests of consumers in this country.

## This Would Be Funny---If Dayton Could Afford a \$500,000 Joke

By the  
Way—  
Did You  
See  
Goldberg's  
Cartoon  
on the  
Toy  
Lighting  
Plant  
?

Socialist spell binders are entertaining the street crowds these days with gaudy promises of what a \$500,000 municipally owned lighting plant would do to Dayton.

Goldberg and his partners exaggerated some of their promises. But they really aren't promising themselves to supply every home with an electric toaster and every housewife with an electric bathtub, tank. If the toy plant is built, they're a lot more conservative.

All they say is that a \$100,000 lighting plant would pay for itself within a year or two, and that within a couple of years more it would produce enough profits to pay for track elevation and more parks and playgrounds.

That the city could not even be its own customer—until its contract for street lighting with the private company expires in 1921—is one of the facts they have either overlooked or refuse to believe.

Other facts which their spell binders do not dwell upon are

- (1) That a \$500,000 lighting plant could serve only a small section of the city—certainly no more than Dayton View.
- (2) That it could handle only residential business, owing to the prohibitive cost of the conduits needed for power and commercial business.
- (3) That several millions more would have to be invested in it, before it could be put upon a self-sustaining basis.

When these facts are considered, the proposed tax-lighting plant assumes the proportions of a rather expensive joke.

The joke develops a grim place, however, when you suddenly realize that the projectors of it are fighting against two of Dayton's biggest and most pressing needs—track elevation and more parks and play areas only.

## ADVERTISEMENT OPPOSING BOND ISSUE

tion every available advertising and publicity medium was used. These included all the local newspapers, electric railway cars, billboards, electric flash signs, moving pictures, an outdoor stereopticon show mounted on motor trucks, house-to-house distribution of literature and the organization of a speakers' bureau. A window display was used, and night and noonday meetings were addressed by business men and also by various officials of Dayton's business administration.

Care was exercised to show the people that it was not the principle of municipal ownership that was being fought, but the impracticability and financial inexpediency of a five-hundred-thousand-dollar plant when Dayton had so many real and pressing needs. The returns showed that the project, which needed only a majority vote for passage, was defeated by more than 4000 votes.

## GENERAL BUSINESS CONDITIONS

### Civic Federation Report, Based on Replies to Inquiries, Indicates Period of Depression Is Over

Mr. John Hays Hammond, chairman of the industrial economics department of the National Civic Federation, presented a report at the annual meeting held at the Hotel Astor, New York, on Dec. 4 and 5 on business conditions throughout the country. It was compiled from the reports of about 600 business men, public officials, economists and sociologists. The substance of his findings is that the worst of the business depression is over, and that while the cumulative effect may be felt for a few months to come, particularly in the way of non-employment and resultant destitution, the state of the nation in general is a promising one. Two series of reports were received, one dated about Oct. 20 and one in November. The changes reported between the two dates are in the majority of cases toward better-



## VALUATION OF CINCINNATI UTILITY

President W. W. Freeman Claims Company Should Have a Portion of the Benefits of Economies Effected

In discussing the valuation of the property of the Union Gas & Electric Company and the recommendation of a reduction in rates made by Mr. A. C. King for the City Council of Cincinnati, President W. W. Freeman, of the company, said:

"The city solicitor is quoted as saying that where doubt existed in Mr. King's mind, such doubt 'was resolved in favor of the city.' This clearly brands the report as a partisan document and robs it of any judicial standing whatever.

"Mr. King, after resolving all doubts in favor of the city, finds a surplus earning of \$330,000, which sum he recommends be utilized in rate reductions. He proposes that the earnings of the company shall be reduced to correspond strictly and absolutely with the amount of its expenses, which he admits are unusually low, and a return of 8 per cent per annum on his valuation of the electric property. In arriving at this valuation he has ignored actual investment, which is greatly in excess of his valuation. The valuation allowed by him is also very much below his own estimate of what it would cost to reproduce the electric property now, which figure he gives at approximately \$8,000,000, but he then deducts from such result about \$1,200,000 as accrued depreciation, thereby arriving at the net value upon which the company is entitled, in his opinion, to earn a fair rate of return.

"The deduction of his estimated depreciation is probably one of the 'doubts' decided in favor of the city. This doubt, however, involves the denial of an admitted actual expenditure of \$1,200,000, and its earning power represents a large proportion of the surplus earnings which it is proposed to 'utilize in rate reductions.'

"Mr. King admits in his report that the operating expenses of our company have been exceedingly low in comparison with other similar companies. Had the company been extravagant in its expenses it would have been rewarded on the basis of rate-making proposed by Mr. King by being allowed to earn correspondingly higher rates. We claim, and we think the public will agree, that unusual economy or efficiency of operation should be recognized as entitling the company to at least a portion of the benefits of such economies. Otherwise it would be to our interest to spend all the money possible in order to make the rates correspondingly high, in which case neither the public nor the company would receive any benefit."

Advertisements of the company, containing similar statements, have been published in the Cincinnati daily newspapers.

A new rate ordinance for the Union Gas & Electric Company has been submitted to the City Council of Cincinnati by City Solicitor Schoenle. It is for a period of ten years and makes a maximum rate of 8 cents per kw-hr. It eliminates any minimum maintenance charge and provides that each new consumer shall be furnished with 150 ft. of wire and pole-line equipment thereof without charge. A fine of \$50 is stipulated for each violation of the ordinance.

The first public hearing on the ordinance was held before the light committee of the City Council on Nov. 27. Mr. Freeman declared that the Council has power to propose a light rate but not to enforce it. Mr. Herbert S. Bigelow agreed with Mr. Freeman on this point, but insisted that there should be a minimum as well as a maximum rate. As president of the People's Power League he threatened to appeal any ordinance that fixed a maximum rate greater than 7 cents.

Mr. Freeman declared that the company will not accept the present ordinance, but will appeal to the Public Utilities Commission if it is passed.

Mr. Samuel Assur spoke for the stockholders' protective association. He advised proper consideration of the interests of the 8000 stockholders and was opposed to waiting for the report of the Public Utilities Commission. The Schoenle ordinance was opposed by Mr. Assur, who said that the present rates should be continued, or, at least, no reduction should be made.

## MR. DOHERTY ON BUSINESS CONDITIONS

On His Return from Europe He Finds an Astounding Change in Sentiment

Mr. Henry L. Doherty returned to New York on Nov. 17 on the steamship *Transylvania* from a trip to England. He sailed from New York for the other side on Oct. 14 and spent a little over three weeks in England, being in London most of the time. In speaking to a representative of the *Electrical World* about business conditions as he found them in England and in this country on his return, Mr. Doherty said:

"I went to England in order to have a conference with our European representatives. I did not expect to take up any particular new business, but I had the conferences that were the object of the trip. I was rather surprised to find how confident everybody seemed to be about the ability of Great Britain to handle the financial conditions arising from the war, including the raising of funds for the campaign, without any disturbance. England is not underestimating the amount of money, time or men that will be required, but no feature in the outlook appears to cause the least alarm.

"The shopping district in London is about as busy as ever. Except for the presence of soldiers everywhere, and especially in great numbers along the east coast, there is little evidence of war. Men are being drilled even in churchyards and in all parks. Except along certain lines like the manufacture of jewelry and cotton goods, there is not much evidence of a falling off in industrial activity. There is a good deal of evidence of increased business activity in certain lines due to the orders for war supplies of all kinds. Orders of this character mean that some factories are being crowded to the fullest extent that they will stand. Almost everybody in England is doing something for the purpose of relieving distress and suffering of the people at home and at the front.

"The street lighting in London is reduced to such an extent that it makes one nervous to ride at night in a taxicab. This, of course, is done primarily to avoid interference on the part of the street lighting with the work of search-lanterns. Apparently observation towers are scattered pretty well over London and the east coast. In some places these towers are improvised in one way or another, but in other places the tops of buildings are used.

"I do not believe that any one can determine the immediate outlook in the investment situation. There is not much doubt that the European buying power is cut down enormously by the war. On the other hand, the most significant factor I observed is that everybody is assured that, outside of subscriptions to the war loan what investment buying there is will be in American securities. People who have criticised the American market and securities and 'Yankee' policies are not talking that way any longer. The universal feeling is that American securities are the safe securities to buy now. Certainly very much the largest percentage of investment buying for a time in the future will be in Ameri

can securities. Even now a certain amount of investment buying is going on and inquiries keep coming all the time.

"Bankers in England feel that there will be enough new investment buying of American securities to offset the forced liquidation, and that in addition to that factor there will later be an absorption of a reasonable amount of securities from investors in this country.

"On my return I was astounded to see how greatly sentiment had changed during the time of my absence. People who told me before I left that in their judgment we should have a long period of business depression were the first to tell me when I got back that we are going to see greatly increased industrial activity here. The news from our operating properties is, on the whole, very encouraging. As a matter of fact, I think that I see a more pronounced change in sentiment than the actual conditions warrant. It is important to remember, on the other hand, that nothing contributes so much to increase the stability of business as a sentimental feeling that conditions will improve. How much the news of the election has contributed to the changed conditions that are evident everywhere I do not know. Certainly it has played an important part in the condition of sentiment. The result of the election is, I think, interpreted generally as a protest against too much interference with business. It has been interpreted by business men, and especially by the people, as an indication that the great body of voters want to have every encouragement given to our railroads and business industries. I think that the record of views expressed by the election will tend to lead the present administration to go still farther in its encouragement of business."

## CONTRACTS FOR STREET LIGHTING

### Cost of Service Provisions in Specification for Such Contracts Under Commission Regulation

The contracts for street lighting made recently in Watertown, Wis., by the Watertown Gas & Electric Company and in Clayton, Mo., and Richmond Heights, Mo., by the Electric Company of Missouri are unique in being the first contracts of their kind to follow the recommended standard forms on file with the National Electric Light Association and the Association of Edison Illuminating Companies, as drafted by the subcommittee on the form of street-lighting contracts and specifications of the joint street-lighting committee of these associations. The contracts for Clayton and Richmond Heights were ratified by referendum votes in those communities.

These contracts proceed upon the assumption that the price for service is subject at all times to regulation by a public service commission and that the terms relating to price of the initial installation of street lamps or of any substitute installation of better type or of additional lamps and the price for relocation of existing lamps, etc., must be based upon the cost of the service, including a reasonable return upon the investment made by the utility. Since the cost of service is at all times subject to determination by the commission, the municipality has the assurance that it will participate in future economies, and the greatest freedom is given to it in changing the type and kind of street-lighting service, should it so desire. The possibility of such changes during the period of the contract are anticipated in the specification. Changes from and additions to the initial installation are made at a price sufficient to care for the cost including depreciation, return upon the investment and the amortization of special investment, should changes or additions be required during the

latter years of the contract. The provision is made that the additional cost due to such amortization may be refunded to the municipality should it, at the expiration of the contract, extend the term of use of such equipment for an additional period of years.

The provisions of the Watertown contract and specification are typical and may be summarized as follows:

(a) *Specification of Initial Installation.* The contract provides for a minimum of 100 arc lamps and the specification contains the technical and descriptive data as to type, wattage, candle-power of lamps, the type of suspension and bracket supports, the height of lamps and the location of the initial installation, the type of distribution system and the hours of lighting, and the rates for initial service.

(b) *Deductions for Outages.* Should lamps of the type specified fail to be illuminated during the hours of lighting for any reason, there is to be deducted from the compensation due the company a pro rata part of the average annual rate, determined in accordance with the number of full hours of the outage. The company must keep a daily record of the time energy is supplied to each of the circuits from which the lamps are fed and the time of cutting off the energy for the purpose of extinguishing the lamps. The company must also keep a daily record of all lamps reported to it by the city police or any other city department as being out of service. At the end of each month the company is obligated to furnish the city with a copy of its record of all lamps out, showing the hours and minutes during the lighting period of each day during which each lamp is out of service.

Twice the amount of this penalty is provided if the company fails for a full period of twenty-four hours to relight any lamp reported out of service, provided that there are no conditions beyond the control of the company which prevent the relighting of the lamp.

From the standpoint of the company these penalties are severe, since all that the utility saves during the period of outage is the energy not used by the lamps, whereas the rate includes, in addition to the cost of energy, fixed charges, which continue irrespective of whether the lamps are lighted or not.

(c) *Additional Lamps and Changes in Location.* The company agrees to install any additional lamps which may be required by the city and to move or remove any lamp as ordered by the city within twenty days after receipt of official written notice by the city. One additional working day is to be added to this twenty-day period for each additional lamp ordered at any time over one lamp. Should the company fail to erect and light or move and remove any lamp or lamps as ordered by the city within this stipulated period, it must pay the city, as liquidated damages and not as penalty, a sum equal to one three-hundred-and-sixty-fifth part of the annual rate for each lamp for each working day of failure to comply with the order of the city. The company is relieved from such obligation to comply during December, January, February and March and in case of strike, fire, action of the elements or other conditions beyond its control.

(d) *Easements.* Provision is made that where lamps are ordered installed by the city at locations which require the company to extend its services over private streets upon which it has no easement the city must obtain, without cost to the company, all rights and permits from abutting property owners affected when and as needed by the company.

(e) *Discontinuance of Lamps.* To the city is given the right to discontinue any or all lamps of the initial or subsequent installation at any time upon service of ten days' written notice to the company of its intention so to do. In case the city orders lamps discontinued,



it must reimburse the company for any unamortized special investment which the company has been required to make on account of furnishing lamps so discontinued. Nothing in this provision, however, is to be construed as giving the city the right to reduce the number of lamps below the initial number specified in the contract, nor to relieve the city from paying the company as a minimum the amount due it for the initial installation.

(f) *Rates for Additional Service.* The city has the right to order additional lamps installed under the terms and at the rates specified in the contract for the initial installation of lamps subject to the following conditions:

(1) *Location.* Should a single lamp be ordered at any location within 500 ft. of any existing lamp or circuit, the entire expense of the installation and necessary operating equipment is to be borne by the company, but should a single lamp be ordered at any location at a distance greater than 500 ft. from any then existing circuit of street lamps, the city must pay the company the added cost of installing such lamp over and above that which would be reasonably necessary to make the installation at a point 500 ft. distant from such then existing street-lighting circuit or lamp. Such added cost is to be gross added cost less the reasonable estimated recovery value of the material at the expiration of the contract. Should more than one lamp be ordered at any time within the city limits and so located and specified as to enable the use of such lamps, on the single circuit, the entire cost is to be borne by the company, provided that the average distance of the lamps apart measured by circuit is not greater than 500 ft., or the nearest lamp to the then existing lamp or circuit does not exceed 500 ft. Otherwise the city must compensate the company for added cost as specified above.

Should the city make payments to the company for lamps installed at a greater distance than 500 ft. apart, as above defined, and should the city later order lamps between such lamps so as to make the average distance between lamps not more than 500 ft., the company must then refund the city payments made for any such extensions.

(2) *Rate of Charge.* Subject to the condition (1) immediately preceding, the company must furnish additional lamps of any type covered by this contract which may from time to time be ordered by the city at the rates specified for the installation of the lamps, provided that such lamps are ordered before the beginning of the last three years of the contract period.

Lamps ordered installed by the city during the last three years of the contract period will be supplied by the company subject to the rates for the initial installation of lamps and other conditions of the specification, plus a sum which, when spread over the remaining life of the contract in equal monthly payments, will reimburse the company for the special investment necessary to install and light such lamps.

Prior to the expiration date of the contract the city will have the right to extend this contract for a period of not less than five years, in which event the company is to refund the city the additional charge paid by the city for lamps installed during the last three years of the contract.

"Special investment" is defined to include the difference between the cost new and the conservatively estimated recovery value of the lamp, its bracket or support, including special poles, the cost of extending lines or circuits as may be necessary to reach such lamp, together with the proper proportion of new special station equipment necessary to supply the character of energy required for the operation of the lamp.

(g) *Substitution of Different Types of Lamps.* The city has the right to require the company to substitute, subject to review by the Public Service Commission of the State, or the company has the right to substitute for the type of lamps specified, new and improved lamps of at least equivalent illuminating power. In case such substitution is contemplated and mutually agreed upon, the party to the contract desiring such substitution must serve upon the other party written notice setting forth in detail the character of lamps which it is desired to substitute in place of those covered by the specification. The Public Service Commission of the State is not only to approve the substitution desired but is to specify the rates of charge at which the company shall supply the new types of lamps, such rates for new lamps to be specified before the work of making any substitution shall be started.

(h) *Compensation for Relocation of Lamps.* The city may order changes from time to time in the location of lamps theretofore installed or order the character of service changed from overhead to underground. For such changes in location or in character of service the city must compensate the company for the full net cost of complying with such orders. "Net cost" is defined to include the difference between the expenditures made by the company and the estimated recovery value of the additional material used at the expiration of the contract.

(i) *Damages.* The company agrees that it will keep, indemnify and save the city harmless from any claims for damages arising out of the negligent stringing of wires on the city streets, the negligent erection of poles thereon, the negligent placing of other apparatus and appliances for street lighting, and the negligent maintenance and operation of such equipment for street-lighting service covered by the contract, and agrees further that it will hold the city harmless from any claims for damages arising out of the negligence of the company, its agents, servants or employees in furnishing street-lighting service.

(j) *Disputes.* Disputes arising out of the performance of the contract or compliance with its specifications which cannot be mutually adjusted by the city and company are to be promptly referred for decision to the Public Service Commission.

(k) *Payments.* The usual provisions are made for monthly payment for street-lighting service and the adjustment of disputes arising out of offsets and counterclaims arising out of the performance of the contract.

The statutory provisions in both Wisconsin and Missouri limit the term of street-lighting contracts to ten years. Under provisions such as outlined it is obvious that the period of contract most satisfactory to the municipality would be indeterminate rather than limited in time. In such cases the condition of termination would be the compensation to the utility of the present value of the special investment devoted to street-lighting purposes. Where the contract is indeterminate the possibility of high amortization costs is minimized and changes in type with the progress in the art are introduced at least expense. It is probable that under the present limited-term form municipalities will find it to their advantage to renew the contract at its expiration in order to secure the difference which extended use of additional equipment will provide. The usual uncertainty, however, as to the action of the city during the last years of street-lighting contracts has postponed needed additions and improvements in many cases. Such a condition will be lessened under the proposed form of limited-term contract. With an indeterminate contract and similar provisions, such conditions would be entirely eliminated.

## PUBLIC SERVICE COMMISSION NEWS

## California Commission

The Pacific Gas & Electric Company, of San Francisco, has been ordered by the commission to submit plans for equipping its generating plants and distribution circuits with various devices designed to minimize the danger to persons and property resulting from contact with high-tension lines. This order was issued as the immediate result of a hearing in which a complaint was made by Mr. W. S. Junkin, who sought to compel the company to install circuit-breakers of the overload-release type on all of its transmission lines within the State. The commission states that the greater number of cases of line failure resulting in hazard to life and property could not apparently be prevented by station protective devices but could in many instances be prevented by more careful construction and maintenance of lines. The commission has, therefore, decided to investigate the construction, maintenance and operation of all power, telephone, telegraph and signal lines.

The Pacific Gas & Electric Company has applied to the commission for leave to establish new tariffs for motor service in all territory in which the commission has power to make rates. The new schedule provides for a minimum charge of \$1 per month per hp for the first 50 hp and 50 cents per month per hp for each horse-power over 50. The schedule now in effect provides for a minimum of \$1 per hp per month for all installations. The company states that, although certain rates will be slightly increased by the operation of the new schedule, rates on the whole will be reduced and revenues decreased for the same service as is now rendered. The company also asks authority to make certain changes in rates for electric motor service for reclamation work.

## Idaho Commission

The commission has issued an order fixing rates for the cities of Moscow, Genesee, Troy and St. Maries, now served by the Washington Water Power Company, and has cited the company to show cause why the rates should not be put in force. An investigation of the rates charged has been postponed because of a pending court suit regarding the right of certain complainants to free access to the company's books. This suit was decided recently by the Supreme Court, which held that not all the books, but only those which the commission decided were necessary to the prosecution, could be made accessible to the complaining company.

For the first 8 kw-hr. or less per month the rate is fixed at \$1; for the next 12 kw-hr. or less, 11 cents per kw-hr.; for the following ten hours or less, 10 cents; for all over 30 kw-hr. to 72 kw-hr., 8 cents; for all over that amount, 5 cents per kw-hr.

## Missouri Commission

Engineers and accountants have begun an investigation of the accounts and property of the Kansas City Electric Light Company in accordance with an agreement made between the Missouri Public Service Commission and the officials of Kansas City some months ago. At that time Mayor Jost appeared before the commission and agreed to certain readjustments of rates. The commission promised to send representatives to determine the value of the property and the earning capacity. Since then the company has prepared the information at its own expense and it has been published. The representatives of the commission are checking the data. When their work is finished a report will be made to the commission, which will hold a hearing in Kansas City. This meeting probably will not take place until next spring.

## New Jersey Commission

The Board of Public Utility Commissioners has handed down a decision in a complaint brought by eleven proprietors of moving-picture establishments at Paterson against the rates for service charged by the Public Service Electric Company. The board holds that the rates now charged are unjust and unreasonable and orders the company to adopt the following schedule, effective on Dec. 17, for moving-picture arcs:

First step: 10 cents per kw-hr. up to and including an amount equal to 75 kw-hr. per horse-power of connected load in each month. Second step: 5 cents per kw-hr. in excess of the consumption noted in the first step in each month. A minimum charge of \$1 per month per horse-power of connected load is to be established. In conclusion the board says:

"It appears to be clear that the service for moving picture establishments involves conditions which are not strictly similar to those imposed by either lighting or motor service. In the board's opinion, a special schedule is applicable and is warranted. To avoid discrimination, strictly speaking, unless there is some other influencing factor, service to moving-picture machines ought to be on as favorable a basis as for other purposes having similar factors. In formulating a rate schedule for this class of service, the board has aimed to adjust this automatically, and the result from the new schedule will result in a net charge ranging from 10 cents per kw-hr. to the present average revenue for all purposes."

## New York Commissions

The Merchants' Association of New York has submitted to the Public Service Commission, First District, a petition for an order revising the entire schedule of rates and charges of the New York Edison Company, basing such revision upon a comprehensive investigation of the affairs, earnings and methods of the company and upon a valuation of its property. The commission at the present time has before it a proceeding for the reduction of rates for small consumers. The Merchants' Association's petition asks for a further reduction in the rates for large consumers, stating that the profits of the company are excessive and unreasonable and are mainly made from the sale of energy to large users, holding that very little profit is derived from small consumers. The immediate result of taking up the new investigation would be to delay a decision in the original proceedings, and the commission has not as yet ordered a hearing in the matter.

## Ohio Commission

The commission is arranging to put its new accounting system into operation on Jan. 1, 1915. Mr. Carl S. Nau, of Nau, Rusk & Swearingen, of Cleveland, is working on a complete revision of the original draft. It is believed by members of the commission that the adoption of the uniform accounts will give a broader insight into the business than has been provided in the past.

There is some uncertainty in regard to the fate of the Public Utilities Commission under the administration of Governor-elect Willis. In some quarters it is believed that the commission will be reorganized under another name, with a Republican majority, as was done under the Cox administration.

## Wisconsin Commission

To promote the sale of its bonds among small investors the Wisconsin Railway, Light & Power Company has been authorized to issue \$10,000 of 5 per cent bonds in denominations of \$100. The issue is to be secured by the pledge of a similar amount of bonds in denominations of \$1,000.



## Current News Notes

**ELECTRIC HEATING APPLIANCES IN DOMESTIC-SCIENCE INSTRUCTION.**—An appropriation of \$150,000 has been voted by the Board of Education at Richmond, Cal., for equipping the domestic-science departments in the new school buildings with electric-heating appliances. The equipment to be installed includes twenty-six disk stoves, two electric ovens and an electric circulating-water heater.

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**MINNESOTA PUBLIC UTILITY RATE.**—Prof. Gerhard A. Gesell, of the department of economics in the University of Minnesota, has recently published a book on rates for gas, electricity and water in Minnesota. The book is a compilation of gas, electricity and water rates in 214 towns and cities in Minnesota having a population of 500 and over. No attempt has been made to draw any hard and fast conclusions or to make any special grouping. The work is a valuable one.

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**TREE-TRIMMING DIFFICULTIES IN LOUISVILLE SETTLED.**—The Board of Park Commissioners of Louisville, Ky., and the Louisville Gas & Electric Company have reached a satisfactory agreement as to the supervision of tree-trimming along the public streets, where the interests of the Park Board, which has supervision of the trees, and the lighting company frequently conflict. At a recent meeting of the Park Board it was announced that the gas and electric company had agreed to pay the salary of a superintendent of tree-trimming to have authority over the gangs of the gas and electric company and to be an officer of the Park Board.

\* \* \*

**BOISE COUNCIL SEEKS TO PROTECT LIGHTING COMPANIES.**—The Boise City Council has by unanimous vote suggested to the Public Utilities Commission of the State of Idaho that no rules or regulations should be adopted by the commission in connection with line construction which will impose any unnecessary burden or expense upon the building, maintenance or extension of electric transmission or distributing systems. It was also the sense of the city fathers that no rules or regulations should be adopted to favor the telephone companies at the expense of the electric companies, or which will recognize anything but legal rights between the two classes of utilities.

\* \* \*

**WATER-POWER SURVEYS IN SNAKE RIVER BASIN.**—Topographic engineers of the United States Geological Survey have been making profile surveys in the Snake River basin, Idaho, and the results of their work have just been published by the Geological Survey in Water-Supply Paper 347, which contains also a map of the area examined. The Snake River basin contains many good storage sites but only a few have been utilized. About 400,000 acre-ft. of water can be stored in Jackson Lake by a dam which has been constructed by the Reclamation Service. The largest site is at Swan Valley, on Snake River, where the water available for storage is approximately 4,000,000 acre-ft. The streams afford enormous water-powers, but only a few sites have been developed owing to the lack of market.

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**RADIO LAWS AND REGULATIONS OF THE UNITED STATES.**—The Department of Commerce has collected and combined in one small volume (100 pages) the various laws, treaties and regulations relating to radio signaling in the United States. The pamphlet is divided into four sections, entitled respectively, "Radio Communication Laws and International Treaties,"

"Regulations Governing Ship and Land Radio Stations," "Regulations Governing Radio Operators," and "General Information." The London radiotelegraphic convention is given in full, as are the requirements for operators' and station licenses. The book concludes with an appendix containing the authorized license forms and showing the international Morse code and conventional signals. The entire subject matter is carefully indexed. Copies may be had from the superintendent of documents, Government Printing Office, Washington, for 15 cents each.

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### SOCIETY MEETINGS

**NEW YORK SECTION, I. E. S.**—"The Art and Science in Home Lighting" is the title of a paper to be presented before the New York Section of the Illuminating Engineering Society on Dec. 10.

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**CHICAGO SECTION, E. V. A.**—At the weekly luncheon of the Chicago Section of the Electric Vehicle Association of America, held at the Railroad Club, Karpen Building, Chicago, Nov. 24, Mr. George B. Foster, assistant to the vice-president of the Commonwealth Edison Company and chairman of the association committee on rates, abstracted a recent convention paper on electric charging stations along the Lincoln Highway.

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**JOINT MEETING OF CHICAGO ENGINEERING SOCIETIES.**—In a paper entitled "Electric Lighting a Factor in Civilization," presented by Mr. S. E. Doane, Cleveland, Ohio, before the joint meeting, Nov. 24, of the Electrical Section of the Western Society of Engineers, and the Chicago sections of the American Institute of Electrical Engineers and the Illuminating Engineering Society, the author asserted that the broad electrical engineering problem of to-day lies in finding an inexpensive method of supplying electric service to every household. Mr. Doane also spoke at some length on the importance of serving the small customer, and in the technical portion of his paper he described research work which has been done in perfecting the gas-filled tungsten lamp. Messrs. E. M. Tompkins, P. Junkersfeld, W. A. Durgin, J. R. Cravath, E. W. Lloyd, Victor H. Tousley, M. G. Lloyd and A. Scheible, all of Chicago, and Prof. W. C. Bauer, of Evanston, spoke in discussion of the paper.

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**ELECTRICITY AN IMPORTANT FACTOR IN MOTION-PICTURE PRODUCTION.**—"Practically every mechanical operation in the production of moving-picture films, with the exception of water heating, is accomplished electrically," declared Mr. W. R. Rothacher, manager of the Industrial Moving Picture Company, Chicago, in speaking before the Chicago Jovian League on Nov. 30. For stage work in producing pictures under artificial light as many as 150 mercury-vapor lamps are sometimes used. On the other hand, excellent industrial pictures can be taken in factories with an equipment of a dozen 4000-cp arc lamps. Referring to the commercial applications of moving-picture films, Mr. Rothacher said that many American manufacturers of heavy machinery are successfully using this method to carry convincing demonstrations to customers in South American countries. The speaker asserted that there are now 2000 motion-picture theaters in Illinois and 12,000 such theaters in the United States, besides 18,000 other places in this country where motion pictures are shown. Mr. Rothacher also expressed his belief that the motion-picture industry is still in its infancy. Within a few years, he said, he expected to see many smaller projectors in use in clubs, halls and private homes.

# Hydroelectric Development on Bishop Creek, Cal.—VIII

Further details concerning the transmission system of the Nevada-California Power Company—The substations at Goldfield, Tonopah, Miller's, Manhattan and Rhyolite. By C. O. Poole

THE branch line to Goldfield ends at the substation in an outdoor bus parallel with the building. Two taps lead into the building directly to two banks of transformers through Kelman automatic oil switches. One bank of transformers consists of three 300-kw Stanley self-cooled units, and the other bank consists of three 750-kw General Electric self-cooled units. All are provided with water-cooling coils for use in hot weather. Preparations are now being made to put weatherproof covers on the transformers and move them outdoors. The transformers reduce the voltage from 55,000 volts to 6600 volts, the banks being connected to a common bus. There is a receiving panel for each bank. The switchboard also has four three-phase, 6600-volt motor-feeder panels, one single-phase lighting panel and one series arc panel, the arc circuit being controlled by a General Electric regulator. The lighting circuit is controlled by a General Electric type regulator. Each of the local circuits is provided with Westinghouse multiple-gap lightning arresters. The high-tension line is provided with a 55,000-volt General Electric electrolytic arrester in a separate concrete building, situated 100 ft. from the main building. Fig. 62 is a general view of the station. It might be noted here that all the distributing lines of the company in Nevada are operated at 6600 volts. This system has been found quite satisfactory and has proved economical in reaching the scattered customers. The Goldfield substation was one of the first stations built and the first to receive energy from the power plants. The building is a substantial stone structure with steel roof. Comfortable living quarters for the attendant are built as part of the structure. There being but one attendant at this station, an alarm is arranged to call him at night if anything goes wrong with the system.

## Tonopah Substation

The line from the Alkali switch station and the copper line from Miller's substation join at the Tonopah substation, the Alkali line connecting to the outdoor bus through a 55,000-volt Kelman automatic outdoor-type oil switch and the copper line from Miller's connecting to the same bus through a Baum open-air switch. A Bowie outdoor-type lightning arrester is connected to this same bus. There are two banks of

transformers placed outdoors, one bank consisting of three 300-kw Stanley units and one bank of three 500-kw Westinghouse units. There are also three 500-kw Stanley transformers inside the building. The high-tension lines lead from the common bus through Bowie automatic outdoor switches. All the transformers are wound for 50,000 volts, connected star with solid grounded neutral. The low-tension side is wound for 7200 volts with taps for 6600 volts, delta-connected. The transformers are of the self-cooled type, with water coils for use in hot weather. Water is circulated through the coils by means of a small centrifugal motor-driven pump and cooled by means of a tank tower, so that very little renewal water is required. Fig. 63 is a general view of the station. The 6600-volt switchboard within the station consists of three receiving panels, four three-phase feeder panels and a series street-lighting panel. A three-phase hand-operated regulator is provided for changing the bus voltage when required. Until recently all the transformers were installed inside the building. A serious fire in the station prompted the placing of the transformers outdoors. The only change in the transformers required was the waterproof covers and porcelain bushings. It is interesting to note that the transformers run from 5 deg. to 10 deg. cooler outdoors than inside, even in very hot weather. This station is also provided with good living quarters for the station attendant. Nearly the whole output of this station, as well as that of the other stations in Nevada, is used for mining purposes. There are several mine hoists operating on the system using 300-hp variable-speed induction motors.

## Miller's Substation

Situated 12 miles north of Tonopah is a large ore-reducing mill at the town of Miller's. Ore from the Tonopah mines is hauled here by rail for treatment. Fig. 64 is a general view of the 1500-kw substation. This station is 30 miles from Silver Peak and is fed by the No. 0 copper line leading from that point. A tie line of the same size connects the Miller's station with the Alkali line at Tonopah, thus closing the loop of the two lines from Silver Peak. Fig. 66 shows this connection. The line from Silver Peak enters the station and connects to the high-tension bus through a Kelman oil



FIG. 62—SUBSTATION AT GOLDFIELD



FIG. 63—SUBSTATION AT TONOPAH



switch. The line leading to Tonopah is controlled by a Kelman oil switch. There is also a line leading from this station bus through a Kelman automatic switch to Manhattan, a distance of 38 miles. The Miller's substation contains three 500-kw, 50,000-volt to 2200-volt Westinghouse self-cooled transformers equipped with

a 5-kw, 2200-volt transformer, the secondary of which was short-circuited through a suitable resistance. This method of grounding the neutral through a resistance was found very satisfactory indeed, since it was an easy matter to introduce sufficient resistance in the 220-volt secondary of the transformer, and the same could be easily changed at will. The 6600-volt, single-phase lighting circuit was, of course, supplied by making connection directly to one outside leg of the 11,000-volt system and with the neutral.

The substation building is a substantial structure of reinforced concrete, of Spanish Mission design, with comfortable living quarters for the attendant. There is a set of 55,000-volt General Electric electrolytic lightning arresters in the building, but arrangements are now being made to take them out and put them in a separate building. Fig. 65 is a general view of the station. The distributing circuits all leave the station on the side not shown on the photo, and each circuit is protected with Bowie outdoor-type lightning arresters.

#### Rhyolite Substation

The line that feeds the Rhyolite district taps the trunk lines at the Palmetto switch station before described. This branch is 72 miles in length and consists of No. 0 seven-strand copper on 35-ft. cedar poles spaced seventeen to the mile. The substation for this district is  $1\frac{1}{2}$  miles from the mining town of Rhyolite. The building is of concrete walls and steel roof and contains three 300-kw Stanley 50,000-volt to 6600-volt transformers. This station also has comfortable living quarters for the attendant and his family. The high-tension line is protected at this point with a set of General Electric lightning arresters in a separate building. The 6600-volt distributing system supplies the mining district for a radius of 8 miles from the substation.



FIG. 64—SUBSTATION AT MILLER'S

cooling coils. The switchboard has one receiving panel and two feeder panels controlling the circuits to the mill in the immediate vicinity. The line is protected at this point by a General Electric electrolytic lightning arrester.

#### Manhattan Substation

The line extends from the Miller's substation to Manhattan and is of No. 0 seven-strand aluminum. This line is on 35-ft. poles and, as on all the other Nevada lines, the poles are spaced seventeen to the mile. The Manhattan substation is one-half mile from the mining town of Manhattan, and the line enters the station through a 55,000-volt Kelman oil switch, the transformer leads being connected directly to the switch terminal. There are three 300-kw Stanley self-cooled transformers equipped with water-cooling coils for hot-weather conditions installed within the building. The voltage is lowered to 6600. The transformation is star to star, giving 11,000 volts on the secondary, at which tension the mines at Round Mountain, another mining town 13 miles distant from the substation, are supplied. A three-phase Westinghouse automatic regulator controls the secondary voltage.

The distributing system supplied by the Manhattan



FIG. 65—SUBSTATION AT MANHATTAN

substation consists of two three-phase, 11,000-volt motor circuits and one 6600-volt, single-phase lighting circuit. At first the 11,000-volt circuits were operated with ungrounded neutral, but considerable trouble was experienced with static, and to do away with this the neutral was grounded through the primary winding of

#### Storage-Battery Car for Pennsylvania Railroad

A successful demonstration of Edison storage-battery car operation was conducted recently over the main line of the Pennsylvania Railroad from Newark to Holmesburg Junction. The trial trip was taken by a number of representatives of the Pennsylvania Railroad and other prominent railroads. The car used for the demonstration was a double-truck accommodation passenger, baggage and smoking car which had been ordered by the Lorain, Ashland & Southern Railway, Ashland, Ohio, from the Railway Storage Battery Car Company, New York, and at the time of the test was on its way to be delivered to the railway company as a second storage-battery rolling-stock equipment for that line.

The demonstration car made the 69-mile trip between Newark and Holmesburg Junction successfully in two hours and thirty-two minutes actual running time, not including stops made at Trenton and Bristol for the purpose of letting passengers off. The average running speed of the car, 27 miles per hour, was very creditable in view of the fact that forty-four passengers were on board, and especially that, owing to a short-circuited motor, the run was made with only three 20-hp motors. This car will be operated experimentally for about thirty days on the 3.8-mile Holmesburg Junction-Bus-tleton branch of the Pennsylvania Railroad, after which two new storage-battery cars will probably be operated on the regular passenger service of the branch. At the end of about six months, if this operation proves successful in reliability and in saving in car-mile costs it is likely that from fifty to seventy-five storage-battery cars will be adopted by the Pennsylvania Railroad for general branch-line service.

# Distribution of Potential Over a String of Insulators

Experimental determination of the differences in the potential between the successive units on a high-tension line—  
Effect of corona. By J. L. Brenneman and Harold M. Crothers

WHEN the suspension type of insulator was first brought out it was generally supposed that the limit of the voltages which could be used on a transmission line was fixed only by the number of these units which might be placed in series. But later tests showed that the flash-over voltage of a string of insulators did not increase directly with the number of

the grounded insulator was the same as before, thus showing that the second transformer was not disturbing the normal distribution of voltage in the string. The secondary voltage of this transformer was then recorded as the potential of that cap above ground, and the operation was repeated at the cap of each insulator in turn.

The arrangement of the circuits is shown in Fig. 1. Transformer A was used to impress the potential on the string of insulators. This transformer, which was designed for experimental work in the university laboratory, had a range of 300 kv. Transformer B, a 50-kv unit, was connected to the cap of some other insulator as shown. The secondary voltages of both of these were calculated from the primary voltages by the ratios of transformation under the loads used.

The inductance coils  $L_1$  and  $L_2$  and the condensers  $C_1$  and  $C_2$  were placed in the circuit as shown in order to suppress harmonics in the wave-form so that the current through the insulators could be accurately read on the oscillograph.

The lead  $H$  from the insulator to the instrument transformer  $T$  was shielded by a grounded metal tube in order to cut off any possible displacement current from the high-tension conductor and surfaces directly to the lead. The cap of the grounded insulator was also shielded by lead foil for the same purpose.

Readings of current were taken on the tracing table of the oscillograph. A tracing cloth ruled in millimeters was used and the calibration constant was defined as the current in root-mean-square milliamperes per millimeter double deflection. To calibrate the instrument the vibrator was put in series with a voltmeter which served as an ammeter.

## Grounded Shield for Oscillograph Lead

The conductor  $H$  from the cap of the grounded insulator to the oscillograph was about 18 ft. long. It could not be used exposed, as the high-potential lead and surfaces would produce displacement currents to the grounded lead. These would be measured in the oscil-

units in the string. A more careful consideration of the nature of the electrical phenomena shows that such must necessarily be the case.

At the peak of the voltage wave all the units are at a potential above ground except the cap of the upper one. There will be a displacement from each metallic cap and pin to the surfaces at ground potential. The displacement current through the dielectric of any insulator is less than that through the unit next to it toward the line by the displacement current to ground from the connecting pin between the two. Thus the displacement current through the grounded insulator may be very much less than that through the line insulator. If the capacities of the units regarded as condensers are all the same, the potential differences across the successive units will be proportional to the displacement currents through them.

What these differences of potential across the successive units are, however, has never been accurately calculated because of the complexity of the electrostatic fields. The problem of determining them experimentally was undertaken by the authors at the University of Wisconsin in 1913, under the direction of Professor Bennett.

## Method and Apparatus

The manner of obtaining the results may be outlined briefly as follows. One high-voltage transformer was used to impress a constant potential of about 40 kv on a string of six insulators. By means of a specially designed instrument transformer and an oscillograph it was found possible to measure quite accurately the small current through the ground insulator and thus to obtain an indication of the voltage across it. Now a lead was brought from another high-potential transformer to the cap of some intermediate insulator in the string, the other terminal of the transformer being connected to the grounded end of the string. The voltage of this second transformer was adjusted until the voltage across

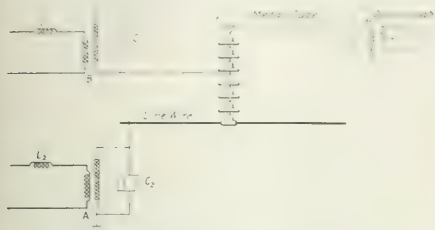


FIG. 1—ARRANGEMENT OF APPARATUS FOR THE PURPOSE OF VOLTAGE TESTING



FIG. 2—SECTION OF INSULATOR

lograph but would not be due to any property of the insulator, and hence would cause an error in the observations. Grounded metal tubes were therefore used to intercept these currents and conduct them to ground.

Before making any measurements on the insulators it was thought desirable to investigate the possibility of any other stray displacement currents which might



produce erratic results. The insulators were removed from the supporting button *F*, leaving the oscillograph and the instrument transformer connected only to the button. A high-potential line was hung 10 in. below the button. With 16 kv on the line a barely perceptible current was observed in the oscillograph. When the lead *H* was disconnected from the button and pulled back entirely within the shield no current was observed, showing that the conductor itself was effectively shielded. By means of lead foil the shield was extended to the supporting button and the cap of the grounded insulator. At one time the current transformer was also shielded in a like manner, but with no noticeable effect since the exposed surface was small and the distance from the high-potential surfaces was great. Most of the readings were taken without this shield.

As a result of these precautions the currents measured in the oscillograph were actual currents through the body of the insulator and therefore could be used

the table the insulators are given in the same order in which they were used in the string.

All of these readings were taken without the lead-foil sheath around the cap of the insulator, and therefore the figures given include the internal capacity of the insulator and also that between the line and the outside of the cap. A determination of the internal capacity alone of insulator No. 1 gave a value of  $2.50 \times 10^{-11}$  farads.

#### Distribution of Potential

In making measurements to determine the distribution of potential in a string of insulators some precautions were taken and corrections made which call for a detailed discussion.

With the six insulators in the string and only transformer *A* connected to the line wire the insulators were

TABLE I—CAPACITY OF INSULATORS IN SERIES

Insulator Number	Capacity in Farads $\times 10^{-11}$
1 (ground)	2.99
2	3.00
3	3.01
5	2.99
4	2.90
6 (line)	2.85

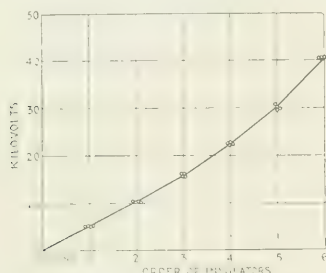


FIG. 3—VOLTAGE OF EACH CAP ABOVE GROUND

as an accurate indication of the voltage across the grounded unit of the string. This fact is the foundation of the work done in this test.

#### Suppression of Harmonics

When the voltage from the transformer was first impressed on the insulators the current wave was found to contain harmonics of such magnitude that any attempt to locate positive and negative peaks would be mere guesswork. Energy was obtained from a large turbo-alternator. While the voltage wave appeared to be a smooth sine curve, there are small ripples in it which are greatly magnified in the current wave taken by a capacity reactance such as an insulator. The harmonics were weeded out by the use of the air-core inductors and the Leyden jars, as shown in Fig. 1. The reactances were proportioned so as to admit the third harmonic freely, since it is required in the exciting current of the transformer, while the higher harmonics were repressed by the inductance. The effectiveness of this arrangement is shown by the oscillograms, which are discussed later.

#### Capacity of the Insulators

All of the insulators used during this test were of the same make and type. Fig. 2 shows a section through one of them. Six of them were used, and each was numbered for the purpose of identification throughout the test.

Before the insulators were used together in a string the capacity of each one alone was determined in order to obtain an idea of their uniformity. Each was used alone under three voltages ranging from 15 kv to 30 kv. From the readings of current frequency and voltage the capacity could be calculated. Table I shows the values observed. It will be noted that four of the insulators have the same capacity within 1 per cent and that the other two fall below by about 5 per cent. In

under normal working conditions. Each insulator assumed a certain proportion of the total voltage, and the cap of each insulator was at a certain normal potential above ground.

When a lead was brought from transformer *B* to the cap of the intermediate insulator in the string all these relations were disturbed. The potential of that cap to which the lead was brought was set by the transformer *B*, and the potentials of the caps of the other insulators were also influenced more or less by this transformer voltage. If the voltage of transformer *B* was set at the normal potential of the cap to which it was connected, the potentials of all the other caps also returned to their respective normal values. This fact was made use of.

The voltage of transformer *B* was adjusted until the oscillograph indicated the same voltage as was indicated when the transformer was disconnected from the cap. Or, in other words, the voltage of transformer *B* was adjusted until making or breaking the connection between it and the cap of a certain insulator produced no change in the voltage across the ground insulator. Then the secondary voltage of this transformer was the normal potential of that particular cap above ground.

Complications arose, however, from the disturbing effect of the lead from transformer *B* to the cap. The presence of this lead in the electrostatic fields surrounding the insulators obviously would disturb those fields and to that extent disturb the distribution of potentials. If the lead could have been brought in to the cap along what was normally an equipotential surface, no disturbance would result and the method would be without error. But in such complex fields this was impossible, although an attempt was made to approximate it. A method of determining the probable effect of this lead and of making a correction for it was devised, however, and will be described in the following detailed account of the operations.

First the voltage across the ground insulator was determined. With the line wire at a potential of about 40 kv, and no connection to the intermediate caps, the deflection on the oscillograph was noted. This deflection was about 16 mm and was called the "base" since

it represented normal potential across the ground insulator.

The potential of the line wire was held constant during the run by transformer A. After this first reading on the oscillograph transformer B was connected to the bottom of the fifth insulator by a No. 14 weatherproof wire, an attempt being made to bring it in along an equipotential surface. On the opposite side of the insulator an extra lead 3 ft. long was placed in as nearly similar a position as possible. The voltage of transformer B was adjusted until the deflection was slightly greater than the "base." After recording this voltage and deflection, the extra 3-ft. lead was removed and the transformers brought back to the same voltages with only one lead on the fifth insulator. The deflection was ordinarily about 0.4 mm less than before. These readings showed that even with a constant potential at the cap to which transformer B was connected the presence of the extra 3-ft. lead in the electric fields caused an increased deflection of 0.4 mm. Presumably the remain-

had been used higher up in the string. Therefore it was felt that the effect of the lead in the electric fields had been quite closely accounted for, and that the possible error from this source had been reduced to a minimum.

#### Results of This Test

In Fig. 3 are plotted the results of this test. Four series of tests were made with the same over-all voltage on the string in each case, and the amount of variation in the results is shown in the points plotted. The voltage of any cap above ground is plotted against the number of insulators between the cap and ground. The curve is drawn to average the points.

From the curve in Fig. 3 the values for the curve in Fig. 4 are obtained. Here the voltage across any insulator is plotted against the number of the insulator in the string. Voltages are plotted in percentages of the voltage across the ground insulator for the purpose of comparing this curve with the other curve shown on the same sheet. The increase in voltage in the insulators

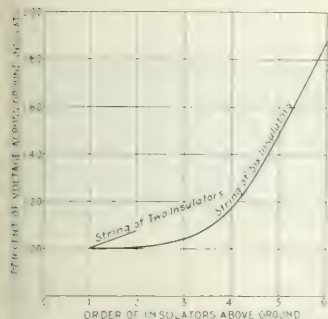
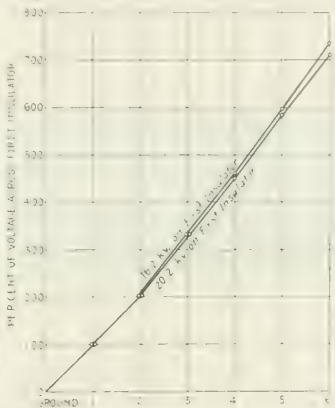
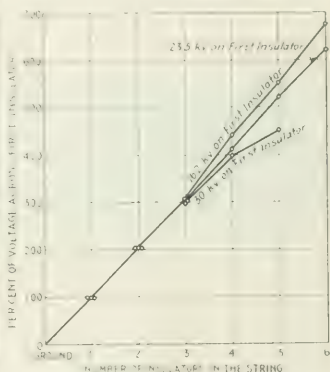


FIG. 4—VOLTAGE ACROSS EACH INSULATOR IN A STRING, STATED IN PERCENTAGE OF THE VOLTAGE ACROSS THE GROUND INSULATOR



FIGS. 5 AND 6—EFFECT OF CORONA ON DISTRIBUTION OF POTENTIAL—LINE VOLTAGE IN PER CENT OF VOLTAGE ACROSS FIRST INSULATOR



ing lead produced an equal disturbance and increased deflection since it lay in a similar position on the opposite side of the insulator. Hence an allowance was made for this disturbance and the voltage of transformer B was adjusted until the deflection on the oscillograph was equal to the "base" plus 0.4 mm. This voltage was recorded as the normal potential of that cap above ground. The same operation was repeated at the third insulator, the fourth insulator, etc., up the string until the potential of each cap above ground had been determined.

Four separate runs were made with the same total line voltage in order to check results. In the last run the lead-foil sheath was removed from around the cap of the upper insulator. The result of this test agreed with the others quite closely.

As an additional check upon the corrections which were used in this test a further test was made. The corrections used varied from zero, when the lead was connected to the bottom of the upper insulator, to 0.4 mm, when the lead was at the bottom of the fifth. Now transformer B was connected alone to the heavy line wire and the deflection noted at the normal line voltage. Then the No. 14 lead was also put in at the bottom of the sixth insulator in a parallel with the line wire, and the same voltage was impressed as before. The deflection was 0.5 mm greater than before. This increase was due entirely to the presence of the No. 14 lead, and the result corresponded closely with the corrections which

near the line is shown more prominently by this curve, and it will be noted that the voltage across the line insulator is 190 per cent of that across the ground insulator, or the ground insulator in this string bears about one-half of the voltage that the line insulator bears. Since break-down or flash-over occurs on the whole string when the line insulator is overstressed, it follows that the insulators near the ground will be working very much under normal voltage. In a string of nine or ten units the division of potentials would tend to become even more unequal. The presence of corona, however, at the high potentials reduces this inequality and makes

TABLE II—CAPACITY OF INSULATORS TO GROUND

Order of Cap Above Ground	Apparent Capacity to Ground in Farads $\times 10^{-12}$
6	2.16
5	2.07
4	1.35
3	0.55
2	0.26

the distribution of potentials more uniform, as will be pointed out later. But the results of this test indicate the difficulty of insulating for very high voltages by simply adding insulators to the string; that is, if the

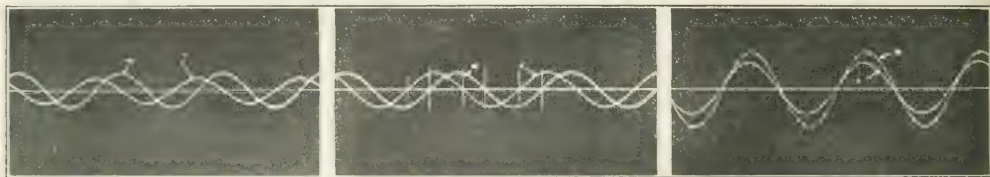


insulators are all uniform. It would be interesting to repeat this test on a string of insulators which was made up of two different types or patterns and in which the insulators near the ground had higher capacity reactance than those near the line.

In Fig. 4 is plotted also the curve for a string of two insulators. The data for this curve were obtained in a slightly different manner from those for the other. One insulator was hung up alone, working voltage was impressed, and a reading of the oscillograph was made. Then another insulator was added to form a string, and the line voltage was increased until the oscillograph showed that the ground insulator was under the same voltage as before. The line voltage then was the voltage across the two units, and the test was complete. A comparison of this curve with the other shows that there is a changing ratio between the voltages across the first and second insulators as others are added to the string. To state it exactly, in a string of six insulators the voltage across the second is 101 per cent of that across the first, while in a string of two insulators the ratio is 108 per cent. This change is caused by the change in the effect of the line wire and the other high-potential surfaces upon the two. One would expect a

similar run was made, keeping 20.2 kv across the ground insulator. The two curves were plotted as in Fig. 5, the line voltage being plotted in percentage of the voltage across the ground insulator in each run for the purpose of comparing them more easily. It will be noted that the curves are identical up to the point at which corona began to appear. From there on the curve at the higher voltage, and the one on which corona appeared first, lies below the other one. This means that the presence of corona reduces the ratio between the line voltage and that across the ground insulator. Evidently corona has the effect of increasing the conducting surfaces of the insulators near the line and thus increasing their capacity. Thus corona tends to grade automatically the capacities of the insulators in a string under very high voltages and thus even up the distribution of potentials. This effect may be quite marked in some very high-tension transmission lines.

The curves in Fig. 5 do not show the magnitude of this effect, for the voltages did not differ widely enough. Corona appeared in both tests, and the curves show only the differential effect. To bring it out more strongly Fig. 6 is presented, for which three tests were made, beginning with 16.2, 23.5 and 30 kv on the first insu-



FIGS. 7, 8 AND 9—DISTRIBUTION OF POTENTIAL OVER A STRING OF SUSPENSION INSULATORS

curve for three or four insulators to lie somewhere between the two already shown.

#### Apparent Capacity of the Caps to Ground

In the *Proceedings* of the American Institute of Electrical Engineers for May, 1912, Mr. F. W. Peek developed formulas for calculating the voltage on any insulator in a string. The assumption is made that each insulator cap had the same capacity to ground. It is now possible to check this assumption by calculating the apparent capacity of each cap to ground. For instance, the voltage across the sixth insulator is 10.1 kv. From the value of capacity of the insulator the current through it is found to be 0.116 milliamp. Likewise the current through the fifth insulator is 0.0905 milliamp, and the current from the cap to the ground is 0.025 milliamp. The voltage between the cap and ground is 30.2 kv, so the apparent capacity between this cap and ground is  $2.16 \times 10^{-12}$  farads. The other values as calculated are given in Table II.

The results shown in Table II do not support the assumption of constant capacity to ground. The apparent capacity to ground is a measure of the displacement current which takes place from the cap to ground. From this fact can be concluded that the strong electric fields from the line and high-potential surfaces repress the currents to ground from the insulators near the ground.

#### Effect of Corona Upon the Distribution of Potential

In order to show the way in which a corona discharge on the surface of the insulator around the pin affects the distribution of voltages, one insulator was hung up alone and the deflection of the oscillograph was found for 16.2 kv. Then insulators were added one at a time and at each step was found the line voltage which would give the same voltage across the ground insulator. A

lateral. In these tests the lead-foil sheath was not used around the cap of the ground insulator. Since all the tests were made under the same conditions, however, this fact should not affect the conclusions drawn. Here as before the curves are identical up to the point at which corona began to appear. Then the curves at the higher voltage fall below. A quite marked effect is shown in these curves.

#### Discussion of Oscillograms

During the tests some oscillograms were taken which also present interesting facts. Fig. 7 shows the wave of voltage impressed on the primary of the high-tension transformer and the wave of the current through a single suspension unit. The shape of the current wave is to be noted as showing the effectiveness of the inductance coils and the Leyden jars in weeding out the harmonics. Measurements on the oscillogram show that the voltage and current waves are practically 90 deg. out of phase. This means that the current is nearly all displacement current and that the leakage current is negligible in comparison. The insulator was dry when this oscillogram was taken.

The waves of Fig. 8 were observed with the insulator under spray from a nozzle which was directed down at an angle of 45 deg. and delivered a fine mist. The precipitation was at the rate of 0.6 in. in five minutes. In this case the current leads the voltage by only 70 deg. From the calibrations the total current is found to be 0.287 milliamp. The displacement current then is 0.27 milliamp and the capacity reactance is 68 megohms. The capacity reactance of the dry insulator is 87 megohms. The increase in capacity when the insulator is wet is due to the increased conducting surfaces. By calculating the leakage component of the current the resistance of the insulator under spray is found to be 82 megohms.

The curves of Fig. 9 were obtained with the insulator under the spray and the axis horizontal. The whole surface is wet when the insulator is in this position, and the leakage current is greatly increased. The angle of lead is 9 deg. The total current is 0.416 milliamp and the leakage current is 0.41 milliamp. The resistance is only 8 megohms. This shows the great drop in resistance when the whole surface is wet. The capacity reactance undergoes a further decrease from 68 megohms to 50 megohms, as would be expected.

#### Summary

From Figs. 3 and 4 it is seen that with a total emf of 40 kv impressed on a string of six insulators the voltage across the line unit is 190 per cent of that across the ground unit. The ratio of voltages between any two insulators changes with the number of units in the string.

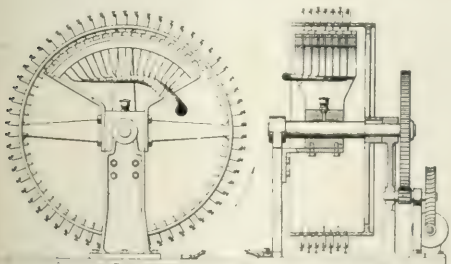
The formation of corona increases the effective capacity of the insulators nearest the line, thus automatically grading the insulators and tending to equalize the voltages across the different units.

When dry, practically all of the current through the insulator is displacement current. Under spray with the axis vertical the leakage current becomes equal to about one-third of the total. Under spray with the axis horizontal the leakage current greatly exceeds the displacement current.

#### Talking Sign with Changeable-Letter Feature

Mr. Siegfried Held, Chicago, inventor of a water-sterilizing apparatus, has now patented an electric talking sign which he claims has advantages over other similar devices. The sign proper consists of a bank of lamps arranged in horizontal and vertical rows like those of motograph signs. From each lamp a single conductor is taken to a stationary connection board, shown at the top of Fig. 1. Revolving outside of this connection board is a drum carrying adjustable contactors arranged to complete the lamp circuits as they slide over the contact board. The drum is driven through a gear train by means of a fraction-horsepower motor.

Changes of reading matter on the sign are accomplished by raising and lowering the contactors on the revolving drum. As can be seen in Fig. 2, each projecting pin is designed so that if it is lifted up and turned



FIGS. 1 AND 2—SIDE AND FRONT ELEVATIONS OF REVOLVING DRUM AND CONNECTING BOARD

slightly it will not return to its original position. When a projecting pin is in the "down," or contact-making, position it is held in place by a spiral spring placed between the pin and its jacket housing. With contact pins of this design it is said that changes in the text of the sign may follow one another with great rapidity.

#### INTERIOR WIRING RULES COMPARED

An Outline of the Regulations Followed in the United States, Germany and England

In the accompanying illustrations are shown the results of a comparative study of the wiring rules followed in the United States, Germany and England, as prepared by Mr. Hugo Eisenmenger, Cleveland, for the

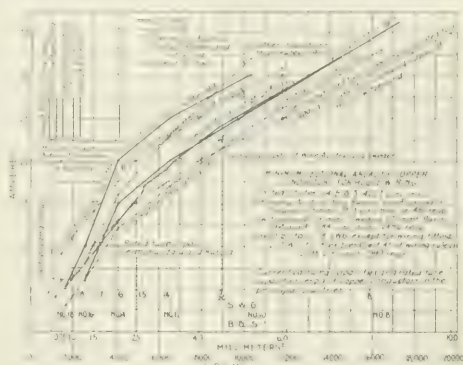


FIG. 1—CURRENT-CARRYING CAPACITIES OF CONDUCTORS

Rules used: United States, National Electrical Code; Germany, Vorschriften des Verbandes deutscher Elektrotechniker; Great Britain, Wiring Rules of the Institution of Electrical Engineers; Austria, Vorschriften des Elektrotechnischen Vereines in Wien; Switzerland, Vorschriften des Schweizerischen Elektrotechnischen Vereines; Russia, Rules of the Permanent Committee of the Russian Congress for Electrical Engineers; Italy, Norme per l'Esecuzione e l'Esercizio degli Impianti Elettrici; Sweden, Lag, Innefattande Vissa Bestämmelser om Elektriska Anläggningar (of June 27, 1902); Paris, Règlement sur les Installations d'Eclairage Electrique (Comité de l'Union des Secteurs Electriques Parisiens).

National Electric Light Association committee on the wiring of existing buildings, of which Mr. R. S. Hale, Boston, is chairman. These curves are based on the data taken from the rules compared in the "parallels" given on pages 1100-1107 in this issue. The rules not there included deal with features having no relation to

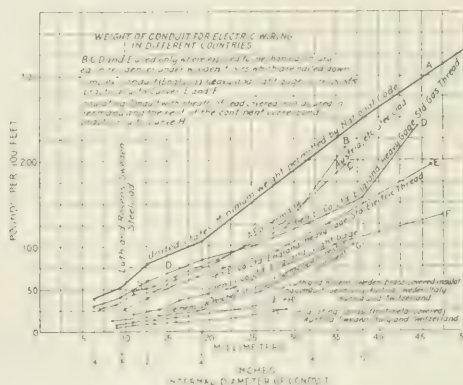


FIG. 2—WEIGHT OF CONDUITS

ordinary inside wiring installations. In Fig. 1 the carrying capacities for European countries apply to all types of insulation, including rubber. On pages 1107 and 1108 are tables showing the requirements of insulation resistance in ordinary indoor installations. It will be noted that Continental rules are much less strict than those of the United States and England.



# Comparison of the American Wiring Rules with the German and English Rules

By HUGO EISENMENGER

United States, National Electrical Code.

Germany, Vorschriften des Verbandes deutscher Elektrotechniker.

Great Britain, Wiring Rules of the Institution of Electrical Engineers.

## All Systems and Voltages—Inside Work—Wires

### UNITED STATES

15a. Must not be of smaller size than No. 14 B. & S. gage except as allowed for fixture work and pendant cord (fixture low-potential, Sec. 26v, not smaller than No. 18 B. & S.), B. & S. No. 14, 4107 circ. mil.; No. 18, 1624 circ. mil.

### GERMANY

20.3. Insulated wires (in conduit) or on insulators the distances between which do not exceed 1 m (39 in.) minimum section, 1 mm<sup>2</sup>; 1976 circ. mil. on and in fixtures, 0.75 mm<sup>2</sup>; 1475 circ. mil.

### ENGLAND

32. Excepting for wiring fittings the sectional area of any copper-conductor must not be less than that of No. 18 S. W. G. .9291 circ. mil.

45. Flexibles must be of a sectional area not less than that equivalent to No. 22 S. W. G. (.789 circ. mil.), and they must be made up of wires twisted together on a short lay, the sectional area of each wire being not greater than that of No. 36 S. W. G. (.53 circ. mil. or .0076 in. diam.). 33. The minimum size of the conductor within a building will be determined as follows:

(a) For lighting circuits, by the permissible drop in volts, which under ordinary conditions must not exceed 2 per cent plus a constant allowance of 1 volt (figured out in tables).

16b. Tie wires must have an insulation equal to that of the conductors they confine, and may be used in connection with solid knobs for the support of wires of size No. 8 B. & S. gage or over. Solid knobs or strain insulators must be used for all wires at the end of runs where conductors are terminated. Split knobs or cleats must be used for the support of conductors smaller than No. 8 B. & S. gage, except at the end of runs. Knobs or cleats which are arranged to grip the wire must be fastened by either screws or nails. If nails are used they must be long enough to penetrate the woodwork not less than one-half the length of the knob and fully the thickness of the cleat, and must be provided with washers which will prevent, under reasonable usage, injury to the knobs or cleats.

16c. Must be so spliced or joined as to be both mechanically and electrically secure without solder. The joints must then be soldered unless made with some form of approved splicing device and covered with an insulation equal to that on the conductors.

25.2. Multiple conductors shall not be fastened in such a way that the conductors are pressed towards each other. Metal tie-wires are not suited for unarmored multiple conductors.

21i. The joining of conductors and the branching off must be made exclusively by soldering, screwing or an equivalent joint. (Expl. to rule: An equivalent connection would be, e.g., a cover of tough metal pushed over the wire-ends and twisted together with them or the riveting connector. Simply twisting the wires around each other is not permissible.)

21.14. Flexibles or cables up to 6 mm<sup>2</sup> (7638 circ. mil.) and solid wires up to 25 mm<sup>2</sup> (31,825 circ. mil.) may be connected to the apparatus by means of eyes bent out of the conductor. Cables over 6 mm<sup>2</sup> section (7638 circ. mil.) or solid wires above 25 mm<sup>2</sup> (31,825 circ. mil.) shall be provided with lugs or equivalent joints. Stranded wires and flexibles of any kind shall, as a rule, have the wires of every conductor soldered together at the end if they are not provided with lugs.

21.15. The connections of flexibles among each other and the branches from the same shall be made with screws on insulating bases or equivalent appliances. On and in fixtures soldering is permissible also for flexible wires if the voltage to earth does not exceed 250 volts.

(See 21.14 above.)

16c. cont. Stranded wires (except in flexible cords) must be soldered before being fastened under clamps or binding wires, and whether stranded or solid, when they have a conductivity greater than that of No. 8 B. & S. gage they must be soldered into lugs for all terminal connections, except where an approved solderless terminal connector is used.

16d. Must be separated from contact with walls, doors, partitions through which they may pass by non-combustible, non-absorptive insulating tubes, such as glass or porcelain, except at outlets where approved flexible tubing is required.

Bushings must be long enough to bush the entire length of the hole in one continuous piece, or else the hole must first be bushed by a continuous waterproof tube. This tube may be a conductor, such as iron pipe, but in that case an insulating bushing must be pushed into each end of it, extending far enough to keep the wire absolutely out of contact with the pipe.

16e. Where exposed to contact, conductors, molding or armored cable, and where liable to come in contact with gas, water, or other metallic piping or other conducting material, must be separated therefrom by some continuous and firmly fixed non-conductor creating a permanent separation, etc.

24d. The wires must be passed through walls, ceilings and floors in such a way that they are sufficiently protected against humidity, mechanical and chemical injury and conduction along the surface. 24.1. The ducts shall either correspond to the method used in the corresponding localities or durable insulating tubes shall be employed in such a way that for every single conductor or multiple conductor a separate tube is used.

21n. Where current-carrying conductors cross each other or cross metal parts these crossings are to be made in such a way that contact is impossible.

72. Joints constitute a source of weakness and should be avoided wherever possible. They must be accessible and be mechanically and electrically perfect to prevent heat being generated. They must be soldered except where flexibles are connected to hard wires (see par. 53 below). Soldering fluids containing acids or other corrosive substances must not be used. Connections between conductors should preferably be made in junction boxes.

53. Connections between flexibles and hard wires may be effected only by means of screw terminals in junction boxes, porcelain or other connecting boxes, or ceiling roses, and not by soldering; and where flexibles from fittings unavoidably pass into ceilings they must be inclosed in conduits terminating in metal junction boxes.

74, 75, 76 and 77 give further instructions about joints, how the dielectric and brand, etc., should be handled in making joints, etc.

69. Where conductors pass between partitions or under floors, they must be protected in accordance with pars. 49 or 50 or 51 (metal conduit or wood casing or armored conductors). 70. Conductors where exposed to injury, e.g., where passing through walls, partitions or ceilings, must be inclosed in porcelain or other protecting conduits. 71. Conductors passing through party walls or fire-resisting floor must be provided with special protection, such as a close-fitting porcelain or other incombustible tube, to prevent the spread of fire. When the end of the tube is outside the building it must be bell-mouthed or bushed, and turned downwards.

26. There must be no contact between conductors (or their insulating material, metallic sheathing or tubing, whether earthed or not) and gas pipes. Non-conducting distance pieces must be used where necessary.

## All Systems and Voltages—Inside Work—Wires

## UNITED STATES

167. Must be so placed in wet places that an air space will be left between conductors and pipes in crossing and the former must be run in such a way that they cannot come in contact with the pipe accidentally. Wires should be laid over, rather than under pipes upon which moisture is likely to gather, or which, by leaking, might cause trouble on a circuit.

18. Table of allowable carrying capacities of wires—

(See curve sheet.)

## GERMANY

(See curve sheet.)

## ENGLAND

(See curve sheet.)

## Switches, Cutouts, Circuit Breakers, Etc.

## UNITED STATES

19a. On constant potential circuits all service switches and all switches controlling circuits supplying current to motors or heating devices and all fuses unless otherwise provided\* must be so arranged that the fuses will protect and the switches disconnect all of the wires.

\*Exceptions as to switches, motors of  $\frac{1}{4}$  hp or less and heaters of 660 watts and less where single pole switches are permitted; exceptions as to fuses. In 23a fuses may be omitted in grounded neutrals, provided the neutral is of equal carrying capacity to the larger of the outside wires.

19b. Switches, cutouts, etc., must not be placed where exposed to mechanical injury nor in the immediate vicinity of easily ignitable stuff, etc.

19c. They must, when exposed to dampness, either be inclosed in a moisture-proof box or mounted on porcelain knobs. The cover of the box must be so made that no moisture which may collect on the top or sides of the box can enter it.

23a. Must be placed on all service wires, either overhead or underground, in the nearest accessible place to the point where they enter the building and inside the walls, and arranged to cut off the entire current from the building.

Where the switch required by No. 24a is inside the building the cutout required by this section must be placed so as to protect it.

For three-wire (not three-phase) systems the fuse in the neutral wire may be omitted, provided the neutral wire is of equal carrying capacity to the larger of the outside wires and is grounded.

23b. Must be placed at every point where a change is made in the size of wire (unless the cutout in the larger wire will protect the smaller).

For three-wire direct-current or single-phase systems the fuse in the neutral wire, except that called for under 23d, may be omitted, provided the neutral wire is grounded as provided for in No. 15.

## GERMANY

11d. All switches for current-consuming devices must, when opened, disconnect all poles of their circuit which are under tension, gaining earth.

Low voltage switches (250 volts to earth) serving smaller groups of incandescent lamps are not subject to this rule.

11.3. As smaller groups of incandescent lamps are counted such groups as do not have to be fused with more than 6 amp (par. 14.7) and do not contain more than 15 lamps in multiple.

11f. It must not be possible to switch off grounded neutrals otherwise than together with their respective outer conductors (except in such rooms as are intended essentially for the operation of electrical machinery or apparatus, and are ordinarily accessible only to instructed persons.) 14d. Conductors must be protected by fuses or automatic cutouts.

(On purpose definite prescriptions are avoided that fuses must be double pole, but it is universally recognized that every pole must be fused, barring grounded conductors.)

31.3. Apparatus shall, where possible, not be placed in moist rooms. If this is unavoidable, care shall be taken to provide particularly good insulation, good protection against personal contact and against the injurious influences of moisture.

## GERMANY

14d. Conductors must be protected by fuse cutouts or by circuit breakers.

14e. Cutouts must be placed on all such places where the cross-section of the conductors is diminished towards the place of consumption. The cutout must be situated as close as possible to the place of diminution of cross-section.

14.6. In case of branches the connecting piece between the main line and the fuse can have a smaller cross-section than the main line if its single length is not more than 1 m (39 in.) provided it is separated in a fire-safe way from inflammable objects and provided that it does not consist of multiple conductors.

14f. In case of reduction of cross-section where the preceding cutout protects the smaller cross-section, further cutouts are not required.

14g. Lines which are grounded under regular operation conditions must in general not be provided with fuses.

14h. The neutral conductors of multiple wire or multiple phase systems shall, as a rule, not be fused. An exception of this rule is insulated lines branching off from a neutral conductor and forming part of a two-wire system. If a system of that kind is fused single-pole only the branches from the neutral shall be marked as such.

14c. Cutouts must be placed on all such places where the cross-section of the conductors is diminishing towards the place of consumption.

14f. In case of reduction of cross-section where the preceding cutout protects the smaller cross-section, further cutouts are not required.

14g. Lines which are grounded under regular operation conditions must in general not be provided with fuses.

14.9. The neutral conductors of multiple wire or multiple phase systems shall, as a

## ENGLAND

17. Every system not being an earthed concentric system must be protected by linked main switches or linked switch-fuses under the control of the consumer, and these must be easily accessible and placed as near the generator or the entry of supply as circumstances permit.

22. Where energy is taken from all the conductors of a two-phase or three-phase system, the conductors must be protected, either by an automatic triple-pole circuit-breaker, or by a fuse on each pole in conjunction with a triple-linked switch, or by three switch-fuses.

24. Every subcircuit must be protected on each pole by a fuse.

19. Where one of the main conductors of a system of supply is earthed, no interruption of the current is permitted at any point in a conductor connected to the earthed main, unless a simultaneous break is effected on the non-earthed conductor. No switch or switch-fuse not linked to another switch or switch-fuse on the non-earthed conductor may be inserted in any conductor connected to an earthed main. This rule does not prohibit the use of a link for testing purposes or a switch for use in connecting a generator.

20. No fuse may be placed in the neutral conductor of a multiple-wire system, but fuses must be placed on both conductors of two-wire circuits branching therefrom. This does not prevent the use of a disconnecting link in the neutral conductor for testing purposes.

17f. In positions where switches and circuit-breakers are liable to injury, or to contact with goods, they must be further protected by an open-fronted box or other suitable guard.

30. Except where completely inclosed in a metallic casing, no switch, ceiling-rose, cutout, plug-connector, or other electrical accessory, may be mounted directly upon any surface liable to become damp, but must, in addition to its own mount, be fixed upon a base block rendered impervious to moisture.

## ENGLAND

17. Every system not being an earthed concentric system (par. 58) must be protected by linked main-switches under the control of the consumer, and these must be easily accessible and placed as near the generator or the entry of supply as circumstances permit.

20. No fuse may be placed in the neutral conductor of a multiple-wire system, but fuses must be placed on both conductors of two-wire circuits branching therefrom. This does not prevent the use of a disconnecting link in the neutral conductor for testing purposes.

24. Every subcircuit must be protected on each pole by a fuse.

20. No fuse may be placed in the neutral conductor of a multiple-wire system, but fuses must be placed on both conductors of two-wire circuits branching therefrom. This does not prevent the use of a



## Constant Potential—Automatic Cutouts

## UNITED STATES

## GERMANY

## ENGLAND

23c. Must be in plain sight, or inclosed in an approved cabinet, and readily accessible. They must not be placed in the canopies or shells of fixtures. Link fuses may be used only when mounted on approved slate or marble bases and must be inclosed in dust-tight, fire-proofed cabinets, except on switchboards.

23c. cont. Link fuses may be used only when mounted on approved bases and must be inclosed in dust-tight, fire-proofed cabinets, except on switchboards.

23d. Must be so placed that no set of small motors, small heating devices or incandescent lamps, whether grouped on one fixture or on several fixtures or pendants (not more than 16 sockets or receptacles) requiring more than 660 watts, will be dependent upon one cutout.

By special permission, in cases where wiring equal in size and insulation to No. 14 B. & S. gage approved rubber-covered wire is carried direct into keyless sockets or receptacles, and where the location of sockets and receptacles is such as to render unlikely the attachment of flexible cords thereto, the circuits may be so arranged that not more than 1320 watts (or 32 sockets or receptacles) will be dependent upon the final cutout.

Except for signs and outline lighting, sockets and receptacles will be considered as requiring not less than 40 watts each. All branches or taps from any three-wire system which are directly connected to lamp sockets or other translating devices must be run as two-wire circuits if the fuses are omitted in the neutral or if the difference of potential between the two outside wires is over 250 volts, and both wires of such branch or tap circuits must be protected by proper fuses.

When 1320 watts are dependent upon one fusible cutout, as is allowed in theater wiring, outline lighting and large chandeliers, the fuses may be in accordance with the following table:

125 volts or less.....	20 amperes
125 to 250 volts.....	10 "

23e. The rated capacity of fuses must not exceed the allowable carrying capacity of the wire as given in No. 18.

Fixture wire or flexible cord of No. 18 B. & S. gage will be considered as properly protected by 6-ampere fuses.

rule, not be fused. An exception to this is insulated lines branching off from a neutral conductor and forming part of a two-wire system. If a system of that kind is fused single-pole only the branches from the neutral should be marked as such.

14.5. In low-tension plants the fuses shall be placed in a location where they are easily accessible to those in charge; it is recommended to centralize them as much as possible.

14.9. The neutral conductors of multiple wire or multiple phase systems shall, as a rule, not be fused. An exception to this rule is insulated lines branching off from a neutral conductor and forming part of a two-wire system. If a system of that kind is fused single pole only the branches from the neutral shall be marked as such

14.1. The capacity of fuses shall be adapted as far as possible to the operating current of the lines and consuming devices which are to be protected. It shall, however, not be greater than is permissible according to the table of carrying capacities of wires and the other prescriptions of par. 20. (See the comparative chart of carrying capacities allowed in different countries.)

disconnecting link in the neutral conductor for testing purposes.

24. Every subcircuit must be protected on each pole by a fuse.

79. Switch and fuse boards must be so constructed and placed that all their parts which may have to be adjusted or handled are readily accessible.

89f. Fuses must not be placed in plug connectors, ceiling roses, or lampholders.

90. Branch fuses must be grouped together in accessible positions in sight, and they should be symmetrically placed and labeled for each circuit.

From 89b: The use of fuses of the inclosed type is recommended.

89d. The bases must be of incombustible, non-conducting and moisture-proof material.

89e. Unless placed in a compartment specially arranged for the purpose, or in engine-rooms in positions where no danger is likely to arise when a fuse operates, fuses must be provided with covers to retain the fused metal. These covers must be of incombustible material, and must either be non-conducting or of rigid metal lined with insulating incombustible material, and clear of all live parts. Small close-fitting covers must be suitably ventilated.

20. No fuse may be placed in the neutral conductor of a multiple-wire system, but fuses must be placed on both conductors of two-wire circuits branching therefrom. This does not prevent the use of a disconnecting link in the neutral conductor for testing purposes.

89a. No overheating of any part of the fuses must take place when the full current flows continuously.

89b. The fuses shall effectively interrupt the current when a short-circuit occurs, and they must be so proportioned to the current to be carried that no conductor protected by them can be raised in temperature above that specified in paragraph 37 (130 deg. Fahr. for rubber and 176 deg. Fahr. for paper and fiber. The corresponding "working currents" are given in a table forming part of the Rules). When the working current does not exceed 10 amperes (see the accompanying comparative diagram of carrying capacities in different countries) the fuses must be proportioned to interrupt the current before or when the current through the conductors rises to three times the working current; for working currents above 10 amperes the fuses must be proportioned to interrupt the circuit before or when the current through the conductors rises to twice the working current. The use of fuses of the inclosed type is recommended. No fuse smaller than one having a working capacity of 3 amperes to fuse at 9 amperes need be inserted in sub-circuits.

## Constant Potential—Switches

## UNITED STATES

## GERMANY

## ENGLAND

24a. Must be placed on all service wires, either overhead or underground, in the nearest readily accessible place to the point where the wires enter the building and arranged to cut off the entire current, etc.

17. Every system not being an earthed concentric system (par. 58) must be protected by linked main switches or linked switch-fuses under the control of the consumer, and these must be easily accessible and placed as near the generator or entry of supply as circumstances permit.

22. Where energy is taken from all the conductors of a two-phase or three-phase system, the conductors must be protected, either by an automatic triple pole circuit breaker or by a fuse on each pole in conjunction with a triple-linked switch, or by three switch-fuses.

## Constant Potential—Switches

## UNITED STATES

24b. Must always be placed in dry accessible places and be grouped as far as possible.

Up to 250 volts and 30 amperes, approved indicating snap switches are suggested in preference to knife switches on lighting circuits.

## UNITED STATES

26a. Where entering cabinets must be protected by approved bushings, which fit tightly the holes in the box and are well secured in place. The wires should completely fill the holes in the bushings so as to keep out the dust, tape being used to build up the wires if necessary.

26b. Must not be laid in plaster, cement or similar finish and must never be fastened with staples.

26c. Must not be fished for any great distance and only in places where the inspector can satisfy himself that the rules have been complied with.

26d. Twin wires must never be used, except in conduits, or where flexible conductors are necessary.

26e. Must where exposed to mechanical injury be suitably protected. When crossing floor timbers, in cellars, or in rooms where they might be exposed to injury, wires must be installed in approved conduit or armored cable, or be attached by their insulating supports to the under side of a wooden strip, not less than one-half inch in thickness, and not less than three inches in width. Instead of the running boards, guard strips on each side of and close to the wires will be accepted. These strips to be not less than  $\frac{3}{8}$  in. in thickness and at least as high as the insulators.

Protection on side walls must extend not less than 5 ft. from the floor and must consist of substantial boxing, retaining an air space of 1 in. around the conductors, closed at the top (the wires passing through bushed holes) or approved metal conduit or pipe of equivalent strength.

When metal conduit or pipe is used the insulation of each wire must be reinforced by approved flexible tubing extending from the insulator next below the pipe to the one next above it unless the conduit is installed according to No. 25 (sections c and f excepted), and the wire is approved for conduit use.

\*Conduit installation throughout.

The two or more wires of a circuit each with its flexible tubing (when required), if carrying alternating current must, or if direct current may, be placed within the same pipe.

26f. When run in unfinished attics or roof spaces will be considered as concealed and when run in close proximity to water tanks or pipes will be considered as exposed to moisture.

In unfinished attics wires are considered as exposed to mechanical injury, and must not be run on knobs on upper edge of joists.

## UNITED STATES

26g. Wires must have an approved rubber, slow-burning, weatherproof, or slow-burning insulation.

26h. Wires must be rigidly supported on non-combustible, non-absorbent insula-

## GERMANY

11.1. In "low-tension plants" (that is, where the voltage to earth cannot exceed normally 250 volts), the switches shall, as a rule, be snap switches.

## GERMANY

10d. Apparatus must be built and mounted in such a way that a sufficient state of insulation is warranted for the wires to be connected (also at the places where the wires enter) against nearby parts of the building, conductors and so forth.

21g. Insulated conductors may either be placed on the surface on suitable insulators or in pipes.

21h. Wires and cables shall, as a rule, be laid in such a manner that they can be exchanged against new ones.

21a. Conductor lines in fixed position must be protected from mechanical injury by their position or by a separate protective cover; inasmuch as they are under tension against ground a separate protective cover is always required within reach of the hands, as a protection against mechanical injury.

21.1. For armored lead cables and metal covered wires and cables the metallic cover is counted as protective cover. In case of low tension (max. 250 volts to ground) pipes and conduits are classed as protective cover.

24d. Where crossing walls, ceilings and floors the wires must be laid in such a way that they are sufficiently protected against dampness, mechanical and chemical injury, and conduction along the surface.

24.1. The crossings shall either correspond to the method of laying used in the respective localities or durable insulating tubes shall be used, one separate tube for every single conductor and for every multiple conductor cable.

21h. In case of wires or cables for single or multiple phase current, which are covered by iron or protected by iron pipes, all conductors belonging to the same circuit must be contained in the same iron casing unless a dangerous heating of the iron case is prevented in some other way.

## Special Rules for Open Work in Dry Places

## GERMANY

19.1. Rubber tape permissible (open wiring, rigidly supported wires only) up to voltages of 125 volts (technically pure, unvulcanized para rubber band).

21.10. Rubber tape insulation never to be used under plaster, not even in insulating tubes. (See also German Standards of Insulated Wires in tabular shape.)

21.9. Insulated, open wires must be placed at distances of 1 cm from the wall

## ENGLAND

18. Main and distribution switch and fuse boards must be fixed in dry situations.

23. Conductors must radiate from distributing centers and in large systems from these centers to sub-centers.

## ENGLAND

50. Metal staples must not be used for fixing unarmored conductors.

52. Flexibles may be used under the following conditions:

a. For pendant and portable appliances.  
b. For sub-circuits from fuse boxes \* \* \* provided they comply with the following requirements:

i. They must not be carried in positions exposed to injury or out of sight, except in conduits complying with par. 52b ii (following herewith).

ii. Where passing directly through division walls they must be protected by incombustible watertight conduits.

iii. They must not pass through floors nor be carried unprotected within 4 feet of the floor level.

iv. They must be firmly supported, and unless protected by conduits they must be attached to insulators. The supports must be spaced not more than 3 feet apart.

v. They must be without joints, except in junction boxes.

70. Conductors where exposed to injury (e.g., where passing out of floors) must be specially protected by stout conduits or boxing.

52b iii. Flexibles must not pass through floors nor be carried unprotected within 4 feet of the floor-level.

52. Flexibles: b ii. Where passing directly through division walls the flexibles must be protected by incombustible watertight conduits. iii. They must not pass through floors \* \* \*

25. Where protected from mechanical injury by metal conduits, conductors of opposite polarity may be bunched. \* \* \* If the supply is alternating and the protection iron or steel, the lead and return conductors must be bunched.

## ENGLAND

Outside of the description of the various classes of insulation for wiring in general and the requirements therefor, no special prescriptions are made as to the kind of insulation required for open wiring.

52b iv. Flexibles must be firmly supported and unless protected by conduits



## Special Rules for Open Work in Dry Places

## UNITED STATES

Wires which will separate the wires from each other and from the surface wired must be in accordance with the following table:

Voltage	Distance from surface	Distance between wires
	in.	in.
100	1/2	1/2
250	1	1
300	1 1/2	1 1/2
350	2	2
400	2 1/2	2 1/2
450	3	3
500	3 1/2	3 1/2
550	4	4
600	4 1/2	4 1/2
650	5	5
700	5 1/2	5 1/2
750	6	6
800	6 1/2	6 1/2
850	7	7
900	7 1/2	7 1/2
950	8	8
1000	8 1/2	8 1/2

Rigid supporting requires under ordinary conditions, where wiring along flat surfaces, supports at least every 4 1/2 ft.

If the wires are liable to be disturbed, the distance between supports must be shortened.

Must not be "dead-ended" at a rosette socket or receptacle unless the last support is within 12 in. of the same.

## GERMANY

in buildings (low voltage, 250 volts to ground) in open air 2 cm (3/4 in.)

No regulations are made about the distance between wires, but the quasi-official commentary on the rules says that the distance between wires with knob and cleat work at low tension (250 volts), as a rule, is 5 cm (2 in.).

## ENGLAND

they must be attached to insulators. . . .

54a. Unarmored conductors must be supported in such a manner as to secure the permanent spacing of the conductors from walls, ceilings, and all structural metal work and metal piping.

b. When carrying more than 6 amperes conductors must also be spaced from each other, unless they are of the multi-core or concentric types or lead-covered.

55. Unenclosed lead-covered conductors must be supported continuously, or at intervals sufficiently frequent to prevent appreciable sagging, and must not come into contact with damp or new brickwork or plaster. The lead covering must be connected to earth.

56. Metal staples must not be used for fixing unarmored conductors.

Flexibles: 52b iv. The supports must be spaced not more than 3 feet apart.

No rules for solid wires.

## For Molding Work (Wooden and Metal)

## UNITED STATES

26k. Wires must have an approved rubber insulating covering and must be in continuous lengths from outlet to outlet, or from fitting to fitting, no joints or taps to be made in molding. Where branch taps are necessary in molding work approved fittings for this purpose must be used.

26l. Must never be placed in either metal or wooden molding in concealed or damp places, or where the difference of potential between any two wires in the same molding is over 300 volts.

When the electrical construction is being carried out in metal molding, permission will be given to extend these moldings through walls and partitions if the molding and capping are in continuous lengths where passing through the walls and partitions. Metal moldings must not be used for circuits requiring more than 1320 watts of energy.

## GERMANY

25a. Wooden molding is not permissible. (Metal molding is not used in Germany and is practically unknown.)

## ENGLAND

50. Conductors (excepting flexibles) insulated as in classes A and B (class A, rubber; class B, impregnated paper or fiber in water-proof sheath, usually of soft metal) may be inclosed in wood casing in dry places, where not buried in plaster or cement nor exposed to moisture, under the following conditions:

(a) Unless efficiently protected from drip, wood casing must not be fixed immediately below, and in no case must touch water pipes.

(b) Conductors carrying more than 6 amperes must be laid singly in separate grooves.

(c) Where the size of the conductor is larger than that of 7/19 S. W. G. (.0086 sq. in. between No. 9 and No. 10 B. & S.) sharp bends must be avoided.

Metal molding not used in England.

## For Conduit Work

## UNITED STATES

25n. Must have an approved rubber insulating covering and must within the conduit tubing be without splices or taps.

26o. Must not be drawn in until all mechanical work on the building has been as far as possible completed.

Conductors in vertical conduit risers must be supported within the conduit system in accordance with the following table:

No.	14 to 0	every 100 ft.
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
10	10	10
11	11	11
12	12	12
13	13	13
14	14	14
15	15	15
16	16	16
17	17	17
18	18	18
19	19	19
20	20	20
21	21	21
22	22	22
23	23	23
24	24	24
25	25	25
26	26	26
27	27	27
28	28	28
29	29	29
30	30	30
31	31	31
32	32	32
33	33	33
34	34	34
35	35	35
36	36	36
37	37	37
38	38	38
39	39	39
40	40	40
41	41	41
42	42	42
43	43	43
44	44	44
45	45	45
46	46	46
47	47	47
48	48	48
49	49	49
50	50	50
51	51	51
52	52	52
53	53	53
54	54	54
55	55	55
56	56	56
57	57	57
58	58	58
59	59	59
60	60	60
61	61	61
62	62	62
63	63	63
64	64	64
65	65	65
66	66	66
67	67	67
68	68	68
69	69	69
70	70	70
71	71	71
72	72	72
73	73	73
74	74	74
75	75	75
76	76	76
77	77	77
78	78	78
79	79	79
80	80	80
81	81	81
82	82	82
83	83	83
84	84	84
85	85	85
86	86	86
87	87	87
88	88	88
89	89	89
90	90	90
91	91	91
92	92	92
93	93	93
94	94	94
95	95	95
96	96	96
97	97	97
98	98	98
99	99	99
100	100	100

The following methods of supporting conductors are recommended:

26p. Must, for alternating systems, have the two or more wires of a circuit drawn in the same conduit.

26q. In case of wires or cables for single or multiple-phase current which are iron-covered or protected by iron conduit, all conductors belonging to the same circuit must be contained in the same iron covering unless a dangerous heating of the iron sheath is prevented in some other way.

26r. In the same tube only conductors are allowed which belong to the same circuit.

The same circuit must not contain more than four two-wire, or three three-wire circuits of the same system, except by special permission of the Inspection Department having jurisdiction and must never contain circuits of different systems.

## GERMANY

2110. Rubber tape insulated conductors shall, even in insulating tubes, be laid only on the surface of the wall.

26d. Wire joints within the tubes are not permissible except in fixtures.

26a. Paper tubes must have a metal covering.

## ENGLAND

49. Conductors (excepting flexibles) insulated as in classes A and B may be inclosed in steel conduits. . . .

(Class A, vulcanized rubber, not rubber tape; class B, impregnated paper or fiber, waterproof sheath of soft metal or the like.)

25. Where protected from mechanical injury by metal conduits, conductors of opposite polarity may be bunched. Where the protecting tubing or casing is non-metallic, lengths of conductors of the same polarity and free from joints carrying small currents for incandescent lighting, from sub-centers . . . may be bunched.

If the supply is alternating and the protection iron or steel, the lead and return conductors must be bunched.

25. Where protected from mechanical injury by metal conduits, conductors of opposite polarity may be bunched. Where the protecting tubing or casing is non-metallic, lengths of conductors of the same polarity and free from joints carrying small currents for incandescent lighting, from sub-centers . . . may be bunched.

If the supply is alternating and the protection iron or steel, the lead and return conductors must be bunched.

25. Where protected from mechanical injury by metal conduits, conductors of opposite polarity may be bunched. Where the protecting tubing or casing is non-metallic, lengths of conductors of the same polarity and free from joints carrying small currents for incandescent lighting, from sub-centers . . . may be bunched.

If the supply is alternating and the protection iron or steel, the lead and return conductors must be bunched.

25. Where protected from mechanical injury by metal conduits, conductors of opposite polarity may be bunched. Where the protecting tubing or casing is non-metallic, lengths of conductors of the same polarity and free from joints carrying small currents for incandescent lighting, from sub-centers . . . may be bunched.

If the supply is alternating and the protection iron or steel, the lead and return conductors must be bunched.

25. Where protected from mechanical injury by metal conduits, conductors of opposite polarity may be bunched. Where the protecting tubing or casing is non-metallic, lengths of conductors of the same polarity and free from joints carrying small currents for incandescent lighting, from sub-centers . . . may be bunched.

If the supply is alternating and the protection iron or steel, the lead and return conductors must be bunched.

## For Concealed "Knob and Tube" Work

## UNITED STATES

26a-26e

## GERMANY

Since frame houses are unknown in Germany, concealed "knob and tube" work is not employed.

## ENGLAND

Since frame houses are unknown in England, concealed "knob and tube" work is not employed.

## For Fixture Work

## UNITED STATES

26v. Must not be smaller than No. 18 B. & S. gage (1624 circ. mil.) and must have an approved rubber insulating covering.

## GERMANY

20.3. The smallest permissible cross-sectional-area for copper-conductors is for wiring on and in fixtures 0.75 mm<sup>2</sup> (=1475 circ. mil.).

18a. In and on fixtures only conductors with water-tight insulation of a quality suited to the voltage applied are allowed.

## ENGLAND

45. Flexibles must be of a sectional area not less than that equivalent to No. 22 S. W. G. (= 789 circ. mil.) . . .

32. Excepting for wiring fittings, the sectional area of any copper conductor must not be less than that of No. 18 S. W. G. (= 2291 circ. mil.).

## For Fixture Work

## UNITED STATES

## GERMANY

## ENGLAND

In wiring certain designs of show-case fixtures, ceiling bulls-eyes and similar appliances in which the wiring is exposed to temperatures in excess of 120 deg. F. (49 deg. C.) from the heat of the lamps approved slow-burning wire may be used. All such forms of fixtures must be submitted for examination, test and approval before being introduced for use.

26w. Supply conductors, and especially the splices to fixture wires, must be kept clear of the grounded part of gas pipes, and where shells or outlet boxes are used they must be made sufficiently large to allow the fulfillment of this requirement.

26x. Must, when fixtures are wired outside, be so secured as not to be cut or abraded by the pressure of the fastenings or the motion of the fixture.

26y. Wires of different systems must never be contained in or attached to the same fixture, and under no circumstances must there be a difference of potential more than 300 volts between wires contained in or attached to the same fixtures.

## UNITED STATES

27

## UNITED STATES

28a. No conduit tube having an internal diameter of less than  $\frac{3}{8}$  in. shall be used. Measurements to be taken inside of metal conduits.

28b. Interior conduits must be continuous from outlet to outlet or to junction boxes or cabinets and the conduit must properly enter and be secured to all fittings, and the entire system must be mechanically secured in position.

In case of service connections and main runs this involves running each conduit continuously into a main cut-out cabinet or gutter surrounding the panel-board, as the case may be.

28c. Must be first installed as a complete conduit system, without the conductors.

28d. Must be equipped at every outlet with an approved outlet box or plate. At exposed ends of conduit (but not at fixture outlets) where wires pass from the

18.3. Where the voltage to earth is greater than 250 volts joints and branches in fixtures must be avoided.

18.2. Branch joints in fixtures shall be placed as much together on one point as possible.

The Association of German Private Assurance Companies has required formerly that all fixtures be suspended by an insulating member, with exception of such fixtures as are connected to a grounded neutral; but now this is no more prescribed.

18a. cont. If the conductors are placed on the outside of the fixture they must be fixed so that they cannot shift and cannot be injured by sharp edges.

18a. cont. Where the voltage to earth is greater than 250 volts the conductors of accessible fixtures must be placed in protected positions.

18b. Where the voltage to earth is greater than 250 volts accessible fixtures are permissible only for direct current and only up to 1000 volts.

## Armored Cables

## GERMANY

Since frame houses are not in use in Germany, armored cables are practically never employed in residence wiring.

## Interior Conduit

## GERMANY

26.3. Conduit which is to be used for more than one wire must have an internal diameter of at least 11 mm ( $\frac{7}{16}$  in.), and where the voltage is more than 250 volts to earth the internal diameter must be at least 15 mm ( $\frac{19}{32}$  in.) for such conduit.

26.4. If in wiring not buried in the wall parts of the run are protected by conduit smaller diameters of the tubes are permissible.

(No mention is made, however, about the minimum permissible size for wiring fittings, except if it be assumed that the par. 46 quoted above refers to the minimum section permissible in fittings. The smallest section mentioned in the table of carrying capacities, which forms part of the rules, is  $\frac{3}{25}$  S. W. G. (= 1145 circ. mil.).

As regards the type of insulation permitted for fixtures, par. 52a says that flexibles may be used for pendant and portable appliances.

46. The insulating material on flexibles must be pure rubber equal to washed Para rubber of the best quality or vulcanized rubber of the best quality. Pure rubber insulation is best suited for flexibles intended for use with pendants. Pure rubber must be laid on in two layers, care being taken that the edges of each layer overlap, and the radial thickness of the dielectric must be not less than 20 mils. Each coil of pure rubber flexible must be tested in air for 15 minutes with a pressure of 1500 volts alternating between the conductors at a frequency of 50 to 100.

47. Vulcanized rubber flexible must be insulated with one layer of pure rubber and two layers of vulcanized rubber, and the radial thickness of the dielectric must not be less than 34 mils. Each coil of vulcanized rubber flexible must be tested for 15 minutes with a pressure of 1500 volts alternating at a frequency of 50 to 100 after twenty-four hours' immersion in water and while still immersed.

98. Where possible, the conductors should be carried without joints through the fittings to the lamps.

99. Combined gas and electric fittings must not be used.

100. If disused gas fittings are adapted for electric light, they must be entirely disconnected from the gas pipes.

## ENGLAND

Since frame houses are not in use in England, armored cables are practically never employed in residence wiring.

## ENGLAND

49a. Conduits must be electrically and mechanically continuous. Slip joint slip sockets do not comply with this rule.\* some form of screwed or grip joint having a conductivity equal to that of the continuous tubing being necessary.

49b. At the outlet points of switches, boxes and fittings, the ends of the conduits must either terminate at metal outlet boxes or they must socket into blocks, preferably of incombustible material. The conductors must in all cases be mechanically protected up to the fitting.

\* Slip joint tubing, however, is being used very largely in England, perhaps 50 per cent of all installations being slip joint.



## Interior Conduit

GERMANY

ENGLAND

## UNITED STATES

conduit system without splice, joint or tap, an approved fitting having separately listed for each conductor is connected to the conduit.

Outlet plates must not be used where it is necessary to install outlet boxes.

25e. Metal conduits where they enter junction boxes, and at all other outlets, etc., must be provided with approved bushings or fastening plates fitted so as to protect wire from abrasion, except when such protection is obtained by the use of approved nipples, properly fitted in boxes or at ends.

25f. Must have the metal of the conduit permanently and effectually grounded to water piping, gas piping or other suitable grounds, provided that when connections are made to gas piping, they must be on the street side of the meter. • • • Where a short section of conduit • • • is used for the protection of exposed wiring on side walls • • • the conduit or pipe need not be grounded. • • •

25g. Junction boxes must always be installed in such a manner as to be accessible.

25h. All elbows or bends must be so made that the conduit will not be injured. The radius of the curve of the inner edge of any elbow not to be less than 3½ in. Must have not more than the equivalent of four quarter bends from outlet to outlet, the bends at the outlets not to be counted.

26.2. cont. The tubes shall further be provided with appropriate armatures, for instance, bushings so that the insulation of the conductors cannot be injured by protruding parts and sharp edges.

It is required only for voltages of more than 250 volts (to earth) that the metallic conduits be connected metallically to each other and that the conduit be grounded. (26b.)

21.8. Conductors shall, as a rule, be placed in such a manner that they can be replaced.

26.2. With metal and insulating tubes in general the internal diameters, as well as the number and the radius of the curvatures, shall be selected in such a manner that the wires can be drawn in and removed. In case of conductors of more than 16 mm² (31,568 circ. mil.) the requirement that the wires shall be withdrawable may be disregarded if the conduit is laid on the wall accessible at any time.

49c. The conduits must have all free ends bushed to prevent abrasion except where wide bell-mouths are used.

49d. The conduits must be connected to earth.

28. Gas-pipes must not be used to obtain an earth connection.

49d cont. In dry places isolated single lengths of tubing need not be earthed if adequately enameled, or otherwise insulated, externally.

49g. Sharp bends or elbows are prohibited, but inspection elbows are permissible.

## Metal Moldings

GERMANY

ENGLAND

## UNITED STATES

Since metal moldings are not used in Germany, no special rules exist for them.

## Fixtures

GERMANY

ENGLAND

## UNITED STATES

36a. When supported at outlets in metal conduit, armored cable, or metal molding systems, or from gas piping or any grounded metal work, or • • • or • • • must be insulated from such supports by approved insulating joints placed as close as possible to the ceilings or walls. The insulating joint may be omitted in conduit, armored cable systems with straight electric fixtures in which the insulation of conductors is the equivalent of insulation in other parts of the system.

Gas pipes must be protected above the insulating joint by approved insulating tubing, and where outlet tubes are used they must be of sufficient length to extend beyond the insulating joint.

Where insulating joints are required, fixture canopies of metal must be thoroughly and permanently insulated. Canopy insulators must be securely fastened in place.

Fixtures having so-called flat canopies, tops or backs will not be approved for installation, except where outlet boxes are used.

36b. Must, when installed out doors, be of water-tight construction.

36c. Fixtures must not when wired on the outside be used in show windows or in the immediate vicinity of especially inflammable stuff.

36d. Fixtures must be free from short circuits between conductors and from contacts between conductors and metal parts of fixtures, and must be tested for such conditions before being connected to supply conductors.

The Association of German Private Fire Insurance Companies required formerly that all fixtures should be grounded with exception of those which are connected to grounded neutrals; but now that is no more required.

18b. If the voltage to earth can rise above 250 volts the metal parts of fixtures must be grounded.

99. Combined gas and electric fittings must not be used.

100. If disused gas fittings are adapted for electric light they must be entirely disconnected from the gas-pipes.

101c. Lamp-holders must not be hung from flexibles exposed to the weather.

36a. Fixed conductors must, as far as they can come in contact with easily inflammable material, be protected entirely by tubes up to the lampholders or to the receptacles, respectively.

5. Every installation for light, power, etc., must have an appropriate state of insulation.

5.4. The state of insulation of an installation in which the voltage against earth cannot exceed 250 volts will be assumed as appropriate if the loss of current at normal operating voltage on every part between two cut-outs or behind the last cut-out does not exceed 1 milliamper. • • •

From 122: • • • When all lamps and appliances have been removed from the circuit, the insulation resistance between conductors must not be less than 25 megohms divided by the number of lamps. • • •

## Sockets

GERMANY

ENGLAND

## UNITED STATES

21c. Key-sockets will not be approved if made of inflammable stuff.

## Flexible Cord

GERMANY

ENGLAND

32a. Must have an approved insulation and covering.

32b. Must be of such a size that the difference between the two wires is over

The covering and insulation of flexible cord, as well as of the other kinds of conductors, is regulated in separate prescriptions which form part of the general rules.

According to the general standard regulations for insulated conductors flexibles, if laid down in fixed positions, may be used up to 1000 volts, and if used for portable appliances, up to 500 volts.

46 and 47 (quoted in full above) give prescriptions about the covering and insulation of flexible cord.

(See next page)



REMENTS OF INSULATION RESISTANCE IN DRY INDOORS INSTALLATIONS (IN OHMS)—EXAMPLES, 110 VOLTS  
(Insulation resistances after the last fuse, in ohms)

40 W. 1/2 Lamp A	Lamp Outlets	Circuits	United States	Germany	England	Austria	Italy	Switzerland	Sweden	Russia
5	5	1	a) 4,000,000 b) 2,000,000	110,000	c) 6,000,000 d) 5,000,000	302,000	110,000	110,000	200,000	No definite figures
10	8	1	a) 4,000,000 b) 2,000,000	110,000	c) 3,750,000 d) 3,125,000	151,000	110,000	110,000	100,000	No definite figures
20	15	2	a) 2,000,000 b) 1,000,000	55,000	c) 2,000,000 d) 1,667,000	75,500	55,000	55,000	50,000	No definite figures
30	25	2	a) 800,000 b) 400,000	55,000	c) 1,200,000 d) 1,000,000	55,000	55,000	55,000	33,300	No definite figures
30	25	2	a) 800,000 b) 400,000	36,700	c) 1,200,000 d) 1,000,000	36,700	36,700	36,700	33,300	No definite figures
60	48	8	a) 800,000 b) 400,000	13,750	c) 625,000 d) 521,000	25,200	13,750	13,750	16,670	No definite figures

a) With fixtures disconnected. b) With fixtures connected. c) To earth, previously to erection of fixtures. d) Between conductors with fixtures in place.

### Engineers' Report on Water-Power Extensions for Sanitary District of Chicago

The commission on sewage disposal and water-power development appointed by the Sanitary District of Chicago to investigate plans for the utilization of the 10,000 to 14,000 second-feet of water which will be available at the completion of the Chicago River improvements and channel extensions now contemplated submitted its water-power report to the trustees of the District on Nov. 12. Mr. Lyman E. Cooley, Chicago, is chairman of the committee, the other members of which are Messrs. John Ericson, William Artingstall and H. H. Walker.

According to the report, the city of Chicago now absorbs for street-lighting and other municipal purposes 53 per cent of the total electrical output of the Sanitary District but pays only 27.5 per cent of the District's total earnings. Commercial customers, on the other hand, receive 26 per cent of the output and furnish 55 per cent of the revenues. The average rate paid by the city is estimated at 5.9 mills per kw-hr., including the substation charge of \$1 per lamp.

The irregularities of flow in the canal may be compensated for and the need of the proposed steam plants avoided, the commission declares, by discarding the present commercial lighting load, increasing the daytime and twenty-four-hour loads, and shifting the working day to avoid overlapping of day and night loads during the winter months. Furthermore, it is proposed to increase the available rating of the power plant at Lockport by (1) equalizing the load demand, (2) increasing the head by enlarging the channel below the plant and extending the Joliet level, (3) increasing the efficiency by modernizing the installation at the present plant, and (4) increasing the volume of water up to the legal rate of dilution. In this way it is expected to increase the electrical output not only proportionally to the increased volume of water, but also by reason of an increase of 20 per cent in efficiency through modernizing the plant and improving the discharge channel. The commission also recommends that the operation, maintenance and contract divisions of the Sanitary District organization be segregated under a distinct head, that the accounting system be revised, and that the administrative organization be reduced and its efficiency increased.

The present rate of return is declared to be inadequate to the investment, and in view of the relatively small revenue received for the city-lighting energy the commission recommends that a system of "reasonable

rates" be established, based on the relative cost of furnishing service to each class of customers. This is taken to mean, of course, that an increase would be demanded over the rate at which energy is now sold to the city—estimated as equivalent to 5.5 mills to 5.9 mills per kw-hr. It is also intimated in the report that the District's distribution lines and equipment should be ultimately disposed of, and that the function of the District be restricted to the delivery of energy to some central receiving point for each municipality served.

### Gasoline-Engine Factory Uses Central-Station Service

The Witte Iron Works, a Kansas City (Mo.) firm making gas and gasoline engines in many sizes, is gradually rearranging its plant so that all machines will be operated by motors driven from the lines of the Kansas City Electric Light Company. Formerly two large gas engines were used to drive the factory ma-



MOTOR-DRIVEN SANDING TABLE IN GASOLINE-ENGINE FACTORY USING CENTRAL-STATION SERVICE

chines, but now one of these has been taken out and it is expected that the other will soon follow. The illustration herewith shows one of the factory's interesting applications of electricity. The small motor mounted overhead drives a circular sanding table upon which the bases of small engines are ground to level surfaces. The sanding circle is partitioned so that several small engine bases may be sanded simultaneously.

# Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods and Current Practice Among Successful Utilities

## Co-operative Newspaper Advertising

By promptly informing residents of St. Louis, Mo., of a large reduction in the price of the vacuum cleaners which it handles the Union Electric Light & Power Company last month produced a notable increase in its sales. A copy of the announcement made jointly by this company and the Sanitary Sales & Service Company is



**ANNOUNCEMENT!**  
Owing to the Enormous Increase in Sales of

The **EUREKA**

**Electric Vacuum Cleaner**  
The Following Reduction in Price is Announced

**Old Price, \$40.00, Now \$31.00**  
COMPLETE WITH ALL ATTACHMENTS,  
**Old Price, \$49.00, Now \$36.00**

Less 5% for Cash, or on Liberal Divided Payment Terms.

ASK FOR FREE DEMONSTRATION.  
**SANITARY SALES AND SERVICE CO.**  
1214 Olive Street.

**UNION ELECTRIC LIGHT AND POWER CO.**  
12th and Locust Sts. 3012 S. Grand Av.  
4912 Delmar 3028 N. Grand Av.

### A TWO-COMPANY ADVERTISEMENT

shown herewith. Twenty-two and a half per cent reduction was offered on the vacuum cleaners alone, while 26.5 per cent was allowed with all attachments. Besides these reductions, the electric-service company offered liberal instalment terms or a 5 per cent discount for cash payments. Free demonstrations were given by the Sanitary Sales & Service Company. While the cleaner affected by the reduction in price is a staple product with the Union Electric Light & Power Company, Mr. C. E. Michel, manager of the appliance department, says that the newspaper advertisements were productive of very satisfactory results.

## The Electric Vehicle and the Middle of the Road

The prejudice which exists in the minds of some drivers of gasoline cars against electric vehicles is heightened, perhaps, by the insistence with which the operators of many electric cars keep to the middle of the roadway or boulevard, thus getting in the way of the gas-car owners who prefer to travel at speeds approaching the ordinance limits. This charge of driving in the middle of the road has been laid principally against women users of "electrics." Some of the offenders offer the defence that the salesmen or demonstrators from whom they purchased their cars advised them to drive on the central crown of the pavement in order to avoid spilling the acid from the battery jars. This explanation has, of course, as little justification as the practice of monopolizing the middle of the road. In cities where traffic is dense offending drivers of electric cars may

do the electric-vehicle cause an injury, for each gas-car driver they thus annoy is a potential purchaser of an "electric" if the superior advantages of this silent, clean and dependable form of locomotion could be demonstrated to him when in a receptive frame of mind.

## Promoting Among the Real Estate Promoters

Almost every central-station company has had experience with the real-estate promoter who, succeeding in selling a few houses in his pet addition, comes to the contract office and demands that his patrons be supplied immediately with electric service. It seldom makes any difference to the promoter how far the electric company must extend its mains to reach the new houses. What he wants is immediate service. If the electric company cannot profitably make the extension, the notoriety it is likely to receive at the hands of an unscrupulous promoter is not desirable.

To avoid such difficulties Mr. S. R. Gallagher, new-business manager of the Springfield (Mo.) Gas & Electric Company, recently attempted a new method of procedure with notable success. Three real-estate companies had united to promote the sale of land in a new addition, beautifying the area by paving driveways in a park and building an artificial lake. The site of the improvements was well outside the district served by the electric company. Before the lots had been laid off and before prices had been established Mr. Gallagher met the real-estate men and told them how much easier it would be to sell lots if electric lines were already in the alleys waiting to be connected to customers' houses. Many other of the myriad advantages to be derived from electric service were also pointed out. There



RESIDENCE WITH CONNECTED LOAD OF 3 KW

were no gas mains in the addition, and that point, too, was emphasized.

The real-estate men understood, of course, that it was preposterous to expect the electric company to build lines into empty fields, but they also saw, when it was pointed out, that if the lines were built with real-estate funds the cost could easily be apportioned and added to the price of the lots. The talking point—



"electric service furnished"—was worth the investment. Accordingly thirty-three spans of distribution line were built, and the three real-estate companies paid \$675 for the construction and material. The electric company now owns this line of 35-ft. cedar poles, and the copper wire it supports is heavy enough to carry all future residence load.

Entire satisfaction has resulted from the arrangement, and a few customers are beginning to be added along the pole line. Good salesmanship exercised in the new district has secured a 3-kw connected load in one house alone. Cooking, water heating and all domestic operations are performed electrically. The water heater placed in the cellar is connected for economy through a four-way switch so that energy can be turned on or off in the cellar, kitchen or both.

### Meter Practice on Rural Electric-Service Lines

On the country lines of the Noblesville (Ind.) Heat, Light & Power Company, which radiate in many directions from the company's central station, all customers'



FIG. 1—TYPICAL METER INSTALLATION; INSIDE WIRING CONCEALED

meters are placed out of doors unless local conditions make such practice entirely inadvisable. Generally the meters are hung on the side of the customer's house or barn under the shelter of a porch roof or overhanging canopy. No attempt is made to surround the meters with boxes or cases of any sort, since the central-station men believe that if the meters are protected from the driving rain by overhanging roofs they will perform their functions accurately without further protection. With this practice carried out consistently a meter reader does not have to make a second call if the customer is not at home the first time. If, on the other hand, the customer is at home, the meter can be read quickly and time taken to ask questions about service and to remedy complaints. A lineman is generally



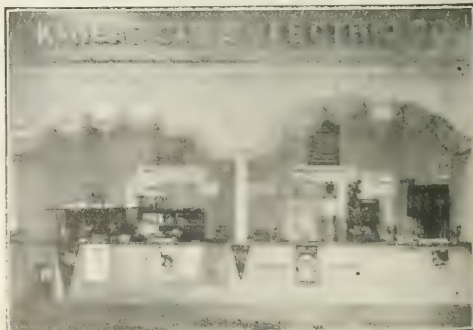
FIG. 2—BUNGALOW 11 MILES FROM CENTRAL STATION SUPPLYING IT WITH ENERGY

selected for reading meters, for he can attend to complaints while he is making his periodical trips over the lines. A reading of each customer's meter is taken quarterly, and the meter reader never fails to acquaint himself with conditions at each farm and to suggest the use of motors or other electrical appliances where they will save time and money for the patron.

The meterman's conveyance while on these trips is a veritable electrical storehouse. In it there is always a full stock of fuses and lamps. They are the staple commodities of the electrical business. In addition to these necessities the meterman carries on each trip a single feature article to be demonstrated to customers. On one trip the meter reader will carry a stock of flatirons; the next time he will have vacuum cleaners or perhaps toaster stoves. These wares are exhibited and placed in operation in the farmers' homes. Sometimes the devices are left on trial and the sales results obtained from this practice are indeed gratifying.

### Wichita Company's Booth at Dry Farming Exposition

At the fourth annual fall exposition and International Dry Farming Congress held at Wichita, Kan., the Kansas Gas & Electric Company exhibited a model dining-room, a kitchen and a laundry electrically equipped. Women demonstrators explained prices and operating costs to interested visitors. To further exploit the use of electricity the electric company secured several rolls of motion-picture films showing applications of electric power in the home and on the farm, and these pictures were shown twice a day free of charge.



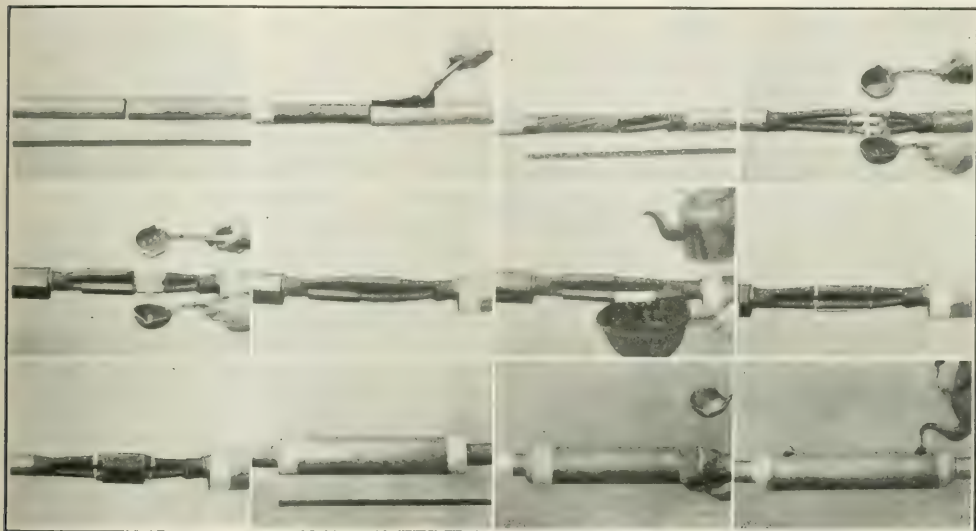
PART OF CENTRAL-STATION BOOTH

# Illumination and Wiring

## Cable Jointing

The kind of cable used for underground circuits will have little effect on the reliability and stability of a system if the joints are made improperly. Excessive heating may occur at the joints if their conductivity is not so high as that of a continuous section of the cable. Furthermore, if the insulation between conductors and the lead sheath is not restored to its original dielectric and resistance value, a break-down may occur when the cable is energized. At the Pittsburgh Crucible Steel Company's plant, Midvale, Pa., where underground circuits are relied upon entirely for supplying energy, tube joints are employed. With this method of jointing it is declared that one man and two helpers were able to make an average of six splices in a three-conductor No.

The copper sleeves were put on the conductors with their ends just touching and sweated on, using two ladles as indicated in the views published herewith. Before the solder had set the connectors were wiped smooth and two layers of cotton tape wrapped over the joint, taking care that none overlapped the cambric insulation. The tape was thoroughly impregnated with joint compound and the small paper tubes were slipped over the joint, centered and tied in place. After the larger paper tube had been similarly fastened over the conductor tubes the lead sleeve was slipped over them all and its ends dressed down to the size of the cable sheath and fastened thereto with a wiped joint. Two V-shaped openings were made in the top of the sleeve, one at each end, and into these was poured "ozite" until the case was full. The insulating compound was poured at a temperature of 450 deg. Fahr. and allowed to boil out about thirty minutes. As it settled into the crevices



SUCCESSIVE OPERATIONS IN SPLICING CABLE

1 cable in one day. The successive operations required in completing a joint are shown in the illustration.

For splicing the chief requisites were three split copper tubes or connectors, three paper tubes to be slipped over each conductor, one large tube to be placed over the three smaller ones, one lead sleeve, and the usual tape and tools. After shaping the cables around the manhole their ends, which had previously been covered with solder to exclude moisture, were sawed off, leaving them just touching each other. Then the lead sheath was stripped off one cable for 9.5 in. and off the other for 5.5 in. Eight and one-half inches and 4.5 in. of the outer cambric belt were removed from the cable ends respectively, leaving one inch of the covering projecting beyond the sheath on each cable.

Over the shorter stripped cable was next slipped the lead sleeve, one end of which had been dressed down to fit the sheath. The cambric insulation on each conductor was then removed for 2.25 in. back from the ends, the copper thoroughly cleaned and the conductors arranged with two in a horizontal plane on top and the third centered beneath them. After tinning the conductors the large paper tube was slipped over the cable sheath on the longer stripped end, followed by the conductor tubing.

and interstices more compound was added slowly until the joint was full and cold. The openings were then soldered up, making the joint complete. No soldering pastes or acids were used in making the joints for fear of starting corrosion.

## Phenomena of the Nitrogen-Filled Lamp

Among the interesting experiments performed by Mr. S. E. Doane, Cleveland, Ohio, before the joint meeting of the Chicago engineering societies, Nov. 25, was one arranged to show that the so-called "stationary" film of gas about the filament of the nitrogen-filled lamp really clings to the filament and moves upward along it. A gas-filled lamp with long, straight vertical filaments was first operated for a short time in an upright position. The lamp was then quickly inverted and at once the reversing convection waves could be distinctly seen as each traveled up its respective filament, the advancing wave-fronts being made visible by their refractive action on the light from the glowing filaments.

An instructive diagram shown by Mr. Doane is reproduced herewith and illustrates three lamps which have energy consumptions respectively of 1 watt per candle for

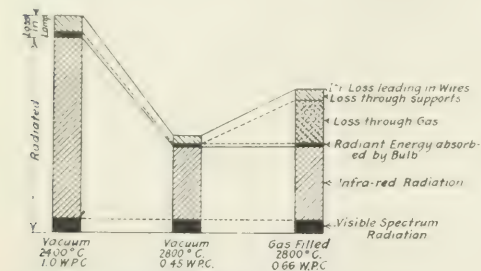


the filament in vacuum at 2400 deg. C.; 0.45 watt per candle for the filament in vacuum at 2800 deg. C., and 0.66 watt per candle for the filament at 2600 deg. C. in the gas-filled amps assumed for comparison. The upright column at the left shows how energy is dissipated in an ordinary vacuum tungsten lamp, while the middle column shows what the efficiency of an ordinary vacuum

tion taking place, say, 120 times per second; and the beginner is always puzzled to know exactly what is meant when it is stated that "an alternating current of 10 amp" flows through a circuit! The simplest, and indeed the only, answer to this question is obtained by considering how alternating current is measured. The type of ammeter which must be used for the accurate measurement of an alternating current is an instrument in which the movement of the pointer is proportional to the square of the current flowing through the instrument; that is to say, to reverse the current does not reverse the deflection of the pointer and if the current is doubled the pointer will move four times as far from the starting point. This fact is visualized in Fig. 1. The distance  $d$  moved by the pointer is proportional to the square of the current through the instrument. If the current slowly rises and falls in value, the pointer, of course, moves back and forth, but if the current pulsates very rapidly in value then the pointer takes up a steady position such that the steady value of  $d$  is proportional to the average value of the square of the current; that is to say, an alternating-current ammeter indicates, strictly, the average value of the square of the alternating current which flows through it. This matter may be made more intelligible by considering the practical meaning of the average value of the square of an alternating current. If a current flows through a wire, the heating effect is proportional to the square of the current, and if the current varies the average heating effect is proportional to the average value of the square of the current. Therefore the alternating-current ammeter measures what may be called the heating value of the alternating current.

The statement that an alternating-current ammeter measures the average value of the square of the current is exactly correct, but the scale on the instrument is what is called a square-root scale; that is, mark No. 2 on the scale is four units of distance from A in Fig. 2, mark No. 3 is nine units of distance from A, mark No. 4 is sixteen units of distance from A, and so on. Therefore the reading  $r$  of the pointer is proportional to the square root of  $d$ , and an alternating-current ammeter provided with this kind of a scale indicates the square root of the average value of the square of the current.

This communication has been prompted by a "question-box" discussion which took place at the meeting of the Allentown Branch of the National Electric Light Association on the evening of Oct. 6. Nearly everybody in attempting to discuss this matter gets lost in the consideration of the "sine wave," which, of course, is a mere abstraction. I have always been in the habit of developing the argument as to the meaning of the reading of an alternating-current ammeter by considering the things and actions which take place inside of



ANALYSIS OF POWER CONSUMED IN TUNGSTEN-FILAMENT LAMPS ON THE BASIS OF EQUAL LUMINOUS OUTPUT

tungsten lamp would be if operated for a short-lived period at the temperature of the gas-filled lamp. The analysis of the energy consumption in the gas-filled lamp, illustrated at the right of the sketch, shows how an efficiency of 0.66 watt per candle is attained in lamps of commercial length of life, by allowing convection losses to occur through the gas.

## Letters to the Editors

### The Cheap Electric Vehicle

To the Editors of the Electrical World:

SIRS:—Referring to the ever-present discussion as to the advisability of marketing a cheap electric automobile, it seems to the undersigned that the demand for only the most refined and luxurious electric vehicles is attributable to the fact that the electric car is supposed by the general public to be much more expensive to operate than the gasoline car, because the gasoline expense is less than that for electricity. The result has been that any man who is willing to pay a higher operating cost for the increased comfort and convenience of the electric vehicle is able and willing to buy the most comfortable machine built.

By convincing the majority of moderately well-to-do persons that the electric vehicle is cheaper to operate than the gasoline car, there can be created a great demand for the car which is also cheaper in first cost; then the low-priced electric vehicle will come into its day.

Lake Charles, La.

F. V. GALLAUGHER.

### Meaning of Alternating-Current Ammeter Readings

To the Editors of the Electrical World:

SIRS:—Everyone who has begun to think of matters relating to the electrical distribution of energy knows that we have direct-current distribution and alternating-current distribution, and nearly every one knows that a direct current of 10 amp is simply an actual steady current of just 10 amp flowing always in the same direction in a wire. On the other hand, an alternating current flows in one direction and then in the other direction through a circuit, the reversals of direc-

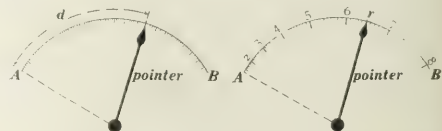


FIG. 1—UNIFORM SCALE FIG. 2—SCALE OF SQUARE ROOTS

an instrument, but the difficulty of presenting the argument on this basis is that very few electrical workers have seen the inside of an instrument. The fact of the matter is, however, that the only thing that is necessary is to look at the pointer and consider what is stated above in regard thereto.

South Bethlehem, Pa.

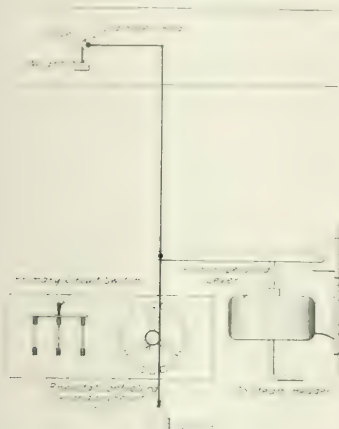
W. S. FRANKLIN.

# Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

## Automatic Regulator for Stoker and Damper

In the generating station at Owensboro, Ky., is an automatic device which regulates the speed of the furnace stokers and opening of the flue dampers to give constant steam pressure. The apparatus consists of a piston-operated lever which rises or falls with variations in steam pressure, causing the damper to operate



APPARATUS REGULATING DAMPER OPENING AND STOKER SPEED

in the proper relation with the stokers, which are motor-driven. As wound-rotor motors are employed, their speed has to be controlled by varying the secondary resistance. When this apparatus was being developed it was found that the speed regulation obtained with a certain change in secondary resistance varied with different loads. It is therefore necessary to operate each motor controlled from this device at practically uniform load. The accompanying illustration shows how the piston-operated lever is connected with the damper and rheostat shaft. The wire cord operating the rheostat is wound around its axis several times and the loose end weighted so that movement of the lever will cause rotation of the rheostat shaft. A three-blade knife switch is also mounted on the regulating panel to control the primary circuit.

## The Classification and Sale of Scrap Material

Mr. B. I. Budd, president Chicago Elevated Railways, in a talk before the recent meeting of the Illinois Electric Railways Association, of which he is president, referred to the work of the scrap experts and engineers who are now engaged in campaigns among electric-lighting and railway companies for the more advantageous disposal of scrap and refuse material. Analyses of the usual methods of the collection and sale of scrap, said Mr. Budd, show that this material, extremely valu-

able in the aggregate, has been handled loosely and sold loosely in most organizations, while owing to the incompleteness of the classification given the scrap the prices received fall far short of those which should be earned. During present business conditions President Budd urged on the part of company executives a closer attention to the disposal of scrap material.

## Disciplining the Man to Blame for the Accident

At the meeting of the Illinois Electric Railways Association at Chicago, Nov. 21, Mr. W. F. Carr, Ottawa, Ill., advised against the policy of discharging men who have made mistakes which caused accidents, for, he declared, a serious accident for which a man is to blame leaves an indelible impression upon his mind and makes him a more careful and thoughtful operative in the future. If, on the other hand, this same man were to be discharged, his place must be given to a new man, and it is very possible that the whole lesson of safety and carefulness will then have to be learned all over again.

## Tunnel Cable Crossing Under the Milwaukee River

To provide connections for electric cables and steam-service mains between the east and west sides of the river in the downtown district of Milwaukee the Milwaukee Electric Railway & Light Company has built a tunnel at Oneida Street. The tunnel supplements two existing crossings. Before starting the work three types of crossings were considered for this location.



BUILDING TUNNEL FOR ELECTRIC CABLES

These were submarine cables, steel end shafts lined with concrete and connected by a cast-iron pipe tunnel, and a driven tunnel constructed under air pressure and fitted with iron or concrete lining. The first type of construction was considered unsatisfactory, as it made no provision for steam pipes and it exposed the cables to mechanical injuries. The second class of construc-



tion, it was decided, presented advantages over the third type because of its lower first cost and the greater speed with which it could be constructed.

The river crossing as it stands completed is 216.7 ft. in length, the horizontal cast-iron pipe tunnel lying 41 ft. below the surface of the earth. There will be ample space in the shafts and tunnel for the passage of a man after eighty conduits and two steam mains have been placed against the walls.

### Using a Cold Machine on the Peak of the Load

One of the operating rules in the transforming and generating station of the Springfield (Mo.) Gas & Electric Company requires that the sixty-cycle load be transferred from one to the other of the company's two 1000-kw frequency changers at the time of day just preceding the peak. In this way a frequency changer with cold windings is provided at a time when maximum output is demanded, the two similar 1000-kw machines being used alternately for twenty-four hour runs. The main advantage to be derived from the operation of a machine with cold windings, it is explained, lies in the possibility of using reduced field current. At Springfield it has been found possible to carry the loads with reduced current in the field coils when a machine is cold, even though the bus voltage is carried slightly above normal during the peak. Energy for driving the frequency changers is secured from the transmission lines of the Ozark Power & Water Company.

### Utilizing a Traction Engine During Plant Repairs at Maryville, Mo.

During the last summer it became necessary for the Maryville (Mo.) Electric Light & Power Company to send one of its reciprocating steam engines to St. Louis for repairs. The story of how the load was handled in the meantime is told in the following words in a recent letter from Mr. C. C. Hellmers, secretary and manager of the company:

"In addition to the disabled unit, we had another engine with a 125-kw generator, which could handle the

service without interruption. The traction engine was operated singly from midnight until morning and on Sundays, when our load was lightest, and we also used it in connection with our other engine at night when the load was heavy.

"Our disabled engine was away for six weeks, but we were able to operate satisfactorily without interruption. We did the work during July when our load is lightest and we might have been able to get along with the one engine by shutting down on Sunday afternoons. But we have always said that twenty-four-hour service means continuous service; therefore, we used the traction engine to tide us over the period of stress."

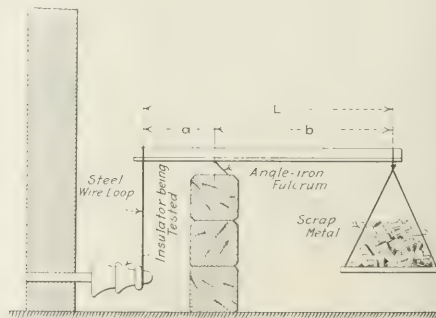
### Apparatus for Testing Approximate Breaking Strength of Pin Insulators

Will you describe some home-made apparatus for testing the approximate breaking strength of pin-type insulators? We prefer having a description of equipment which can be readily assembled from materials found in any locality. E. T. L.

Whenever it is necessary to determine the breaking strength of assembled pin insulators where delicate testing apparatus is not available the equipment illustrated herewith may be employed to obtain approximate results. The pin may be inserted in a hole in a stout vertical timber as shown and a strong steel wire looped over the insulator head and fastened to one end of a rigid steel bar supported on the edge of an angle iron and weighted at the other end. If only scrap material is available for weighting the lever, it can be supported on a platform suspended from the end of the bar. The angle iron or fulcrum on which the lever rests can be laid on any substantial support such as a heavy wooden block. After the lever has been supported for the test, the lengths of the lever arms should be measured, then the pan should be loaded until the insulator fails. The material used in loading the lever, together with the platform employed to support it, should then be weighed on a platform scale and the value thereof multiplied by the lever ratio. If the weight of the lever is considerable, a correction may be made by adding to the

breaking strength as computed above  $\frac{W}{2La} (b^2 - a^2)$ ,

where  $W$  is the weight of the bar in pounds,  $L$  is the



APPARATUS FOR TESTING BREAKING STRENGTH OF INSULATORS



TRACTION ENGINE DRIVING 75-KW ALTERNATOR

load except on Saturday night. We knew, however, that it would be necessary to do a little tightening up from time to time and so did not want to risk carrying the load with one engine.

"In the station was an extra 75-kw generator, and this we hooked to a large traction engine, and by this method we were able to keep up our twenty-four-hour

total length in inches,  $a$  is the length of the lever arm attached to the insulator, and  $b$  is the length of the lever arm supporting the weights expressed in inches. This correction is unnecessary if the fulcrum is placed close to the middle of the lever, but may become a considerable part of the breaking strength if a large lever ratio is employed.

# Digest of Current Electrical Literature

## Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

### Generators, Motors and Transformers

**Standardization Rules.**—An editorial discussion of the revised standardization rules of the American Institute of Electrical Engineers. Heating tests are especially discussed and reference is made to the suggestion of the employment of thermocouples or resistance coils placed as nearly as possible at the estimated hottest spot of a machine. "We doubt whether the general introduction of these 'hot-spot' temperature measurements is altogether desirable. We admit that a method of this kind will give very useful information to the manufacturer, and it will probably be worth while to apply it to any new line of machines; but once the manufacturer has gained his experience it seems to us that the older methods give all the information that is necessary for testing a plant and seeing that it complies with the guarantees."—*London Electrician*, Nov. 13, 1914.

### Lamps and Lighting

**Street Lighting with Nitrogen-Filled Tungsten Lamps.**—L. BLOCH.—A paper read before the Association of German Central Stations on June 19, 1914. The author points out the great advantage of the nitrogen-filled tungsten lamp consuming 0.5 watt per cp over the old drawn tungsten-filament lamp consuming 0.8 watt or 1 watt per cp. The nitrogen-filled lamps are rated in Germany exactly like arc lamps, according to the hemispherical candle-power with a clear-glass globe and without an external reflector. While the nitrogen-filled tungsten lamps were made in the beginning only in sizes from 1000 cp to 3000 cp for standard voltages, they are now available for 110 volts in sizes down to 200 cp and for 220 volts in sizes down to 400 cp. In the accompanying table the different types of nitrogen-filled lamps are given, as used for lighting different kinds of streets

DATA ON NITROGEN-FILLED LAMPS

	Mean Horizontal Illumination in Meter-candles	Candle-power of Nitrogen-Filled Tungsten Lamps	Height of Lamp Above Ground, Meters	Distance Between Lamps in Direction of Street, Meters
Bre. white ways in large cities	10 to 20	2000 to 3000	7 to 9.0	25 to 35
Main streets	5 to 10	1000 to 2000	5 to 8.0	30 to 50
Side streets with considerable traffic	2 to 5	200 to 1000	4 to 6.0	30 to 80
Side streets with little traffic	0.5 to 2	500 to 2000	4 to 6 to 7	30 to 80

in Germany. The mean horizontal illumination in meter-candles is measured at a height of 1 m above the ground. It will be seen from the table that German streets are now better lighted than they were ten years ago. The author gives the photometric curves of the distribution of light from various types of nitrogen-filled tungsten lamps and shows by different numerical examples the distribution of light in a street and how high a degree of uniformity of illumination can be obtained in street lighting. The paper is to be concluded. —*Elek. u. Masch.* (Vienna), Oct. 18, 1914.

### Installations, Systems and Appliances

**Large Electric Kitchen.**—KURT PERLEWITZ.—A fully illustrated description, based on a recent paper by A. Steinhart, of the electric kitchen in the new office building of the Siemens-Schuckert company near Berlin, with an equipment for feeding daily 3000 persons in four groups each of from 700 to 800 people. Since the generating equipment for lighting the office building is used only in the afternoon hours of the winter months,

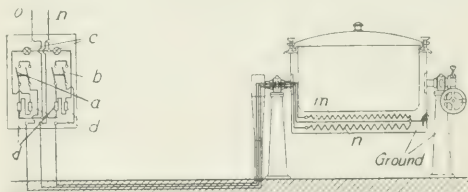


FIG. 1.—WIRING ARRANGEMENTS FOR HEATING VESSEL.

energy is available at a low rate at other hours. The electrical equipment of the kitchen consists of four roasting ovens, eighteen roasting pans, eleven heating vessels and two heating closets. All apparatus is for 220 volts distributed equally between the two halves of the three-wire network. The earthed neutral is connected without a fuse to one pole of the heating elements, and at the same time connection is made with the metallic body of the apparatus. The outer circuits contain a fuse and the switch for temperature regulation. The roasting pans ( $400 \times 600 \times 65$  mm) are of wrought iron, the heating elements being placed below the bottoms of the pans and pressed against them by means of a plate. The heating element of a roasting pan which can roast 200 chops an hour has a rating of 7 kw. The heating vessels have two sets of heating elements directly within the bottom, so that by tilting the vessel the heating elements can be easily taken out and replaced when necessary. These vessels are used for cooking meat, vegetables, soups, etc. For preparing dishes with the addition of milk, for cooking cabbage, etc., direct heating by means of heating elements in the bottom of the vessel is employed. For such purposes some of the vessels have oil jackets and the heating elements are outside of the oil jacket and below the bottom of the vessel. When filled, these vessels have an efficiency of 82 per cent during the heating period against 90 per cent for vessels with direct electric heating. But this difference is unimportant since the oil jacket represents a very economical storage of heat. When the energy supply is cut off the contents of the vessel continue to boil for one and one-half hours. The circuit connections for such a heating vessel are shown in Fig. 1, in which *o* is the outer conductor and *n* the neutral wire of the network, *a* and *b* are the main switches for the principal circuit and the auxiliary circuit respectively, *c* lamps, *d* fuses. The heating vessel is shown on the right, with two sets of heating elements in the bottom *m* and *n*. Both sets of heating elements are distributed all over the bottom of the vessel



and divided up into branch circuits. Vessels to contain 400 liters have two circuits of 12 kw and 24 kw respectively, so that 12 kw, 24 kw or 36 kw can be supplied to the vessel. Vessels for 200 liters consume a maximum of 18 kw. The coffee machines for preparing 75 and 150 liters per hour respectively have a rating of 12 kw and 18 kw. The mean average energy consumption per day for each person in the office building is 0.430 kw-hr., of which 0.312 kw-hr. is for cooking alone. Load curves are given showing that the energy consumption is lowest on Saturday because many of the employees do not take their lunch there. The energy consumption per person is correspondingly a maximum on Saturday. Since the energy for kitchen purposes is charged at 1.25 cents per kw-hr., the total energy cost per person a day is 0.54 cent. The total yearly energy cost of from \$2,500 to \$3,000 can probably be decreased by 10 per cent after the attendants have become familiar with the most economical way of handling the apparatus. Since the total expense of the kitchen is from \$125,000 to \$150,000 a year, the energy cost is only 2.5 per cent of the total cost. The figures for two other electric kitchens are as follows: In the electric kitchen of the Cable Works of the Siemens-Schuckert company the total energy cost per person is 0.97 cent (170 persons, rate of charge 2.5 cents per kw-hr.), and in the electric kitchen of the Hennigsdorf factory of the Allgemeine Elektrizitäts Gesellschaft the corresponding figure is 0.51 cent (130 persons, rate of charge 1.25 cents per kw-hr.). In similar kitchens fired with coal, steam and gas the fuel cost per person per day is between 0.4 cent and 0.62 cent for the dining-rooms of the officials and 0.32 cent and 0.47 cent for the dining-room of the workmen.—*Elek. Zeit.*, Oct. 22, 1914.

*Effect of the War on the British Electric Supply Industry.*—An article illustrated by diagrams and giving data for different cities. In many cases the output has benefited by increased motor load, but lighting has decreased with only a few exceptions. Load-factors have improved. There are a few instances in which outputs have suffered seriously, but for the most part the effect has not been unfavorable.—*London Elec. Eng'ing*, Nov. 12, 1914.

*Austria-Hungary.*—C. HONIGMANN.—An English translation of his recent German article giving statistical data on the electrical industry in Austria-Hungary.—*London Elec. Review*, Nov. 13, 1914.

#### Electrophysics and Magnetism

*Magnetic Resistance Change of Pure Iron.*—R. A. HEISING.—An account of an experimental investigation the main results of which are as follows: Electrolytic iron has a slightly greater rate of percentage resistance change for the longitudinal effect than ordinary iron. Iron, when transversely magnetized, does not increase in resistance at small fields, but continually decreases. Continual decrease of resistance in transverse case after saturation is proportional to internal H raised to the 0.85 power.—*Phys. Rev.*, October, 1914.

*Magnetic Habits of Alloy Steels.*—J. A. MATHEWS.—A paper read before the American Society for Testing Materials. The relationship between magnetic and physical characteristics of steel and its alloy has received much attention. No definite laws expressing this relationship have been found, although broadly considered there are similarities between magnetic and physical behavior which are very striking. In this paper, after briefly outlining the methods and scope of the work and describing the apparatus and units employed, the following subjects are dealt with: The suggestion of a new magnetic unit of magnetic hardness,  $B_p/H_p$ ; that is, the ratio between residual density and coercive

force is used to indicate magnetic hardness in a way similar to the use of  $\mu$  to indicate permeability. The relation between hardness as measured by the Brinell and Shore methods and magnetic hardness as indicated by  $B_p/H_p$  is discussed. It is shown that in hardened alloy steels the magnetic properties vary with the cross-section, but in some cases the magnetic hardness increases as the section increases, while in other cases the reverse is true, and in some alloy steels either condition may be had, depending upon the manner of quenching. It is shown that many alloy steels give lower induction, lower residual density and higher coercive force when quenched in oil than when quenched in water, the corresponding physical hardness test showing, as would be expected, that the water quenching confers the greater hardness. The effect of drawing the temper of hardened alloy steels is discussed, and it is shown that for equal drawing temperatures the magnetic properties of oil-hardened pieces are most affected, while as to the physical hardness the water-hardened pieces are affected to the greater degree.—*Proceedings, American Society for Testing Materials*, Vol. 14, 1914.

#### Electrochemistry and Batteries

*Electrometallurgy.*—J. W. RICHARDS.—A paper giving a review of the present status of electrometallurgy. The author divides his subject into electrolytic methods and electric furnace methods for the refining of metals and winning of metals from ore.—*Proceedings, Engineers' Club, Philadelphia*, October, 1914.

#### Units, Measurements and Instruments

*Units and Notation.*—The complete amplified list of notations adopted by the committee on units and notation (A. E. F.) of the German Association of Electrical Engineers. Notations: length  $l$ , mass  $m$ , time  $t$ , radius  $r$ , diameter  $d$ , wave-length  $\lambda$ , surface,  $F$ , volume  $V$ , angle, arc,  $\alpha, \beta, \dots$ , phase angle  $\phi$ , speed  $v$ , angular velocity  $\omega$ , number of revolutions per time unit  $n$ , number of cycles per time unit  $n$ , acceleration of gravity  $g$ , force  $P$ , pressure (force divided by surface)  $p$ , modulus of elasticity  $E$ , work  $A$ , energy  $W$ , momentum of a force  $M$ , power  $N$ , efficiency  $\eta$ , momentum of inertia  $J$ , centrifugal momentum  $C$ , normal tension  $\sigma$ , specific elongation  $\epsilon$ , specific cross-contraction  $\nu = 1/m$  ( $m$  Poisson's figure), friction coefficient  $\mu$ , absolute temperature  $T$ , temperature measured from the ice point  $t$  or  $\theta$ , which is to be used in formulas which also contain the time (the I. E. C. has amplified this rule by designating the absolute temperature with  $\Theta$  and the Celsius temperature with  $\theta$ ), quantity of heat  $Q$ , mechanical equivalent of heat  $J$ , entropy  $S$ , specific heat  $c$ , specific heat at constant pressure  $c_p$ , specific heat at constant volume  $c_v$ , heat expansion coefficient  $\alpha$ , calorific value  $H$ , light intensity  $J$ , magnetic field intensity  $\mathfrak{H}$ , magnetic flux density  $\mathfrak{B}$ , intensity of magnetization  $\mathfrak{J}$ , magnetic permeability  $\mu$ , magnetic susceptibility  $\chi$ , electromotive force  $E$ , electric current  $I$ , electric resistance  $R$ , quantity of electricity  $Q$ , coefficient of self-induction  $L$ , electric capacity  $C$ . Symbols for units: meter  $m$ , kilometer  $km$ , decimeter  $dm$ , centimeter  $cm$ , millimeter  $mm$ , micron  $\mu$ , arc a, hectare  $ha$ , square meter  $m^2$ , square kilometer  $km^2$ , square decimeter  $dm^2$ , square centimeter  $cm^2$ , square millimeter  $mm^2$ ; liter  $l$ , hectoliter  $hl$ , deciliter  $dl$ , centiliter  $cl$ , milliliter  $ml$ ; cubic meter  $m^3$ , cubic decimeter  $dm^3$ , cubic centimeter  $cm^3$ , cubic millimeter  $mm^3$ ; ton  $t$ , gram  $g$ , kilogram  $kg$ , decigram  $dg$ , centigram  $cg$ , milligram  $mg$ ; hour  $h$ , minute  $m$  or (if alone)  $min.$ , second  $s$ ; degree Celsius  $^\circ C$ , calorie  $cal$ , kilogram-calorie  $kcal$ ; ampere  $A$ , volt  $V$ , ohm  $\Omega$ , siemens  $S$ , coulomb  $C$ , joule  $J$ , watt  $W$ , farad  $F$ , henry  $H$ , milliamperes  $mA$ , kilowatt  $kW$ , megawatt  $MW$ , microfarad  $\mu F$ , megohm  $M\Omega$ , kilovoltampere  $kVA$ ,

ampere-hour Ah, kilowatt-hour kWh. The symbols for units are to be used only in connection with figures, but not in formulas. It is correct to write "the length is 500 m," but in formulas the name of the unit is written out or abbreviated (but not by its symbol); for instance,  $E_1 = 4.44\sqrt{N_s\Phi_1} \times 10^{-4}$  volt.—*Elek. Zeit.*, Oct. 22, 1914.

### Telegraphy, Telephony and Signals

**Neutralizing Transformers in Telephone Circuits.**—THOMAS SHAW.—The neutralizing transformer is a special type of series transformer used for reducing low-frequency voltages electromagnetically induced in telephone and telegraph wires by adjacent energy-transmission circuits. The author describes the development of the device, gives the general theory of neutralizing action and construction of details and also discusses the limitations of the use of neutralizing transformers. An editorial by C. F. Scott gives further particulars of the evolution of this device.—*Elec. Journal*, November, 1914.

**Mechanical Analogue of Coupled Circuits.**—T. R. LYLE.—An abstract of a British Association paper in which the author gives a demonstration of an "exact mechanical analogy to the coupled circuits used on wireless telegraphy." Having derived a simple formula expressing the coupling angle between two inductively coupled circuits in terms of the inductances, he showed his model. It consisted essentially of a steel beam  $M$  (Fig. 2) built up of two parallel straight edges, 4 ft.

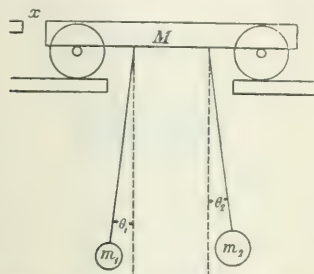


FIG. 2.—MODEL FOR SHOWING MECHANICAL ANALOGUE OF COUPLED CIRCUIT

long, 3.5 in. apart, connected rigidly by aluminum distance-pieces and clamps, and resting with its edges on the overhanging axles of two pairs of steel disks, which were 1.5 in. apart and made from 5-in. slotting cutters ( $\frac{1}{8}$  in. thick) by grinding off the teeth. The wheels rested on a carefully leveled plate of glass, all friction being so well reduced that the beam system, when once set in motion, would continue to oscillate to and fro for a long while.  $x$  indicated the distance of the beam from a stationary origin. Two pendulums, of masses  $m_1$  and  $m_2$ , were suspended from cross-boards by means of V's, so that they could swing in the longitudinal space between the two members of the beam. The author showed that the angular displacements of the two pendulums were mutually connected by equations identical in form with those connecting the potential differences of the condensers in the corresponding electrical system. The relations of the resultant frequencies were best presented by the aid of a triangle the apex of which was the coupling angle. As described so far, the mechanical system was the analogue of the coupled circuits of a radiotelegraphic transmitter. The beam might itself be considered to represent the ether. The variation of the coupling was imitated by placing masses on two platforms at the ends of the beam. By increasing the load on the beam the coupling was diminished. When

the beam was first steadied and then started by hand, and the one pendulum let go simultaneously, the second pendulum began to swing with increasing amplitude, while the amplitude of the first pendulum diminished. After a certain time the conditions appeared reversed, and so the transfer of energy forward and backward changed many times. These surgings could be calculated, and the advantages of loose couplings were demonstrated. The pendulum model also explained the theory of the quenched spark, as it was impossible to "break" the primary circuit without disturbing the whole mechanical system if the bob of the primary pendulum were not placed on its platform but taken in the hand so as to slacken the string. In order to imitate the conditions of a receiver when receiving signals, the first pendulum was made compound, and disturbances were transmitted to it from the beam by means of a simple electromagnetic device energized through flexible wires, for instance, by attaching one permanent bar magnet to the pendulum between two electromagnets on the beam. The model would also elucidate some of the problems arising in connection with the paralleling of alternators. The many models that others had described utilized rubber cords and steel springs, while inertia forces should alone be resorted to.—*London Engineering*, Nov. 13, 1914.

## Book Reviews

### HANDBOOK OF TABLES AND FORMULAS FOR ENGINEERS.

Compiled by Clarence A. Peirce, with mathematical sections by Walter B. Carver. New York: McGraw-Hill Book Company, Inc. 168 pages. Price, \$1.50.

In these days handbooks are constructed so massively as to raise the image of the mailed fist, but this little handbook, although containing a large amount of information useful to the engineer, is also a real pocket-book and weighs less than 150 grams. The book is divided into ten sections dealing with the following topics: Algebra, geometry and trigonometry, analytic geometry, calculus, measurement, physical and chemical properties of substances, mechanics, strength of materials, standard gages, fastenings and flanges, mathematical tables. The book is strong in its mathematical and mechanical sections. It will appeal particularly to the mechanical engineer but will interest all engineers.

**RECHERCHES SUR LES PHÉNOMÈNES DE LA COMMUTATION.** By J. Rezelman. Charleroi, Belgium: Librairie R. Lenders. 226 pages, 167 illus. Price, 7.5 francs.

This volume gives an interesting quantitative account of certain experimental researches on commutation phenomena in a certain direct-current machine. The author sets out to determine, both experimentally and arithmetically, the reactance of one section of a drum armature, and also the mutual inductance between adjacent sections of different armatures, for various frequencies between 0 cycle and 200 cycles per second. The results are then applied to the behavior of a particular 100-kw machine using oscillograms, superposition of characteristics and a bismuth spiral. These researches will be of interest to direct-current machine designers and to all students of dynamo commutation. The book is divided into four sections, dealing respectively with the following subjects: Reactance determinations, rectilinear commutation, experimental applications, and the currents which circulate under the brushes.

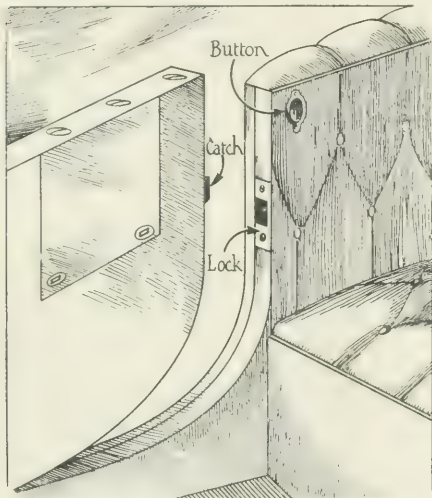


# New Apparatus and Appliances

## An Illustrated Descriptive Record of Recently Developed Manufactured Products of Interest to Electrical Readers

### Electrically Operated Automobile-Door Lock

The doors of the 1915-model light-weight cars built by the Scripps-Booth Company, Detroit, Mich., are equipped with electrically operated locks. The lock operates on the same principle as that of the main door



AUTOMOBILE DOOR WITH ELECTRIC LOCK

of an apartment house, which is unlocked by pressing a button in any one of the apartments. By means of a lock of this type the door handle is eliminated and the possibility of tearing one's clothes is therefore lessened. A mother-of-pearl push-button is set into the upholstery beside the door, as shown in the accompanying diagram. The button is so placed that one can grasp the door with one hand and press the button with the index finger of the same hand.

### Cabinets Equipped with "Double Knock-Outs"

The cabinet shown in the accompanying illustration is provided with so-called "double knock-outs," which con-



CABINET WITH "DOUBLE KNOCK-OUTS"

sist of a plug knock-out within a plug knock-out. With a slight tap of a hammer the center slug will come out. If a larger hole is wanted, the remaining ring can be easily pulled out with a pair of pliers. The box is of

stamped metal and is made in the following sizes: 6 in. by 6 in. by 3 in., 6 in. by 8 in. by 3 in., 8 in. by 10 in. by 3 in., 8 in. by 10 in. by 4 in., and 4.5 in. by 9 in. by 3.5 in. The cabinet has been approved by the Underwriters' Laboratories and is being manufactured by the Dill Manufacturing Company, 684 East Eighty-second Street, Cleveland, Ohio.

### Workmen's Electric Time Recorder

An electrically operated time-recording machine consisting of a clock, panelboard and one or more registers for printing job tickets is being placed on the market by the Gisholt Machine Company, Madison, Wis. The clock may be placed in the superintendent's office, the cost department or the general office. The registers are usually placed near the foreman's desk beside a rack for the job tickets of the workmen. An eight-day weight-operated pendulum clock is employed. The working day



SWITCHBOARD AND RECORDER

is divided into a certain number of units or periods. These periods are usually taken as tenths of an hour; that is, six minutes. The master clock is so arranged that it controls the operation of the registers for any pay period and permits the registers to advance only during the shop hours. By this method the numbers stamped on the job ticket represent net time only.

The panelboard, which is placed near the clock, consists of a slate panel on which are mounted a knife switch, clips for fuses, resistance units and a signal lamp. The recorder is designed for either direct current or alternating current. The registering machine has only one slot and one lever. Holes are punched in the bottom of the card so that if the workman tries to put his job ticket in upside down a pin drops into these holes and prevents him doing so. When the card is placed in the machine a number is stamped on it by moving the lever either forward or backward. This number represents a certain period. When the job is completed the workman again inserts the card and another period number is printed. The difference between the two numbers gives the amount of time put

on that particular work. At each printing a hole is punched in the card to prevent the workman stamping one number on top of another.

### Conduit Box Strap

A strap for attaching receptacles to outlet boxes is shown in the accompanying illustration. It is designed especially for use with the pancake-type box and deep boxes having no lugs or ears. The device is made in

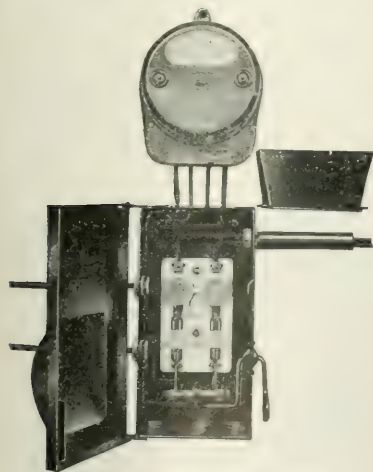


RECEPTACLE ATTACHED TO OUTLET BOX BY STRAP

two types, one for deep boxes and the other for shallow boxes. Either style may be used with or without the fixture stud. In the illustration this strap is shown attached to the fixture strap. The strap is being placed on the market by Pass & Seymour, Inc., Solvay, N. Y.

### Entrance Switch and Cabinet

A service entrance switch and distributing cabinet recently developed are shown herewith. The meter is usually mounted above the cabinet. A meter trim is provided, and when it is in place and the door of the cabinet is locked tampering with the wires is obviated. The cabinet is equipped with knock-outs and there is considerable available space inside the box for wiring purposes. The "square D" cabinet, as it is called, is of

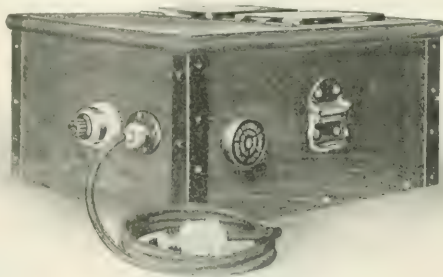


SERVICE SWITCH AND CABINET

sheet steel and is finished in black enamel. Both single-compartment and double-compartment cabinets are being made. The switch and cabinet is the product of the Detroit Fuse & Manufacturing Company, Detroit.

### Demagnetizers

When iron and steel are brought in contact with a magnetic chuck they become more or less permanently magnetized. To counteract this action demagnetizing devices for use on alternating current and direct current have been developed by the D & W Fuse Company, Providence, R. I. The demagnetizing device consists essentially of a continuous U-shaped core made of lam-

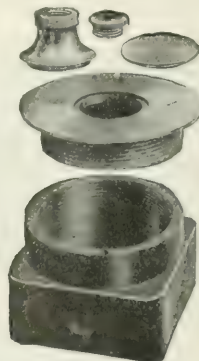


DIRECT-CURRENT DEMAGNETIZER

inated steel, which is energized by two stationary coils through which alternating-current energy is passed. The upturned core ends are fastened to two surface plates across which the pieces to be demagnetized are passed. The core and the coils are inclosed in an oak box reinforced at the corners with metal strips. The surface plates project slightly above the top of the box. A switch for making and breaking the circuit and a cord are provided, and the box is equipped with handles, so that the device can be easily carried about from place to place. The direct-current demagnetizer is equipped with a small converter which changes the direct-current energy to alternating-current energy.

### Cast-Iron Floor Box

A square cast-iron floor box developed by the Frank Adam Electric Company, St. Louis, Mo., is shown in the accompanying illustration. The thread in the box and that of the cover is of standard 3.5-in. pipe size, and therefore the contractor can use a standard tap to clean



SQUARE FLOOR BOX

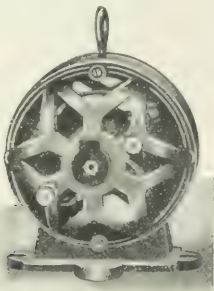
the threads in case they become rusty. The cover is of brass and is  $\frac{1}{8}$  in. thick and 5 in. in diameter. It is provided with a hole to take a standard round attachment plug in connection with a standard flush recep-



tacle, which can be supported on two special studs screwed into the bottom of the box. A nozzle is provided to screw into the brass cover; it is fitted with a gasket and is threaded at the top with a standard 0.75-in. pipe thread to take an insulating bushing. A cap equipped with a slot for screwdriver is also employed when the outlet box is not in service. The exposed parts are finished in polished brass. The above box has been designed particularly for use in post-office buildings.

### Battery-Operated Motor

The motor illustrated herewith is designed for experimental and laboratory work, electroplating, lighting miniature lamps and operating small dynamos and machinery, and it will run on three or four wet or dry

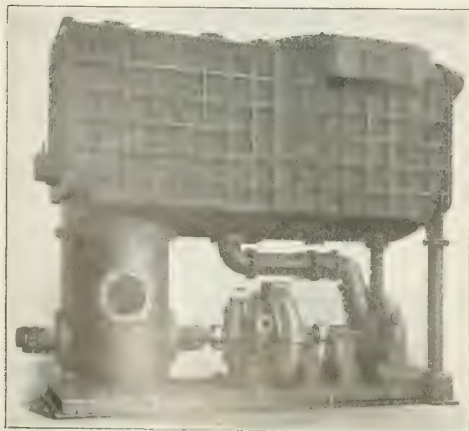


SMALL BATTERY-OPERATED MOTOR

cells. The motor is shunt-wound, and at a speed of 3500 r.p.m. its output is 6 volts and 3 amp. The armature is laminated and has twelve sections. A 1-in. grooved pulley is used with the motor. The apparatus complete weighs 6 lb. The motor is being made by the Menominee Electric Manufacturing Company, Menominee, Mich.

### Rain-Type Counter-Current Jet Condenser

A rectangular rain-type counter-current jet condenser with turbine-driven self-contained auxiliaries is shown in the accompanying illustration. The condenser, which was built for the city of Seattle, Wash., by the

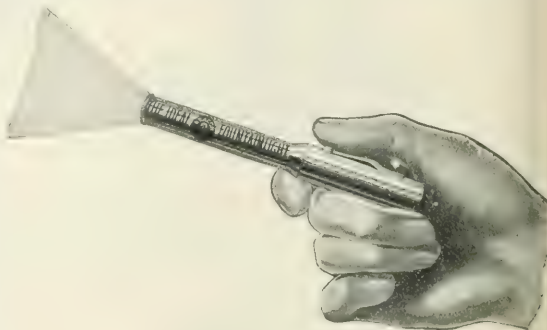


JET CONDENSER WITH TURBINE-DRIVEN AUXILIARIES

Wheeler Condenser & Engineering Company, Carteret, N. J., is capable of condensing 97,500 lb. of steam an hour and maintaining a 28.5-in. vacuum. The illustration shows the discharge of the tail pump, which is of the submerged type and is connected directly to its driving turbine. On the same shaft with this machine is the turbo-air pump. This arrangement makes a very compact and simple unit. Exhaust steam is delivered to the condenser at the top, so that the entire equipment is directly beneath the unit it serves.

### Flashlamp Shaped Like a Fountain Pen

A compact flashlamp shaped like a fountain pen has recently been developed by the Beacon Miniature Electric Company, 108 Duane Street, New York. The device

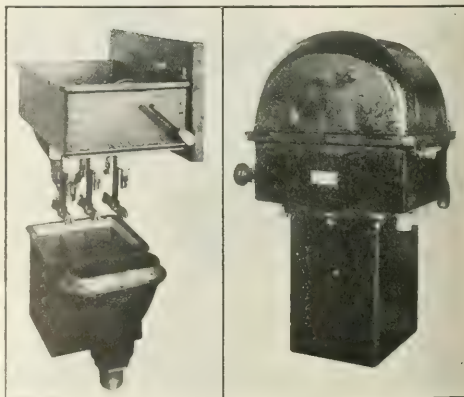


"FOUNTAIN-PEN" FLASHLAMP

consists of a barrel, a cap and a clip. The end of the barrel holds the lamp and the cap incloses the battery. The circuit is closed when the clip is pressed against the casing. When placed in a pocket with the cloth between the clip and the cap the device is held securely, and in this position the lamp cannot be lighted, as the cloth acts as an insulator.

### Oil Switches for Manhole Service

Two types of manhole oil switches for mounting on flat vertical surfaces have recently been developed by the General Electric Company, Schenectady, N. Y. One of the switches is designed for hand operation and the



FIGS. 1 AND 2—HAND SWITCH AND SOLENOID SWITCH

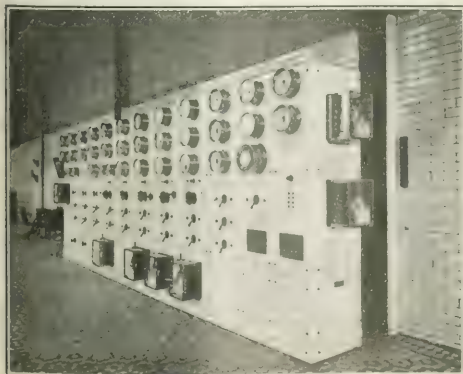
other is worked by a solenoid that is part of the switch.

In the hand-operated switch there are two bell chambers through which run the leads to and from the switch. After the leads are connected to the switch terminals the chamber is filled with an insulating compound and made air-tight. The bell chambers as well as the oil vessel and cover are of cast iron. They are bolted to the cast-iron switch frame, the joints being made water-tight by gaskets. The operating handle is outside the frame and can be operated by a hook from the entrance to the manhole. The shaft handle passes through a stuffing box.

The solenoid-operated switch is as a rule operated by a control switch in the central station. The plunger of the solenoid is directly connected to the crosshead attached to the operating rods. The switch solenoid is energized only when the switch is being closed or opened. The switch is closed by a catch, and it opens by gravity when the switch is thrown out of position either by the trip-coil plunger or by a small tripping lever outside the switch frame. Both switches are equipped with an indicator, which can be seen from the top of the manhole and shows whether the switch is open or closed.

### Large Glass Switchboard

Recent developments in the making, beveling and drilling of massive slabs of glass have made it possible to utilize this substance in the construction of switchboards. In the accompanying illustration is shown a glass switchboard built for Dodge Brothers, Detroit, Mich., by the Mutual Electric & Machine Company, Wheeling, W. Va., which is declared to be one of the largest switchboards of this type ever made. The board is of white Carrara glass and is 1.5 in. thick. All instruments are finished in golden bronze to add to the pleasing appearance of the apparatus as a whole. The board is in the engine room and is used only for control purposes. The generator and feeder switches are operated by solenoids and motors and are on additional switchboards in the basement and other parts of the factory. Mounted on the switchboard is a set of remote-control field discharge switches and "I-T-E" motor-operated circuit-breakers. To the left and right of the control switches on the glass board are mounted red and green signal lamps. The board is used in connection with the control of two 480-volt, 750-kw, three-phase, 60-cycle, steam-turbine units, one 500-kw, three-phase Corliss-engine directly connected unit, one engine-driven exciter and two motor-generator exciter units.



GLASS SWITCHBOARD

### 15,000-Ohm Resistance Unit

A 15,000-ohm resistor, 4 in. long and 7/16 in. in diameter, with a rating of 40 watts, has been developed by the Ward Leonard Electric Company, Bronxville,

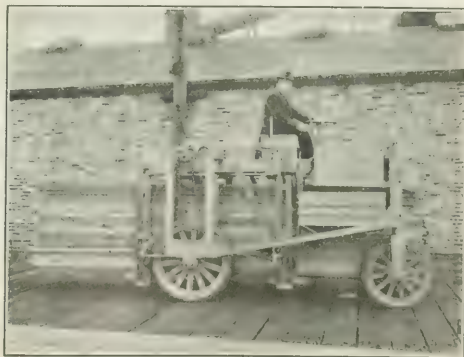


RESISTANCE UNIT

New York. The resistance wire, it is declared, has a temperature coefficient which is practically zero. The wire is in one layer and is protected against oxidation or depreciation. The unit can be employed with a fuse-clip or screw-base mounting.

### Electric Truck for Hauling Lumber

The electric truck shown herewith has recently been designed by the Stetson-Ross Machine Works, Seattle, Wash., and is equipped with "Ironclad-Exide" batteries manufactured by the Electric Storage Battery Company, Philadelphia, Pa. The truck is made of angle irons and I-beams, which are riveted together. The wheels are fitted with solid rubber tires, and springs are provided only under the front wheels. The motor-gear case and jack-shaft are directly behind the driver's seat. The controller is underneath the seat and the batteries are mounted on each side. The truck is designed to be driven directly over a pile of lumber which has been previously raised about 6 in. from the ground. By means of a lever on the side of the driver's seat two side frames, one on each side of the truck, are forced against the pile of lumber and locked into place. After the side frames have been locked in place, the driver's clutch is shifted and the motor is used to hoist the lumber clear of the ground. To unload the truck the cables are released and are controlled by a brake.



ELECTRIC LUMBER TRUCK



# Jobber, Dealer and Contractor

## Sales Campaign Doubles Contractor's Fan Business

Although four contractors and the central-station company handle fans in Springfield, Mo., the Electrical Equipment Company, a contracting firm, did a greater fan business than all of its rivals combined. Mr. J. T.

ELECTRICAL EQUIPMENT CO.	
CITY.	
GENTLEMEN:	
I am interested in electric fans for my	
(Please write name of office or home)	
Please have your representative call, giving me your	
terms and quoting me your very best price. It is understood	
that this does not obligate me in any way.	
Yours very truly,	
Name	
Street No.	

MAILING CARD USED IN FAN SALES CAMPAIGN

Coon, manager of this successful concern, attributes the company's large fan business mainly to aggressive sales effort. At the opening of the fan season circular letters exploiting fans were mailed to practically every user of electricity on the lines of the Springfield Gas & Electric Company. An addressed and stamped post card, similar to the one shown herewith, was sent with each letter. A great many of the cards were filled in and returned, and salesmen following these inquiries were singularly successful. The company's total fan sales for the year were more than twice as great as its sales for any previous season.

## Bureau of Home Economics to Stimulate Demand for Electrical Appliances

The New York Edison Company has recently established a Bureau of Home Economics to disseminate information regarding the nutritive values of foods, to persuade housekeepers that efficiency and economy in the home are greatly increased by electrical equipment and to serve as a place of reference regarding household



"BUREAU OF HOME ECONOMICS"

appliances. By extending this service and gaining the confidence of housekeepers the company hopes ultimately to increase the demand for electrical household appliances and consequently electric service. Information collected by this bureau will be presented to the

public through magazine articles and by lectures and demonstrations on the production and conservation of bodily energy, economy and efficiency as applied to the household, household administration, cooking by electricity, etc.

So far 400 women have registered with the bureau and have requested that they be notified of its lectures. High-school and normal-school teachers, domestic-science schools, etc., are being advised regarding dietetics and technical characteristics and operation of electrical appliances. The bureau is co-operating with women's clubs, home economic associations and domestic-science clubs for the delivery of lectures bearing on the use of electrical devices. The bureau was also represented at the Electrical Exposition and Museum of Safety Exhibits held recently in New York City. Data on the nutritive values of foods and a booklet entitled "Household Engineering," stating the cost of operating various electrical devices, have been distributed quite generally. Return post cards stating the aims of the bureau are now being prepared, by means of which persons can request information available from the bureau.

Plans have been made to equip one floor of the company's Forty-second Street building as a model apartment house. Apparatus for this exhibit will be solicited from all manufacturers for display purposes. These devices will be tested and the results with the method of economic operation will be shown by Misses A. M. East and I. J. Zimmer, who are in charge of the bureau. In this way housekeepers will be enabled to select devices on their merits and will in addition receive the consulting service of these women, who are specially qualified to talk on the energy values of different foods. Miss East is at present visiting appliance manufacturers in the West for the purpose of acquainting them with the aims of the bureau, obtaining information regarding new devices, pointing out the weak points of appliances now manufactured, and describing operation which might be performed by electricity. Eventually teas and informal talks will be given at the bureau headquarters. Orders for appliances will be taken by the bureau, but will be transferred to the manufacturers for filling. The bureau will, therefore, act as a retail jobber, but will receive no commissions from manufacturers or fees from purchasers for its services.

## Lively Electrical Supply Business in Kansas and Missouri

Traveling among the jobbers, contractors and central-station men in Kansas and Missouri, and repeatedly asking the question, "How's business?" a representative of the *Electrical World* finds that snap switches, lamps, sockets and the other electrical details and supplies are still being sold in quantities indicating lively trade conditions. Jobbers and dealers tell the same story everywhere. They say: "Our sales of small devices are as good as ever, if not better," but they generally qualify the statement by saying that larger apparatus is not moving rapidly. Jobbers in Kansas City, Mo., are optimistic and speak spiritedly of the good wheat crop in Kansas. They also point with pride to the increasing bank clearings at Kansas City, which have recently overstepped all precedent and gone above the clearings at St. Louis. Contractors in some of the medium-sized cities report that their 1914 business will be the greatest in the history of their firms.

In nearly all cases these dealers do not hesitate to assign their success to good crops, active central-station co-operation and aggressive sales effort.

# Industrial and Financial News

## Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

**Electric Aluminum Percolator.**—The Hotpoint Electric Heating Company, Ontario, Cal., has recently improved its "El Perco" percolator. Instead of the usual cast spout a pressed-sheet aluminum spout is used. The above company is preparing to manufacture 20,000 of these percolators.

**Small Motor Business Good.**—The Electric Operations Company, formerly the McLeer Electric & Manufacturing Company, Bush Terminal, Brooklyn, N. Y., is noting a good demand for its small-sized motors. This company is also engaged in the repair of motors manufactured by other companies.

**Electric Toys Received Before War.**—The Manhattan Supply Company, 17 Park Place, New York, received a large shipment of electric toys from Germany before the European war began. Business for this company in small battery-operated and motor-driven devices suitable for Christmas presents is good.

**Fan-Motor Business Picking Up.**—An improvement in the fan-motor business has been noted by the Menominee Electric Manufacturing Company, Menominee, Mich. The company is also receiving many orders for other types of small motors. The business in toy motors is not so good as it was at this time last year.

**High-Efficiency Tungsten Lamp Load at Louisville.**—Since the first of October the commercial department of the Louisville (Ky.) Gas & Electric Company has been conducting a campaign to popularize the use of nitrogen-filled tungsten lamps in Louisville. Since the beginning of the campaign a total of more than 100 kw of this type of lighting load has been added to the company's lines.

**No Shortage of Electrical Toys from Germany.**—John Bing, 381 Fourth Avenue, New York, representing Bing Brothers, Nuremberg, Germany, is receiving shipments of electrical toys from Europe in spite of the war. The above concern manufactures various types of electrically operated miniature trains, electric railway-signal systems, miniature electric cranes, etc. A large supply of electric toys from Bing Brothers is now on hand at the New York establishment.

**Electrically Operated Reversible Planer.**—The Allis-Chalmers Company, Milwaukee, Wis., has developed a compound-wound motor for use with reversing planers. The motor is equipped with four commutating poles which are connected in series with the armature. The machine is automatically reversed at the end of the cutting and return strokes. The control equipment and brake employed with the motor are being made by the Electric Controller & Manufacturing Company, Cleveland, Ohio.

**Flashlamp Company's Business Good.**—Although comparatively a new concern, the Beacon Miniature Electric Company's business in flashlamps has been very good. The company has recently developed a small vest-pocket-size flashlamp shaped like a fountain pen. This device has a clip so that it can be fastened to the pocket in the same manner that one fastens a fountain pen. This lamp, it is declared, is meeting with considerable favor. The above company is also an importer of special small-sized decorative lamps for trimming Christmas trees. These lamps come chiefly from Germany, and on account of the war it is very difficult to obtain regular shipments. The offices of the above company are at 108 Duane Street, New York.

**Toy Transformers.**—The Dongan Electric Manufacturing Company, 741 Franklin Street, Detroit, Mich., has recently improved its type "F" and "master" toy transformers. These transformers are of the lever-control design and are

equipped with a small low-voltage fuse in the secondary or low-voltage windings. In case of a short-circuit of the toy or if a train should jump the track, causing a short-circuit, the fuse will be blown, thus protecting both the transformer coils and house fuses. Being of the standard 6-volt automobile type, the fuse can easily be replaced. The popularity of these transformers for use in operating toy motors, miniature trains and similar devices during the holiday season last year was marked.

**Shallow Flush Push-Button Switches.**—The Chelton Electric Company, Philadelphia, Pa., is manufacturing shallow flush push-button switches which are meeting with favor in residences, apartment houses, hotels, etc. Installations of these devices have been made in the following buildings: Woodward Building, Washington, D. C.; Empress Hotel, Victoria, B. C.; Detroit Athletic Club, Detroit, Mich.; the Brighton Apartments, Washington, D. C.; E. T. Stotesbury residence, Philadelphia, Pa.; Asylum for Insane, Battleford, Sask.; Philadelphia Stock Exchange, Philadelphia, Pa.; the Dresden Apartments, Washington, D. C.; Vassar College, Poughkeepsie, N. Y.; State Capitol, Albany, N. Y.; Charlevoix Apartments, Cleveland, Ohio; Trinity Court Apartments, Boston, Mass.; Campbell Building, Victoria, B. C.; General City Hospital, Winnipeg, Manitoba; American National Bank, San Diego, Cal.; Alcazar Hotel, Vancouver, B. C. The above company also manufactures various types of switch boxes, clamps, etc.

**Hydroelectric Power Plant Contract Awarded in Massachusetts.**—The Amherst Power Company, whose headquarters are at Greenfield, Mass., has awarded contracts for the construction of a 36,000-kw hydroelectric plant at Montague City, near Turners Falls, to Fred T. Ley & Company, of Springfield, Mass., and to Thomas Brothers, Turners Falls. The former will handle the steel and concrete work and the latter the brickwork and masonry. The generating plant will be 150 ft. by 96 ft. and 56 ft. high, with an operating room 45 ft. by 50 ft. in dimensions. Work will be started immediately, and it is planned to begin the installation of machinery on March 1, 1915. Energy will be supplied from this plant to the high-tension network of the company in the central Connecticut Valley, which includes 70,000-volt transmission lines connecting with the system of the United Electric Light Company at Springfield, connections to the auxiliary steam-turbine plant of the company at Mount Tom Junction, and arrangements for the sale of energy for industrial purposes in the Turners Falls district. The Cabot interests, of Boston, are in control of the project.

**Earnings of Byllesby Utility Properties.**—Consolidated net earnings of the utility properties managed by H. M. Byllesby & Company, Chicago, for October were 10.7 per cent greater than for the same month of 1913. For the ten months ended Oct. 31 the gain in net was 7 per cent. The October showing, therefore, was considerably better than the average for the year thus far and bears out the contention that war conditions have not seriously impaired the net earnings of electric and gas companies, although the gain in gross is not so satisfactory. The Byllesby group of properties is fairly representative as it includes the subsidiaries of the Standard Gas & Electric Company, the Northern States Power Company and the Western States Gas & Electric Company, operating in sixteen states of the Middle West, West and South. The consolidated earnings of the Byllesby properties for October were: Gross, \$1,201,703; net, \$592,408, an increase over October, 1913, of \$20,150 and \$57,255 respectively. For the ten months ended Oct. 31 the earnings were: Gross, \$11,721,719; net, \$5,421,606, an increase over the corresponding months of 1913 of \$289,334 and \$355,723 respectively.



## Corporate and Financial

**Money Invested Best Value for Rate Fixing.**—H. F. McConnell & Company, of New York, in reference to public utility securities said: "The amount of money invested in a public utility property is the best evidence of value for rate-fixing purposes."

**Panama Canal and Pacific Coast.**—The *Commercial and Financial Chronicle* has issued with the current number an extra section on the Panama Canal and the Pacific Coast. Special articles are contributed by men of prominence. A portion of the book is reserved for descriptions of the securities and reports of industrial and public service companies and banks of the Far West.

**Seven Cities Company Out of Temporary Receivership.**—Mr. C. M. Garsaway, general manager of the Seven Cities Company of Russellville, Ark., stated that the company went out of temporary receivership early in November and that litigation has been dismissed by compromise. Mr. A. Brewster is chairman of the board of directors, and Mr. Henri Chouteau is president of the company.

**Proceeds from Consolidated Gas Debentures.**—The proceeds from the \$25,000,000 of debentures authorized recently by the Public Service Commission, First District, are to reimburse the company for money expended in acquiring capital stock of the New York Edison Company and the Astoria Light, Heat & Power Company; also to discharge \$5,000,000 of collateral-trust notes and \$2,500,000 of demand notes.

**Republic Railway & Light Sells Assets of Subsidiaries.**—The Republic Railway & Light Company, of Youngstown, Ohio, announces progress on the plan for unifying the corporate organization of the companies. Assets of the Youngstown-Sharon Railway & Light Company and Sharon & Newcastle Railways Company have been sold to the Mahoning & Shenango Railway & Light Company, and the two former companies have been dissolved.

**Lighting Companies Come Under Court Control.**—The court control in Kansas City, Mo., which heretofore had embraced only the Metropolitan Street Railway Company, was extended Monday by Judge Hook to include the Kansas City (Mo.) Electric Light Company and the Standard Electric Company of Kansas City, Kan. The lighting companies are in effect operating now under receiverships subject to the court, except that no receivers have been appointed.

**Pacific Gas & Electric Purchases Notes.**—In response to its request for tenders of \$2,500,000 of one-year 5 per cent gold notes, due March 25, 1915, the committee, composed of the Bankers' Trust Company of New York, Harris, Forbes & Company and N. W. Halsey & Company, received tenders of \$3,751,000 of notes. The company purchased \$2,511,000 of these notes at prices which netted approximately 1 per cent in comparison with the call price of the notes.

**Northern California Power Company Assessment.**—The assessment of \$2 per share recently levied by the Northern California Power Company had raised \$130,000 on Nov. 7, according to a statement by the secretary, who also said that many of the large stockholders had not yet paid but had expressed their intention of paying before the day of the delinquent sale. By delaying action these stockholders save interest and lose only about \$1.50, the cost of the advertisement.

**Ohio Light & Power Bond Offering.**—Perry, Coffin & Burr, of Boston, and N. W. Harris & Company are offering at 90 and interest \$1,200,000 of first mortgage 5 per cent gold bonds of the Ohio Light & Power Company, of Tiffin, Ohio. The bonds are dated May 1, 1914, and are due on May 1, 1944. They are secured by a first mortgage on all the property and franchises of the company, which does the entire commercial and, with one exception, the entire municipal electric lighting and motor-service business of eleven cities and towns in the central and northwestern sections of Ohio. The population served is estimated to exceed 100,000. The company is controlled by the American Gas & Electric Company of New York.

**The Ohio Service Company.**—The Ohio Service Company has been organized recently for the purpose of consolidating four separate companies in the counties of Guernsey, Tus-

carawas and Coshocton, Ohio, namely, the County Electric Company, Twin City Traction Company, New Midland Power & Traction Company, and Lafayette Light & Power Company. The corporate existence of the Tuscarawas County Electric Light & Power Company, which has been held alive but has not been an operating company, will be ended. The merger will take place as soon as the respective mortgages can be satisfied. For the purpose of refunding these mortgages the Ohio Public Service Commission has authorized the Ohio Service Company to issue \$925,808 three-year notes. Most of the bonds, as well as all the stock of the various companies, are owned by the United Service Company of Scranton, Pa., so that only a little over \$250,000 notes will be held in reserve to refund bonds not immediately obtainable. It is stated that all the outstanding bonds will be obtained within the three years, and then a twenty-year first mortgage bond issue will be made and the three-year notes retired.

**Annual Report of Virginia Railway & Power.**—The annual report of the Virginia Railway & Power Company for the year ended June 30, 1914, shows gross earnings of \$5,156,048; deducting \$2,565,908 for operating expenses, including depreciation, and adding \$80,910 for other income, leaves \$2,671,050 as gross income. When fixed charges and rentals of \$1,307,348, taxes and licenses of \$308,112 and direct charges of \$83,685 were deducted from gross income a surplus of \$971,905 was left. Dividends of \$781,949 left a surplus of \$189,956. Expenditures for maintenance of way and equipment were increased during the fiscal year to 16.01 per cent of gross earnings, as compared with 14.99 per cent for the fiscal year ended June 30, 1913. In addition to the regular charges for maintenance of way and equipment, \$100,000 was set aside in cash in monthly instalments during the year as a depreciation reserve and charged to operating expenses. President Thomas S. Wheelwright states: "The company has continued its policy of liberal expenditures for maintenance of property and equipment during the past year and has carried forward comprehensive plans for improvements with a view to keeping the physical and operating conditions up to, or in advance of, the needs of the service."

**Shoshone & Twin Falls Refinancing Plan.**—The bond-secured note holders' protective committee of the Shoshone & Twin Falls (Idaho) Water-Power Company has deposits, in accordance with the agreement for refinancing of July 27, 1914, of approximately 70 per cent of the outstanding notes. Only a very small amount of the matured notes has been deposited. Holders of the matured notes, claiming that by reason of their maturity they should be paid, refused to accept the plan of July 27 without modification, and therefore the committee has presented a modified form for refinancing. It states that the outstanding \$115,000 first mortgage bonds may be surrendered by holders in exchange for \$92,000 of 6 per cent bond-secured notes to be deposited with the committee. The total outstanding notes will then be \$1,872,000, to be secured by \$2,340,000 first mortgage bonds. The committee will cause the property to be sold for the benefit of depositing note holders and conveyed to a new company. The new company shall issue its entire full-paid, non-assessable capital stock in payment for the property, in amount equal in par to the face value of the 6 per cent notes deposited. The American Water Works & Electric Company, a creditor, shall advance as the committee may call upon it the reasonable expenses of foreclosure and reorganization. The entire stock of the new company shall be deposited in escrow with the Commonwealth Trust Company, of Pittsburgh, which shall issue certificates of participation of par value equal to the notes. Such certificates shall be distributed to depositing note holders pro rata, who will receive cash equal to accrued interest upon their notes from the date of issuance of the certificates. The American company shall pay holders of the certificates every six months for a period of five years 6 per cent interest on the par value of the 6 per cent exchanged collateral notes. The American company shall have the option at any time within five years to purchase the entire stock of the new company by paying in cash the par value of the deposited notes with accrued interest at 6 per cent. The members of the committee are Messrs. Alvin W. Krech, H. Hobart Porter and A. C. Washington Robinson.

## WESTERN COMPANIES DO WELL

**Electric Utilities of the Pacific and Mountain States Show a Satisfactory Growth—Companies in Small Towns Experience Surprisingly Large Increase**

The returns for September operations from the companies in the Pacific and Mountain States show approximately a 4 per cent growth over the corresponding period of the preceding year. A glance at the 1913 column will show that September in the West is naturally a dull and quiet period. It is indeed surprising that the companies should show a growth during this time, especially when one

TABLE I—COMPARATIVE RETURNS FROM COMPANIES IN SIX LARGE CITIES IN CALIFORNIA, WASHINGTON, OREGON, UTAH AND COLORADO, REPRESENTING OVER 60 PER CENT OF ELECTRIC UTILITY INDUSTRY OF PACIFIC AND MOUNTAIN STATES

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
June	\$1,569,297	\$1,559,596	5.1	140,494,562	129,504,858	8.5
July	1,645,688	1,531,493	9.6	144,776,151	131,387,904	10.4
August	1,642,096	1,595,891	3.0	145,646,601	140,920,218	3.4
September	1,705,518	1,675,800	2.4	141,335,639	139,320,517	1.5

takes into consideration the added depression of the present year.

Figures in Table I need no comment. It will be noted by reference to Table II that companies in small cities in the West did better in September than in any of the four previous months. By comparing Tables III and IV it will also be noted that the Pacific States had a better growth rate in output and a poorer growth rate in income than the Mountain States during September. Companies in the Mountain States have for some time past been making a

TABLE II—COMPARATIVE RETURNS FROM COMPANIES IN SIX SMALL CITIES IN NEW MEXICO, ARIZONA, WASHINGTON, WYOMING AND IDAHO, REPRESENTING LESS THAN 1 PER CENT OF THE INDUSTRY OF THE PACIFIC AND MOUNTAIN STATES

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
May	\$55,828	\$54,103	3.3	1,613,341	1,770,549	*8.8
June	54,753	55,509	*1.5	1,262,265	1,645,528	*23.3
July	58,250	56,405	3.5	1,488,605	1,756,973	*15.2
August	59,361	54,718	8.3	1,649,420	1,747,405	*5.6
September	62,872	56,190	12.0	1,843,610	1,676,564	10.0

\*Decrease.

special effort toward increasing their domestic customers. One large company stated that the motor-service load was so uncertain that special efforts had to be made to increase the number of domestic users of electrical energy. Table V shows that while there has been a depreciable loss in the income growth rate, the great loss came in the output growth rate.

Industrial conditions during the month of September in the Far West were far from being good. While business picked up some toward the end of the month, in the first half business was decidedly irregular and unusually dull. The Mountain States reported cheerful indications in the first week in September with heavy orders for winter goods. While the retail trade was generally dull in the Mountain

States in this month, it was unusually so in the second week of September. In the third week the general business had somewhat improved, especially in the drug trade. The

TABLE III—COMPARATIVE RETURNS FROM OVER 60 PER CENT OF THE CENTRAL-STATION INDUSTRY OF THE PACIFIC STATES OF CALIFORNIA, WASHINGTON AND OREGON

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
June	\$1,329,041	\$1,261,966	5.2	110,466,824	102,761,425	7.6
July	1,323,118	1,245,135	6.2	114,993,629	106,422,888	8.0
August	1,331,820	1,290,076	3.2	119,418,013	114,033,423	4.8
September	1,397,664	1,357,338	3.0	116,465,943	112,570,232	3.7

steel mills were running on half time because there was practically no demand for rails. In the fourth week there was little change. Conditions, however, were promising. The indications were favorable the first week along the

TABLE IV—COMPARATIVE RETURNS FROM OVER 80 PER CENT OF THE CENTRAL-STATION INDUSTRY OF MOUNTAIN STATES OF COLORADO, NEW MEXICO, UTAH, ARIZONA, WYOMING, NEVADA AND IDAHO

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
June	\$565,849	\$539,962	4.8	44,859,631	39,074,902	14.8
July	586,453	528,292	11.0	44,686,495	37,832,222	18.0
August	604,612	582,021	3.8	47,038,849	44,714,822	5.2
September	603,018	577,413	4.0	40,642,974	40,953,155	*0.7

\*Decrease.

Coast, and an improvement was generally expected. During the second week, however, there was considerable irregularity, depression in many lines and improvement in

TABLE V—RETURNS RECEIVED FROM THE CENTRAL-STATION INDUSTRY OF THE PACIFIC AND MOUNTAIN STATES

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
May (60 per cent of industry)	\$1,525,729	\$1,426,885	7.0	144,839,552	129,357,915	11.9
June (70 per cent of industry)	1,894,887	1,791,918	5.8	155,326,455	141,836,377	9.6
July (75 per cent of industry)	2,212,827	2,085,189	6.8	183,160,015	169,718,357	7.9
August (78 per cent of industry)	2,386,677	2,282,061	4.6	193,216,699	185,330,705	4.2
September (78 per cent of industry)	2,457,513	2,308,176	3.7	190,979,705	185,090,658	3.2

others; sales were diminished and prices advanced. The Northwest was considerably helped by the excellent salmon market. Lumber was very much depressed, but flour millers were doing very well. A good trade has been developed



in the Orient for paper pulp, paint and preservatives. The enormous tie-up in shipping, however, was a great hindrance to the export trade. In the third week general business was still quiet, but some lines were recovering, with many becoming fairly active. Prices were generally higher. The activities of the wheat market made a very irregular trade for the millers. The sugar refineries were preparing for increased business and manufacturing developments were generally active, owing to a decision of the Interstate Commerce Commission in reducing eastbound rates. In the fourth week business was not very active, although it was somewhat better. The outlook became rather encouraging.

## Business Notes

**The Menominee Electric Manufacturing Company.**—L. M. Wood, formerly sales manager for the Menominee Electric Manufacturing Company at Menominee, Mich., is now sales manager of the territory designated as the southern district, and his headquarters are at St. Louis.

**The Edison Storage Battery Company,** Orange, N. J., has appointed W. F. Bauer manager of its Chicago office to succeed C. B. Frayer, who has retired to devote himself to private interests. Mr. Bauer was formerly connected with the Electric Accumulator Company, the Westinghouse Electric & Manufacturing Company and the Pullman Company.

**Reed & Leonard.**—C. G. Reed and C. Leonard have formed a partnership to deal in electrical material and will represent manufacturers of Baltimore, Washington and vicinity. The office of this firm will be at No. 705 American Building, Baltimore, Md. Both Mr. Reed and Mr. Leonard were formerly connected with the Westinghouse Electric & Manufacturing Company. The above firm will succeed the establishment of Clinton G. Reed, 100 West Fayette Street, Baltimore, Md.

## New Industrial Companies

**The Flanders Electric Company,** of Chicago, Ill., has been incorporated with a capital stock of \$25,000 to manufacture electrical appliances. The incorporators are J. P. O'Shaughnessy, J. P. Rosen and J. L. Toohey, of Chicago.

**The Caledonian Electric Company,** of New York, N. Y., has been incorporated with a capital stock of \$5,000 to manufacture motors, machinery, fixtures, etc. The incorporators are H. A. Malcolm, T. G. Canon and J. J. Rafferty, 30 East Forty-second Street, New York, N. Y.

**The Huron Bay Construction Corporation,** of New York, N. Y., has been chartered with a capital stock of \$25,000 to do a general civil, mechanical, electrical engineering and contracting business. The incorporators are C. V. Fanning, of Greenport; W. J. Cunningham, of Richmond Hill, and H. Speicher, of Glendale, N. Y.

## Trade Publications

**Hickes.**—The Wilton Manufacturing Company, Wrightsville, Pa., has published Bulletin No. 32, entitled "The Wi-co Hangstrait Hickey."

**Steel Boxes.**—Steel service and cut-out boxes are the subject of a leaflet issued by the Electric Operations Company, Bush Terminal, New York.

**Motor Starters.**—Automatically controlled motors are the subject of a bulletin being printed by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

**Electric Drill.**—A drill operating on either alternating or direct current is referred to in a folder issued by the Van Dorn Electric Tool Company, Cleveland, Ohio.

**Arc-Lamp Controller.**—The Speed Controller Company, 257 William Street, New York, has issued several booklets which describe its motor-driven arc-lamp controller.

**Applications of Ball Bearings.**—"Ball Bearings and Their Correct Use" is the subject of folders sent out by the Hess-Bright Manufacturing Company, Philadelphia, Pa.

**Insurance for Utilities Companies.**—The Utilities Mutual Insurance Company, 51 Wall Street, New York, has issued a booklet entitled "Insurance at Absolute Cost."

**Field Rheostat.**—The Ward Leonard Electric Company, Bronxville, N. Y., has issued Circulars No. D13 and D14, which describe a recently developed 6-in. field rheostat.

**Ball Bearings.**—Ball bearings for paper-making machinery are described in Bulletin No. 21, published by the SKF Ball Bearing Company, 50 Church Street, New York.

**Underfeed Stokers.**—The Sanford Riley Stoker Company, Worcester, Mass., has published a thirty-two-page illustrated catalog which describes its self-dumping underfeed stokers.

**Insulating Material.**—A forty-six-page catalog describing various insulating materials placed on the market by the Continental Fire Company, Newark, Del., has recently been published.

**Annunciator Target.**—An electrically reset annunciator drop which is unaffected by vibration is described in a catalog issued by Edwards & Company, 140th Street, New York City.

**Table for Electric Sewing Machine.**—A convertible table for motor-driven sewing machines is described and illustrated in a leaflet issued by the Bissell Motor Company, Toledo, Ohio.

**Molded Insulation.**—In a thirty-six-page catalog recently published by the Bonton Rubber Manufacturing Company, Bonton, N. J., are described various substances used for insulating purposes.

**Milk Clarifiers.**—Motor-driven centrifugal milk clarifiers capable of handling 100 lb. to 2000 lb. of milk an hour are illustrated in a folder published by the De Laval Separator Company, New York City.

**Railway Motors.**—The General Electric Company, Schenectady, N. Y., is sending out Bulletin No. 44,404, which describes a recently developed 600-volt ventilated commutating-pole railway motor.

**Tools for Christmas Presents.**—Descriptions of tools suitable for Christmas presents are described in a folder recently issued by the Smith & Hemenway Company, 150 Chambers Street, New York.

**Electrical Devices for Christmas Presents.**—The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued an attractive folder which lists various devices suitable for Christmas gifts.

**Automobile Lighting Switches.**—The Hartman Electrical Manufacturing Company, Mansfield, Ohio, has issued a bulletin designated as No. 10, which describes lighting switches and starter switches for automobiles.

**Combined Volt-Ammeter.**—In a folder sent out recently by the Hoyt Electrical Instrument Works, Penacook, N. H., is described a double-faced instrument for measuring the voltage and current in a circuit simultaneously.

**Storage Batteries.**—"The Dry Battery: A Symposium," is the subject of a leaflet which enumerates some of the features of dry batteries and which is issued by the Nungesser Carbon & Battery Company, Cleveland, Ohio.

**Automatic Pumping Equipment.**—Features of the Eureka motor-driven automatic pumping equipment are given in a leaflet which is being distributed by the Bishop-Babcock-Becker Company, 431 Lafayette Street, New York City.

**Distributing Transformers.**—Bulletin No. 1088, published by the Allis-Chalmers Manufacturing Company, Milwaukee, Wis., describes and illustrates various types of distributing transformers. This bulletin supersedes Bulletin No. 1077.

**Electric Cooker.**—An electric-steam oven which will automatically maintain a uniform temperature and start cooking at a definite time is described in a booklet prepared by the Berkeley Electric Cooler Company, 228 Monadnock Building, San Francisco, Cal.

**Transformers for Stop-Motion Equipment.**—The General Electric Company, Schenectady, N. Y., has just issued a bulletin designated as No. 48,015, which describes its Type M transformer for operating stop-motion magnets with equipment used in the textile industry.

## Personal Mention

**Mr. Frank Stout**, for many years New York manager of the Bryant Electric Company, has resigned.

**Mr. William F. Woerner** has resigned as member of the Public Service Commission of Missouri to give his attention to private affairs.

**Mr. E. J. Bean**, formerly attorney for the Public Service Commission of Missouri, has succeeded Mr. William F. Woerner as member of the same commission.

**Mr. S. E. Smith** has resigned as manager of the new-business department of the Atlantic City Electric Company, Atlantic City, N. J., on account of illness, and has moved to Denver, Col., in an effort to regain his health.

**Mr. B. Elshoff** has recently resigned his position as superintendent of the electrical department of the Canadian Westinghouse Company, Ltd., to become works manager of the Diehl Manufacturing Company, Elizabeth, N. J.

**Mr. G. Masunaga**, electrical engineer to the Imperial Government Railways, Tokyo, Japan, is on a tour of inspection of the electrified railways of the United States. Mr. Masunaga is interested particularly in block-signal protection for electrified tracks.

**Mr. Henry Grenacher**, for a number of years connected with the engineering department of H. M. Byllesby & Company, has been appointed efficiency engineer of the company to co-operate with managers of its various properties in improving their plant efficiencies.

**Mr. D. S. Harris**, who two years ago resigned as special representative of the Westinghouse Lamp Company to become general agent of the National District Telegraph Company, New York, has been appointed assistant to Mr. W. L. Jacoby, vice-president of the American District Telegraph Company, New York.

**Mr. Oscar T. Crosby** has just returned to America after spending a year abroad. He has traveled in Spain, Algeria, Tunisia, Egypt, Turkey, India, Borneo, Ceylon, the Federated Malay States, Java and Japan. He returned to the United States through China, taking the Trans-Siberian Railway to Russia. Mr. Crosby left Pekin after the war was started but found it easy to get out of Russia by way of Finland, Sweden and Denmark. From Denmark he entered Germany, and went to Holland, thence going to England. He also traveled a considerable distance in France and returned from there to Kemp, from which he sailed.

**Mr. Kempster B. Miller**, of the firm of McMeen & Miller, consulting engineers, Chicago, has been appointed chief engineer for the receivers of the Central Union Telephone Company. The appointment took effect Dec. 2. Mr. Miller

will continue to make his headquarters at Chicago, devoting only a portion of his time to the affairs of the receivership. The new chief engineer for the receivers of the Central Union company is widely known as a telephone engineer and as the author of the standard work "American Telephone Practice." Mr. Miller also collaborated with his partner, Mr. McMeen, on the "Telephony" series of papers on telephone engineering subjects. He is a graduate of Cornell University and prior to 1896 served on the examining staff of the Patent

Office at Washington. From 1896 to 1898 he acted as chief electrician of the Western Telephone Construction Company, Chicago, and from 1899 to 1905 was engineer for the Kellogg Switchboard & Supply Company, Chicago. Since 1904 Mr. Miller has been practising as a consulting engineer under the firm name of McMeen & Miller. He is a member of the American Institute of Electrical Engineers, the New York Engineers' Club, the Chicago Engineers' Club and the Union League Club of Chicago.

**Mr. Frank E. Watts** has resigned as Eastern manager of the *Electrical World*. Prior to his connection with the advertising department of this publication Mr. Watts was employed by the Western Electric Company. He is widely known in the electrical industry, being a past-Jupiter of the Jovian order. Recently he was appointed first Tribune of that order in New York.

**Mr. J. W. Graham**, of Twin Falls, Idaho, has been appointed to fill the vacancy left on the Idaho Public Utilities Commission by the resignation of Judge D. W. Standrod. Mr. Graham is a lawyer by profession, a native of Canada, and was educated at the University of Nebraska. The appointment which he has just accepted will hold until four years from the first Monday of January, 1914.

**Mr. Ryotaro Mitsuda**, electrical engineer to the Japanese Imperial Department of Communications, is visiting the United States to observe recent progress in the electrical industry. Mr. Mitsuda recently spent four weeks at the Schenectady (N. Y.) plant of the General Electric Company, and last week was in Rochester, N. Y., investigating certain features of the Rochester Railway & Light Company's underground distribution system.

## Obituary

**G. L. Chapin**, a member of the staff of the Society for Electrical Development, Inc., died at his home in Newark, N. J., on Nov. 24 after a short acute attack of pleuro-pneumonia. For a number of years Mr. Chapin was connected with the General Electric Company, serving in its Pittsfield (Mass.) and Harrison (N. J.) works.

**Douglas S. Martin**.—Cable advices report the death at the Boulogne Hospital, France, from shrapnel wounds in the knee received at the battle of Messines, on the Belgian border, of Douglas S. Martin, of New York City, who left there early in August to enrol in the mounted forces of Great Britain. He was a grand-nephew of Dr. Samuel Smiles, the famous author of "Self Help," "Lives of the Engineers," etc. On Mr. Martin's graduation from the Central Technical College, London, where he studied under the late Professor Ayrton, he entered the British Thomson-Houston works at Rugby, England, and shortly afterward came to this country, in 1911, and took up the assistant editorship of the *General Electric Review* at Schenectady, soon becoming editor. Desiring to

secure a fuller knowledge of the electrical arts from practical field work, particularly modern high-tension power transmission, he resigned his position in July, 1913, going to Vancouver, B. C., and then visiting the whole Pacific Coast, meantime keeping his prolific pen quite busy. Early in this year he returned East and joined the editorial staff of the *Electrical World*. He organized the more recent statistical work of this paper, constituting practically a new department, of which he remained in charge until his departure for the front. Having already served in the yeomanry and being a dashing horseman as well as a crack shot, he sought an opportunity to get to the fighting line and, to use his own phrase, "by the greatest of good luck" was drafted into the Sixteenth Lancers, which went to the war immediately. Mr. Martin was a frequent contributor to leading newspapers and magazines here and in England, and his last article, on the electric lighting of highways, appeared in the September *Engineering Magazine*. He had also a poetic faculty, and some of his verses appeared on the editorial page of the *New York Times* this summer. Mr. Martin was only twenty-seven years of age. He was a brother of Mr. T. C. Martin, secretary of the National Electric Light Association.



D. S. MARTIN



K. B. MILLER



## Construction

## New England

**PLAINFIELD, N. H.**—The Public Service Commission has granted the Windsor Electric Light Co., of Windsor, Vt., permission to supply electricity to the town and also to extend its transmission lines into the town at its discretion.

**BURLINGTON, VT.**—The city has voted to authorize the City Council to issue \$40,000 in bonds, the proceeds to be used for miscellaneous improvements to the municipal electric-light plant.

**NORTH ATTLEBORO, MASS.** Plans have been submitted to the Electric Light Commissioners by the town for improvements to the lighting system on Washington Street. William H. Martin is superintendent of the municipal electric-light plant.

**STOCKBRIDGE, MASS.**—Within the next two months the Stockbridge Ltg. Co. expects to erect 2 miles of overhead distribution lines and install about 1/2 mile of underground distribution lines; also to purchase 2 miles of 2-in. insulated line wire, 1/2 mile of 4400-volt, twin-conductor cable and all necessary equipment for service extensions, several motors for small power consumers and two electric pumping plants. Joseph Franz is engineer.

**SURSFIELD, MASS.**—Within the next four months the managers of the municipal electric-light plant expect to install one 319-hp. Heine boiler, for 200-lb. working pressure, and superheater, for which contracts have already been placed. Also to purchase within the next three months shafting and grates for above. H. B. Willard is manager.

**HARTFORD, CONN.**—The Hartford Electric Co. has practically completed the erection of a 22,000-volt (steel-tower) transmission line to Unionville. A. D. Colvin is assistant general manager.

## Middle Atlantic

**BROOKLYN, N. Y.**—Bids will be received by C. B. J. Snyder, superintendent of school buildings, Department of Education, corner of Park Avenue and Fifty-ninth Street, New York, until Dec. 7 for additions, alterations and repairs to electric equipment in the Boys' High School and in Public Schools 82, 126 and 141, borough of Brooklyn. Bids will also be received at the same time and place for installing an electric elevator in the Manual Training High School, on Seventh Avenue, between Fourth and Fifth Streets, borough of Brooklyn. Blank forms, plans and specifications may be obtained or seen at the office of the superintendent, Park Avenue and Fifty-ninth Street, borough of Manhattan, and also at branch office, No. 131 Livingston Street, borough of Brooklyn.

**BUFFALO, N. Y.**—Bids will be received at the office of the Department of Public Works, Room 5, Municipal Building, Buffalo, N. Y., until Dec. 15 for an electric lighting and power plant for the Porter Avenue pumping station. Plans and specifications can be seen and forms of proposals can be obtained upon application to the Bureau of Waterworks. G. Ward is commissioner of public works.

**NEW YORK, N. Y.**—Bids will be received by C. B. J. Snyder, superintendent of school buildings, Board of Education, Park Avenue and Fifty-ninth Street, New York, until Dec. 7 for alterations and additions to the electric-light equipment in the Jamaica Training School, on Flushing and Highland Avenues, borough of Queens. Bids will also be received at the same time and place for alterations and additions to the electric equipment in Public School 15, on St. Paul's Avenue and Grand Street, Tompkinsville, borough of Richmond. Blank forms, plans and specifications may be obtained or seen at the office of the superintendent, Park Avenue and Fifty-ninth Street, borough of Manhattan, and also at branch offices, 63 Broadway, Flushing, borough of Queens, and Borough Hall, New Brighton, borough of Richmond.

**POUGHKEEPSIE, N. Y.**—Plans, it is reported, are under way for the organization of a stock company to furnish electricity to mills and motors to the villages of northern Dutchess County and include those of Milan, Pine Plains and Stanford. The plans, it is understood, provide for the construction of a large power station on the banks of the Rokillt. Jensen Kill, about 10 miles north of Pine Plains, in the vicinity of Mount Ross. Chester Husted, 227 Union Street, Poughkeepsie, is interested in the company.

**EASTON, PA.**—The Easton Light & Power Co. has been introduced in the City Council providing for

a bond issue of \$16,300, of which \$4,200 will be used for extensions and improvements to the street-lighting system. The City Council has awarded the contract for the installation of the ornamental lamp standards on Northampton and Third Streets to the Macan, Jr., Co., of Easton, at \$5,675. A. T. Koehler, electrical engineer, is in charge of the project.

**FREMANSBURG, PA.**—The Borough Council has granted the Freemansburg Electric Light & Power Co. a franchise to supply electricity for lamps, heaters and motors in Freemansburg and adjacent territory. The company also gave the company a contract for lighting the streets of the borough for a period of five years. The contract calls for 26 lamps of 32 cp. A. H. S. Cantlin is president and general manager of the company.

**HANOVER, PA.**—The Public Service Commissioners have approved the contracts and franchises awarded on Nov. 5 by the Hanover Township Commissioners to the Luzerne County Gas & Electric Co., of Plymouth. The contract calls for furnishing 150 lamps at \$60 each per year for a period of 10 years. The company is also given a franchise to erect new lines and lay gas mains if needed. H. G. Williams is general manager of the Luzerne company.

**STOWE, PA.**—Bids will be received by H. B. Parkinson, Woodward Avenue, McPherson, Pa., until Dec. 7 for alterations and additions to the Davis School Building in Stowe Township. Separate bids will be submitted for plumbing work, electric wiring, etc. Plans and specifications are on file at 46 Conestoga Building, Pittsburgh, Pa.

**SOUTH ORANGE, N. J.**—Estimates have been prepared by the Board of Trustees by John L. Boyd, engineer, for the installation of a municipal electric-light plant in conjunction with the local water-works, which places the cost at about \$70,000, distributed as follows: low pressure piping, \$12,500; conduit and manhole construction, \$38,000; cables and wires, \$14,250; posts, lamps and brackets, etc., \$5,250.

**EMORY, VA.**—The Edmondson Electric Co. is building a hydroelectric power plant on the Middle Fork of the Holston River near Emory, to develop about 2000 hp. Contracts, it is reported, have been placed for equipment. The company proposes to supply electricity to Emory, Chilhowie, Meadows, Glade Spring and Abingdon. D. H. Edmondson is president.

**ANACOSTIA, D. C.**—Bids will be received by the Secretary of the Interior, Department of the Interior, Washington, until Dec. 15 for furnishing machinery and apparatus for remodeling pumping plant at the Government Hospital for Insane, Annapolis, Md. Plans and specifications for machinery now in use. Copies of specifications may be obtained upon application to the chief clerk of the department.

**WASHINGTON, D. C.**—Bids will be received by the office of the Supervising Architect, Treasury Department, Washington, D. C., until Dec. 30 for the installation of an electric passenger elevator, hoistway, etc., in the Butler Building, Washington, D. C., for the proposed new building.

**WASHINGTON, D. C.**—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Dec. 22, for furnishing at various navy yards and naval stations supplies as follows: Norfolk, Va. Schedule 7644—75 non-watertight buzzers, 312 interior fittings, 48 lighting fixtures with steel reflectors; Schedule 7655—miscellaneous supplies; Norfolk, Va. Schedule 7656—miscellaneous interior communication cable; Schedule 7654—150,000 ft. double conductor wire, miscellaneous nickel-steel cable, 1/2 in. dia., 20,000 lb. twin and single conductor wire, 3700 galvanized steel conduit; Schedule 7650—48,800 ft. rubber-covered wire, 500 lb. weatherproof wire; Schedule 7646—miscellaneous steel boiler plate, 400 lb. composition tubes; Washington, D. C. Schedule 7641—3800 yellow pine cross-arms, 540 chestnut telephone poles; Schedule 7646—200,000 ft. lb. innot cable, 1/2 in. dia., 20,000 lb. steel tubing; Schedule 7629—1000 ft. extra-strong copper pipe, miscellaneous brass tubing, 2040 lb. bronze tubing, 12,300 lb. steel tubing. Applicants for proposals must designate the schedule desired by number.

**WASHINGTON, D. C.**—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Dec. 22, for furnishing at the various navy yards and naval stations the following supplies: Brooklyn, N. Y. Schedule 7631—950 bunker lamps; Schedule 7632—36 leaded and armored interior-communication cable, 1/2 in. dia., 20,000 lb. wire; Schedule 7624—1200 lb. phosphor copper, in lots of about 5 lb. each; Schedule 7626—miscellaneous cast, wrought and malleable iron pipe fittings, 2500 lb. lead pipe

for lining steel tubing, 11-ft. 6-in. lengths; Schedule 7630—29,400 lb. seamless drawn-brass pipe, 12-ft. lengths, 6000 lb. seamless drawn-copper tubing, 12-ft. lengths. Bids will also be received for the following: Schedule 7622 as follows: Norfolk, Va., Schedule 7635—one motor-driven beading machine, one motor-driven, bottom flanging machine with improved lifting device, one motor-driven turning power press, one motor-driven, double-crane, back-gear power press, one motor-driven spacing punch, complete with spacing rack, one motor-driven double end slitting machine, one motor-driven carriage and ways, one motor-driven squaring power shears. Philadelphia, Pa., Schedule 7633—one double direct electric-driven motor, 100-hp., 2200-volt, 4-pole, Class 44. Schedule 7622—one 100-hp., 2200-volt induction motor (type A, Class 4). Brooklyn, N. Y., Schedule 7634—remodeling miscellaneous motor-generators and spars parts. Applications for proposals should designate the schedule desired by number.

**WASHINGTON, D. C.**—Foreign trade opportunities as announced by the Bureau of Foreign and Domestic Commerce in the Monthly Commercial Trade Reports, No. 14,380—An American consular officer in southern Europe reports that an importer of electrical material of all kinds, with experience in contact with manufacturers of incandescent lighting mantles, fixed and adjustable supports, etc.; batteries, bells, switches, telephones, insulators, chemical apparatus, etc. (including electric copper wire (plain and insulated, 0.35 mm. to 0.8 mm.), brass tubes, 1/2 in. to 1/4 in. in diameter, brass plates, etc. Correspondence should be in French or English. The agent in Europe who, it is explained, has good business connections with certain mining companies in that country informs an American consular officer that he wishes to be put in touch with American manufacturers of electrical material. Catalogs and price lists should be sent at once. Correspondence should be in Spanish. No. 14,381—A French consular officer in America requests an American consular officer to put him in communication with American manufacturers of small electric, kerosene and gasoline motors; also portable generators, etc. Catalogs and price lists. Correspondence may be in Spanish or English. No. 14,372—A firm established in Italy advises an American consular officer that it wishes to put in touch with American manufacturers of electric-lighting supplies, electrically driven tools, machinery, surgical instruments, etc. Correspondence should be in Italian or French. No. 14,377—An American consular officer in the West Indies reports that a local commission merchant is interested in obtaining a small electric-light plant for a moving-picture theater, with apparatus, etc. Correspondence in Spanish, stating export prices and terms. No. 14,522—A large firm abroad wishes to correspond with reliable firms in the United States manufacturing electric motors and accessories, including solder, steel cables, etc. No. 14,528—A firm dealing in electrical machinery and supplies wishes to purchase brass pipe. No. 14,542—A foreign manufacturer of dynamo and motor parts, that it wishes to correspond with American manufacturers of dry batteries. No. 14,474—A South American firm wishes to get in touch with American manufacturers of electrical goods and equipment. The correspondence may be in English. No. 14,618—A merchant of high standing has requested the American consul to place him in communication with American manufacturers of dynamos, transformers, motors, switches and material for electrical installation, such as lamps and insulating tubing, electroliers, electric heaters, water heaters, etc. Correspondence may be in English. No. 14,627—A firm abroad is desirous of communicating with manufacturers in the United States of electric apparatus, fan lamps and batteries for such lamps. Further information may be obtained on application to the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., or to the following branch offices: Room 409, United States Custom House, New York, N. Y.; 629 Federal Building, Chicago, Ill.; Association of American Manufacturers, New Orleans, La.; 310 United States Custom House, San Francisco, Cal.; 521 Post Office Building, Atlanta, Ga.; 1207 Alaska Building, Seattle, Wash., and 752 Oliver Building, Boston, Mass.

## North Central

**BATTLE CREEK, MICH.**—Plans are being prepared by M. H. Morehouse, architect, 23 South Dearborn, Chicago, Ill., for the construction of a power plant for the Kellogg Toasted Corn Flakes Co., of Grand Rapids. The W. L. Ferguson Co. has been engaged as engineer.

**BAY CITY, MICH.**—The Bay City Electric Light Department expects to install within the next three months a 1200-kw. turbo-generator, surface condenser and steam-driven exciter, also to purchase wire in the next four months, see watt-hour meters and transformers (200 kw.). Williams Fitzhugh is superintendent.

**BENTON HARBOR, MICH.**—The Council of the city has asked tenders for the installation of ornamental lamps on West and East Main Streets.

**DETROIT, MICH.**—Bids will be received by Messrs. Van Leyen & Schilling, 1115 Broadway Trust Building, Detroit, until Dec. 14 for the construction, including electric wiring, etc., of a public school building for the School District No. 10, fractional Greenfield and Springwells Township.

**SHREVEPORT, MICH.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Dec. 19, for construction complete, including mechanical equipment, interior lighting fixtures and approaches, of the United States post office at Ishpeming. Drawings and specifications may be obtained at the above office or from the custodian of site at Ishpeming. O. Wenderoth is supervising architect.

**JACKSON, MICH.**—The Commonwealth Pwr. Co. is reported, will supply energy to operate the new Kalamazoo-Grand Rapids Interurban Railway, which will be put in operation about the first of the year.

**MOUNT MORRIS, MICH.**—The franchise offered by the Flint El. Co., of Flint for lighting the streets of the town for a period of 30 years will be submitted to the voters at a special election to be held Dec. 5.

**ATHENS, OHIO.**—The city Council is considering the installation of ornamental street-lighting system in the business section of Court Street, to be maintained by the property owners. It is also proposed to place power wires underground in this section of the city.

**CUMBERLAND, OHIO.**—The Town Council has entered into an agreement with C. A. Vansickle for lighting the streets of the city. The town will provide for the installation of 25 street lamps of 200 cp.

**GLOUSTER, OHIO.**—Bonds to the amount of \$4,000 have been sold to provide funds for improvements to the lighting and water systems of the town.

**NORWALK, OHIO.**—The City Council has authorized the establishment of a municipal electric-light plant. The proposal of the Cleveland & South Western Columbus City Co. offering to supply energy to operate the proposed municipal electric-light plant and sell such portion of its district of lines, equipment, etc., as the city might wish was rejected. The resolution authorizing the engaging of an electrical engineer was adopted.

**WEST LIBERTY, OHIO.**—The Public Utilities Commission has granted the West Liberty Lt. & Pwr. Co. permission to issue \$10,000, of which the proceeds of \$7,500 are to be used for the lighting of the plant of C. A. Hartzler and the remainder for improvements and extensions to system.

**YOUNGSTOWN, OHIO.**—The report on the municipal electric-light plant submitted by E. Whitford Jones & Co., consulting engineers, of Cleveland, has been accepted by the City Council. The report embodies a complete layout for street lighting and lighting for shops and restaurants, lamps of 100 cp for the general lighting system while the business district is to be lighted with 243 nitrogen tungsten lamps of 1000 cp and 73 incandescent lamps. The incandescent lamps will be placed underground. The engineers recommend that negotiations be taken up with the lighting companies with a view of obtaining the best prices for lighting according to these plans, and, if reasonable rates cannot be obtained, that the city proceed with the installation of a municipal electric plant and distributing system.

**LOUISVILLE, KY.**—The Monarch Auto Co., operating a garage at 206 East Broadway, Louisville, is contemplating installing improved equipment for charging storage batteries of automobiles, for both pleasure cars and trucks. The company has increased its capital stock from \$10,000 to \$24,000.

**MIDDELBURY, IND.**—At an election to be held on Dec. 14, the proposal to light the streets of the town will be submitted to the voters.

**MISHAWAKA, IND.**—Bids will be received by the Board of Public Works until Dec. 14 for the construction of a lighting complete one 4,000-000-gal. horizontal, cross-compound, opposed-type crank and flywheel Corliss pumping engine, together with all other appliances and accessories, on file in the office of George W. Nutt, clerk of

board, City Hall, Mishawaka. A. R. Kline is superintendent of the municipal electric-light and water-works system.

**PERRI, IND.**—The installation of an ornamental street-lighting system on Broadway is under consideration by the City Council.

**GALESBURG, ILL.**—Plans are being considered for the installation of an ornamental street-lighting system in the business district. It is proposed to erect ornamental standards carrying two incandescent lights, the property owners to pay for installing the system and the city to maintain the lamps.

**MONTICELLO, ILL.**—Within the next three months the Monticello El. Co. expects to change over its system from 133 cycles to 60 cycles and install one 75-kw. and one 150-kw generator with all switchboard apparatus. Equipment for above improvements has already been purchased. John A. Glover, of Urbana, Ill., is general superintendent.

**ROCHESTER, ILL.**—Negotiations are under way with the officials of the Springfield Gas & El. Co. and the Village Board of Rochester for the erection of an electric transmission line to furnish electricity for the village. The company has its lines extended to within 3 miles of the village.

**BLACK CREEK, WIS.**—At an election held recently the proposal to issue \$7,000 in bonds for the installation of a municipal electric-light plant was carried.

**EAU CLAIRE, WIS.**—The cities of Red Wing, Minn., and Eau Claire, Wis., with the co-operation of the commercial bodies of the cities have decided to establish ornamental lighting systems in their business districts. The ornamental lamps are to be erected and maintained by the Wisconsin Lt. & Pwr. Co., of Eau Claire, a subsidiary of the American Public Utilities Co. of Grand Rapids, Mich. The ornamental iron standards in Red Wing are to be furnished by a local firm. The ornamental iron posts in Eau Claire will be furnished by an Eau Claire foundry from patterns approved by the civic and commercial association.

**MANITOWOC, WIS.**—The C. Reiss Coal Co., of Manitowoc, is reported, has purchased the franchise of the West Side El. Co., which furnishes electrical service in the west side of the city. Plans have been prepared for the erection of a large power plant on the docks owned by the C. Reiss Coal Co.

**AITKIN, MINN.**—Bids will be received by E. A. Hanson, chairman of county board, Aitkin, until Dec. 22, for construction of county jail and sheriff's residence, to be erected in the city of Aitkin. Separate bids will be received at the same time for heating, plumbing and electric wiring and jail work. Plans and specifications may be obtained at the office of J. E. Lemire, county auditor, Aitkin, and C. E. Bell, Security Bank Building, Minneapolis, Minn.

**HOLDINGFORD, MINN.**—The Village Council has awarded a franchise to V. Herman to construct and operate an electric-light plant in Holdingford. Work has already begun on construction of the plant.

**SAUK RAPIDS, MINN.**—The Public Ser. Co. of St. Cloud, is reported, is contemplating the construction of a new substation in Sauk Rapids.

**NORA SPRINGS, IA.**—A company, it is reported, has been organized to take over the plant recently granted to C. H. W. True, of Ladysmith, Wis., to supply electricity in Nora Springs. A transmission line (8 miles long), it is understood, will be laid at once. True, president of the company, is W. W. True, president of True, vice-president and manager, and G. V. Coon, secretary.

**LA PLATA, MO.**—The La Plata Lt. Ht. & Pwr. Co. will purchase at once a thermostat at 60-mhp, 220-volt direct-current generating house generator. J. M. Atkinson is resident manager.

**LEXINGTON, MO.**—The Missouri Gas & Pwr. Co. expects to change its distributing system within the next four weeks from 1100 volts single-phase, to 2200 volts, three-phase, and to install within the next six months a 220-volt direct-current generating unit, directly connected. Equipment for the above has already been purchased. L. F. Marshall is manager.

**LOUISIANA, MO.**—The Louisiana Lt. Ht. & Pwr. Co. expects to install within the next 30 days one 16-in. by 36-in. Hamilton Corliss engine belted to a 120-kva Allis-Chalmers revolving-field generator. A. Vogel is engineer.

**ST. LOUIS, MO.**—The Laclade Gas Lt. Co., of St. Louis, has been granted a permit to erect a power house, to cost about \$20,000.

**PIERRE, S. D.**—The Council is contemplating the installation of cluster lamps on Pierre Street.

**KANSAS CITY, KAN.**—The city, it is reported, will soon ask for bids for wire, motors, heaters, etc., needed in connection with the municipal electric-light plant. A 3-mile 6600-volt line is to be erected soon, duplicating the present line.

**LEAVENWORTH, KAN.**—All bids submitted Nov. 13 for standards for the proposed ornamental system have been rejected by the Board of City Commissioners. It is expected that a contract for standards will be awarded to a local firm.

## Southern States

**DARIEN, GA.**—The Darien Mfg. Co., recently incorporated with a capital stock of \$10,000, it is reported, proposes to construct an ice factory and build an electric light plant and water-works system. The incorporators are James F. Thomson, Mayor Bluestein, Robert J. Downey and Charles M. Tyson.

**CHILEY, ILL.**—Within the next two months the Chiley Lt. & Pwr. Co. expects to erect about 2 miles of line for commercial lighting. E. H. Hale is general manager.

**KEY WEST, FLA.**—The city of Key West will consider application for a telephone franchise from companies other than the Southern Bell Tel. & Tel. Co.

**BAY MINETTE, ALA.**—Bids will be received by the Mayor and Councilmen of the town of Bay Minette, until Dec. 5 for furnishing materials and machinery and constructing a complete water-works system, sewer system and electric-lighting plant. The following is a list of the equipment to be supplied: one 50-kva, 1200 r.p.m., belted-type, three-phase, 60-cycle, 2300-volt generator, two-inch switchboard, exciter and about 2 miles of pole-line, water main, also construction of power house, reservoir tower and tank, 80-hp oil engine, oil tank, compressor, 750-gal. pump, 25 hydrants, about 4 miles of water main and 3½ miles of sewers. Plans and specifications are on file in the office of Mayor W. D. Stapleton, Bay Minette, and at the office of Edgar B. Kay, engineer, Tuscaloosa, Ala. Copies of specifications and bidding sheets may be obtained upon application to Mayor Stapleton.

**CANTON, MISS.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Dec. 21 for construction complete, including mechanical equipment, interior lighting fixtures and approaches, of the United States post office at Canton, Miss. Drawings and specifications may be obtained at the above office or from the custodian of site at Canton. O. Wenderoth is supervising architect.

**CORPUS CHRISTI, TEX.**—The Texas Southern El. Co., which has recently secured a franchise to erect an electric railway between Corpus Christi and Bishop, a distance of 35 miles, contemplates the erection of a central power plant and the construction of several connecting electric railways.

**DALLAS, TEX.**—Bids will be received by the Dallas County Commissioners, Charles H. Gross, auditor, Dallas, until Dec. 10 for furnishing and installing electric-lighting fixtures in the county criminal courts and jail building; also to furnish furniture in court rooms for same building. Plans and specifications may be obtained from H. Overbeck, architect, Dallas, upon deposit of \$10.

**GALVESTON, TEX.**—Bids will be received by the Board of Commissioners of the city of Galveston, at the office of D. Kelley, city secretary, Galveston, until Dec. 14 for the construction of a city hall building in accordance with plans and specifications on file at the office of the city secretary, City Hall, Galveston.

## Pacific States

**RIVERSIDE, WASH.**—Application has been made to the Council by J. K. Norris, of the Riverside Lumber & Box Co., for a franchise to install an electric-light system in Riverside.

**UNION, ORE.**—The City Council has signed a new contract with the Eastern Oregon Lt. & Pwr. Co. for street lighting. The new contract calls for the installation of new street lamps.

**FRESNO, CAL.**—The Fresno Interurban Ry. Co. has applied to the State Railroad Commission for permission to issue \$212,000 in capital stock at \$20.00 per share, the proceeds to be used for the construction of an electric railway 26 miles long, one branch of which will run from Fresno to the Center, and another branch from the other from Fresno to the Clovis and Gould colony.



**LOS ANGELES, CAL.**—The State Railroad Commission has granted the Southern California Edison Co. the system desired, permission to issue \$784,000 in bonds, of which \$266,000 may be sold at once at not less than 95.

**LOS ANGELES, CAL.**—The city of Los Angeles has filed a petition with the State Railroad Commission asking for an appraisal preliminary to a condemnation of the distributing system of the Southern California Edison Co. The system is desired by the city for the purpose of distributing electricity from its aqueduct generating plant. The proceeds of the \$6,500,000 bond issue voted last spring will be used to purchase the system.

**OROVILLE, CAL.**—The Oro El. Corp. has applied to the Supervisors of Trinity County for a franchise to erect transmission lines in Trinity County. Bids for the above franchise will be received until Jan. 7.

**SAN FRANCISCO, CAL.**—The Coast Valleys Gas & El. Co., of San Francisco, has filed an application with the State Railroad Commission asking permission to issue \$100,000 in bonds, of which \$69,392 to be used to reimburse the company for additions and improvements already made and the remainder for further construction.

**RUPERT, IDAHO.**—Within the next six months the Rupert El. Co. expects to purchase from 50 to 75 air heaters and a switchboard capable of handling 1000 amp at 220 volts, complete with switches and fuses. F. N. Victor is president.

**PUREKA, UTAH.**—The Utah Pwr. & Lt. Co. is installing a new street-lighting system at Panguitch. The company is also making extensive improvements to its system in Tintic.

**HEZEMAN, MONT.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Jan. 2, for construction, including mechanical equipment, interior lighting fixtures and approaches, of the United States post office at Bozeman, Mont. Drawings and specifications may be obtained at the above office or from the custodian of said at Bozeman. O. Wenderoth is supervising architect.

**MONDAK, MONT.**—A company, it is reported, is being organized to construct and operate an electric-light plant in Mondak. Ground has already been broken for the power house.

**LA JUNTA, COL.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Jan. 4, 1915, for construction complete, including mechanical equipment, interior lighting fixtures and approaches, of the United States post office at La Junta. Drawings and specifications may be obtained at the above office or from the custodian of said at La Junta. Col. O. Wenderoth is supervising architect.

**STEAMBOAT SPRINGS, COL.**—Within the next 12 months the Steamboat Ser. Co. expects to purchase a car load of poles and 3 miles of No. 8 weather-proof wire. W. E. Carver is secretary.

## Canada

**DELAWARE, ONT.**—The Village Council is contemplating the installation of an electric system to supply electricity for street-lighting, commercial and industrial purposes.

**MOUNT BRIDGES, ONT.**—At an election held Nov. 23 the by-law providing for securing electricity from the Hydro-Electric Power Commission was carried.

**NEWMARKET, ONT.**—The Town Council has decided to call an election on Jan. 15, 1915, to debenture the by-law authorizing an issue of \$15,000 in debentures for the construction of a substation and the extension of the Hydro-Electric Power Commission service into the municipality.

**NIAGARA FALLS, ONT.**—The electric light committee, it is understood, will soon call for bids for the installation of the proposed new street-lighting system.

**OTTAWA, ONT.**—Tenders will be received by R. C. Desrochers, secretary Department of Public Works, Ottawa, until Dec. 3, for the installation of one standard freight elevator in the Ottawa post office. Plans, specifications and form of tender may be obtained on application to the Department of Public Works, at the offices of Thomas A. Hastings, clerk of works, postal station "F" Toronto, Ont., and R. L. Deschamps, superintendent of public buildings, Montreal, Que.

**SHELBURNE, ONT.**—The proposal to secure energy from the Hydro-Electric Power Commission of Ontario has been approved by the rate-payers.

**TORONTO, ONT.**—Bids will be received by the advisory industrial committee of the Board of Education, addressed to W. C. Wilkinson, secretary and treasurer of board, Toronto, until Dec. 11, for power-plant equipment for the new central technical department of Lepincoff Street, Toronto, consisting of steam engines, generators, switchboard, steam piping and electrical connections. Plans and specifications may be obtained at the office of the Canadian Domestic Engineering Co., 47-51 King Street, engineer.

**WINDSOR, ONT.**—The City Council has passed a by-law authorizing an additional issue of \$125,000 in debentures, the amount of \$75,000 for the installation of the Hydro-Electric system in Windsor. The original estimate was \$100,000, but owing to the growth of the city many miles of additional wiring and pole lines will have to be erected. This expenditure will not cover the cost of the street-lighting system, but will provide for the distributing system, the power lines and the service wires within the city.

## Miscellaneous

**PEARL HARBOR, HAWAII.**—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Dec. 12 for furnishing three electric traveling shop cranes at the naval station, Pearl Harbor, Hawaii. Plans and specifications may be obtained on application to the above bureau. H. R. Stanford is chief of bureau.

**PANAMA.**—Bids will be received at the office of the general purchasing officer of the Panama Canal, Washington, D. C., until Dec. 14 for furnishing wire cables and attachments, cable clips, turnbuckles, steel rolling doors, etc. Bids and general information relating to this circular (No. 880) may be obtained at the above office or from the offices of the assistant purchasing agents, 24 State Street, New York, N. Y., 614 Whitney-Central Building, New Orleans, La., and 1086 North Point Street, San Francisco, Cal. Major F. C. Boggs is general purchasing officer.

## New Incorporations

**DOVER, DEL.**—The Ohio & Western Utilities Co. has filed articles of incorporation under the laws of the State of Delaware with a capital stock of \$7,500,000. The company proposes to establish and operate utilities in any state. The incorporators are: Harry Van Wyck, Crawford, N. J.; Albert and A. Bridgeman, of St. George, Staten Island, and L. M. Symmes, of Brooklyn, N. Y.

**BALTIMORE, MD.**—The General Utilities & Operating Co. has been organized with a capital stock of \$1,500,000. The company has acquired the Logan County Lt. & Pwr. Co., of Logan; also the plants at Merryville and Rockford, Tenn., and proposes to purchase other public utilities in the South. The officers are: J. C. M. Lucas, president; D. F. Mallory, vice-president, and Francis R. Weller, Hibbs Building, Washington, D. C., general manager and engineer. The office of the company is at 1422 Murray Building, Baltimore, Md.

**GETTYSBURG, PA.**—The Oxford Township Lt. & Pwr. Co., of Gettysburg, has been incorporated with a capital stock of \$5,000. The incorporators are Norman S. Meindel, Raymond F. Topper and J. Donald Swope, all of Gettysburg.

**RICHLANDS, VA.**—The Richlands Service Corp. has been incorporated with a capital stock of \$1,000,000 to construct and operate electric and gas plants. The officers are: A. M. Mann, of Big Stone Gap, Va., president, and W. E. Pelton, of Cincinnati, Ohio, vice-president and secretary.

# Directory of Electrical Associations

**ALABAMA LIGHT AND TRACTION ASSOCIATION.** Secretary-treasurer, H. O. Hanson, Mobile Gas Co., Mobile, Ala.

**AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.** Permanent secretary, L. O. Howard, Smithsonian Institution, Washington, D. C. Annual meeting, Philadelphia, Dec. 26, 1914, to Jan. 2, 1915.

**AMERICAN ELECTRIC RAILWAY ACCOUNTANTS ASSOCIATION.** Secretary-treasurer, E. B. Burritt, 29 West 39th St., New York.

**AMERICAN ELECTRIC RAILWAY ASSOCIATION.** Secretary, E. B. Burritt, 29 West 39th St., New York.

**AMERICAN ELECTRIC RAILWAY ENGINEERING ASSOCIATION.** Secretary, E. B. Burritt, 29 West 39th St., New York.

**AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.** Secretary, Prof. J. W. Richards, Lehigh University, South Bethlehem, Pa.

**AMERICAN ELECTRO-THERAPEUTIC ASSOCIATION.** Secretary, Dr. J. Willard Travell, 27 East 11th St., New York.

**AMERICAN INSTITUTE OF CONSULTING ENGINEERS.** Secretary, Eugene W. Stern, 101 Park Ave., New York City.

**AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.** Secretary, F. L. Hutchinson, 33 West 39th St., New York. Board of directors meets monthly. Sections and branches in the principal electrical centers throughout the country.

**AMERICAN PHYSICAL SOCIETY.** Secretary, Prof. A. D. Cole, Ohio State University, Columbus, Ohio.

**AMERICAN SOCIETY OF REFRIGERATING ENGINEERS.** Secretary, William H. Ross, 154 Nassau St., New York City.

**AMERICAN SOCIETY FOR TESTING MATERIALS.** Secretary-treasurer, Edgar Marburg, University of Pennsylvania, Philadelphia.

**AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS.** Secretary, Edwin A. Scott, 29 West 39th St., New York.

**AMERICAN WATER WORKS ASSOCIATION.** Secretary, J. M. Diven, 47 State St., Troy, N. Y.

**ARKANSAS ASSOCIATION OF PUBLIC UTILITY OPERATORS.** Secretary, W. J. Tharp, Little Rock, Ark.

**ASSOCIATION OF EDISON ILLUMINATING COMPANIES.** Assistant secretary, Walter Neumuller, Irving Place and 15th St., New York.

**ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS.** Secretary, W. T. Snyder, McKeesport, Pa.

**ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.** Secretary-treasurer, Jos. A. Andreucci, Chicago & Northwestern Railway, Chicago.

**ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.** Secretary, P. W. Drew, 112 West Adams St., Chicago.

**CALIFORNIA ELECTRICAL CONTRACTORS' ASSOCIATION.** Secretary, W. S. Hanbridge, 1408 Merchants' National Bank Building, Los Angeles, Cal.

**CANADIAN ELECTRICAL ASSOCIATION.** Affiliated with N. E. L. A. Secretary-treasurer, Alan Sullivan, 610 Confederation Life Bldg., Toronto, Can.

**COLORADO ELECTRIC CLUB.** Secretary, C. F. Cehlman, Meets every Thursday at Albany Hotel, Denver, Col.

**COLORADO ELECTRIC LIGHT, POWER AND RAILWAY ASSOCIATION.** Secretary-treasurer, T. F. Kennedy, 900 15th St., Denver, Col.

**COMMERCIAL SECTION, N. E. L. A. Secretary, J. F. Becker, 1170 Broadway, N. Y.**

**EASTERN NEW YORK SECTION, N. E. L. A. Secretary, C. S. Van Dyck, Schenectady, N. Y.**

**ELECTRIC CLUB OF CHICAGO.** Secretary, Howard Ehrlich, 603 South Dearborn St., Chicago. Meets every Thursday noon at Hotel Sherman.

**ELECTRICAL CONTRACTORS' ASSOCIATION OF GREATER BOSTON.** Secretary, R. S. Hale, 33 Boylston St., Boston.

**ELECTRICAL CONTRACTORS' ASSOCIATION OF MASSACHUSETTS.** Secretary, H. D. Temple, 30 Foster St., Worcester, Mass.

**ELECTRICAL CONTRACTORS' ASSOCIATION OF NEW YORK STATE.** Secretary, Geo. W. Russell, Jr., 25 West 42d St., New York.

**ELECTRICAL CONTRACTORS' ASSOCIATION OF THE CITY OF CHICAGO.** Secretary, M. N. Bumenthal, 173 West Washington St. Meets at noon on the second and fourth Wednesday of each month at 424 South Wabash Ave.

ELECTRICAL CONTRACTORS' ASSOCIATION OF STATE OF MISSOURI. Secretary, A. J. Brides, 313 N. Third St., Kansas City, Mo.

ELECTRICAL CONTRACTORS' ASSOCIATION OF WISCONSIN. Secretary, Albert Deibel, 626 Lloyd St., Milwaukee, Wis.

ELECTRIC CREDIT ASSOCIATION OF CHICAGO. Secretary, Frederic F. Vose, 1343 Marquette Building, Chicago.

ELECTRIC CREDIT ASSOCIATION OF PAID. Secretary, John W. Child, 1241 Land Title Building, Philadelphia, Pa.

ELECTRICAL SALESMEN'S ASSOCIATION. Secretary, Francis Raymond, 125 Michigan Ave., Chicago, Ill.

ELECTRICAL SUPPLY JOBBERS' ASSOCIATION. General secretary, Franklin Overhang, 411 South Clinton St., Chicago, Ill. Next meeting, Birmingham, Ala., Dec. 8-10.

ELECTRICAL TRADES ASSOCIATION OF CANADA. Secretary, William R. Staveloy, Royal Insurance Building, Montreal, Can.

ELECTRICAL TRADES ASSOCIATION OF THE PACIFIC COAST. Secretary, Albert H. Elliott, Harding Building, 34 Ellis St., San Francisco, Cal. Meeting, San Francisco, second Thursday of each month.

ELECTRIC VEHICLE ASSOCIATION OF AMERICA. Executive secretary, A. Jackson Marshall, 29 West 39th St., New York. Sections in New York, New England, Chicago, Philadelphia, Washington and Los Angeles.

EMPIRE STATE GAS AND ELECTRIC ASSOCIATION. Secretary, Charles H. B. Chapin, 29 West 39th St., New York. Midyear meeting, Albany, N. Y., Dec. 10 and 11.

FARADAY ELECTRICAL ASSOCIATION. Secretary, W. J. Collins, 1129 Masonic Temple, Chicago. Meets at noon on the first and third Wednesday of each month at Planters' Hotel.

FRANKLIN INSTITUTE. Secretary, Dr. R. B. Owens, Philadelphia, Pa.

GAS, ELECTRIC AND STREET RAILWAY ASSOCIATION OF OKLAHOMA. Secretary-treasurer, Prof. H. V. Bozell, Norman, Okla.

GEORGIA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, J. M. Clayton, Atlanta, Ga.

ILLINOIS STATE ELECTRICAL ASSOCIATION. Secretary, H. E. Chubbuck, Peoria, Ill.

ILLUMINATING ENGINEERING SOCIETY. General secretary, C. A. Littlefield, 29 West 39th St., New York.

INDEPENDENT ELECTRICAL CONTRACTORS' ASSOCIATION OF GREATER NEW YORK. Secretary, A. Neuburger, 1153 Myrtle Ave., Brooklyn, N. Y.

INDEPENDENT TELEPHONE ASSOCIATION OF AMERICA. Secretary, W. S. Vivian, 19 South LaSalle St., Chicago. Annual meeting, Minneapolis, Minn., Dec. 2-4, 1915.

INDIANA ELECTRIC LIGHT ASSOCIATION. Secretary, Thomas Donahue, Lafayette, Ind.

INDIANA STATE ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, George Skilman, Indianapolis, Ind.

INSTITUTE OF OPERATING ENGINEERS. Secretary, L. Houmiller, 29 West 39th St., New York.

INSTITUTE OF RADIO ENGINEERS. Secretary, E. J. Simon, 71 Broadway, New York.

INTERNAL COMBUSTION ENGINEERS' ASSOCIATION. President, Charles Kratsch, 416 West Indiana St., Chicago. Meeting second Friday of each month at Lewis Institute.

INTERNATIONAL ASSOCIATION OF MICHA-

EL ELECTRICIANS. SECRETARY, C. R. GEORGE, HOUSTON, TEX.

INTERNATIONAL ENGINEERS' ASSOCIATION. Secretary-treasurer, W. A. Cattel, Foxcroft Building, San Francisco, Cal. Headquarters, San Francisco, September, 1915.

INTERNATIONAL ELECTROTECHNICAL COMMISSION. INTERNATIONAL BODY REPRESENTING various national electrical engineering societies contributing to its support. General secretary, C. le Maistre, 28 Victoria St., Westminster, London, S. W., England. Meeting at San Francisco, Sept. 9-11, 1915.

IOWA ELECTRICAL ASSOCIATION. Affiliated with N. E. L. A. Secretary, W. H. Thomson, Des Moines, Ia.

IOWA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, M. T. Humphrey, Waterloo, Ia.

IOWA STREET AND INTERURBAN RAILWAY ASSOCIATION. Secretary, H. E. Weeks, Davenport, Ia.

JOVIAN ORDER. Jupiter (president), Homer E. Niesch, Chicago, Ill.; Mercury (secretary), E. C. Bennett, Syndicate Trust Building, St. Louis, Mo.

KANSAS GAS, WATER, ELECTRIC LIGHT AND STREET RAILWAY ASSOCIATION. Secretary-treasurer, Ivor Thomas, 237 South Main St., Wichita, Kan.

LOUISIANA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, J. J. Ziegler, 227 Bourbon St., New Orleans, La. Meeting, Audubon Building, New Orleans.

MAINE ELECTRIC ASSOCIATION. Secretary-treasurer, Walter S. Wyman, Waterville, Maine.

MICHIGAN ELECTRIC ASSOCIATION. Affiliated with N. E. L. A. Secretary, Herbert Silvester, 8 Washington Boulevard, Detroit, Mich.

MINNESOTA ELECTRIC ASSOCIATION. Secretary-treasurer, P. A. Otto, St. Paul Gas Light Company, St. Paul, Minn.

MISSISSIPPI ELECTRIC ASSOCIATION. Affiliated with the National Electric Light Association. Secretary-treasurer, H. F. Wheeler, Hattiesburg, Miss. Next annual meeting, Hattiesburg, April 12-14, 1915.

MISSOURI ELECTRIC GAS, STREET RAILWAY AND WATER WORKS ASSOCIATION. Secretary-treasurer, F. D. Beardslee, Union Electric Light & Power Co., St. Louis.

NATIONAL ARM, PIN AND BRACKET ASSOCIATION. Secretary, J. B. Magers, Madison, Ind.

NATIONAL ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary-treasurer, Wm. L. Smith, Concord, Mass.

NATIONAL DISTRICT HEATING ASSOCIATION. Secretary, D. L. Gaskill, Greenville, Ohio.

NATIONAL ELECTRIC LIGHT ASSOCIATION. Executive secretary, T. C. Martin, Engineering Societies Building, 33 West 39th St., New York.

NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION OF THE UNITED STATES. Secretary, George H. Duffield, 41 Martin Building, Union, N. Y.

NATIONAL ELECTRICAL CREDIT ASSOCIATION. Secretary, Frederic F. Vose, 1343 Marquette Building, Chicago.

NATIONAL FIRE PROTECTION ASSOCIATION. Secretary of electrical committee, Ralph Sweetland, 141 Milk St., Boston, Mass. Open meeting, New York, March, 1915.

NATIONAL INDEPENDENT TELEPHONE ASSOCIATION. Secretary-treasurer, J. B. Earle, Waco, Tex.

NEBRASKA SECTION, N. E. L. A. Secretary-treasurer, S. J. Bell, David City, Neb.

NEW ENGLAND ELECTRICAL CREDIT ASSOCIATION. Secretary, Alton F. Tupper, 60 State St., Boston, Mass.

NEW ENGLAND SECTION, ELECTRIC VEHICLE ASSOCIATION OF AMERICA. Secretary, L. L. Edgar, 39 Boylston St., Boston, Mass.

NEW ENGLAND STREET RAILWAY CLUB. Secretary, H. A. Faulkner, 12 Pearl St., Boston, Mass. Meets last Thursday of each month.

NEW ENGLAND SECTION, N. E. L. A. Secretary, Miss O. E. Bursiel, 149 Tremont St., Boston, Mass.

NEW ORLEANS ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, S. J. Stewart, 312 Carondelet St., New Orleans, La. Meetings second and fourth Tuesday of each month.

NEW YORK ELECTRIC RAILWAY ASSOCIATION. Secretary, Charles C. Dietz, 365 East 21st St., Brooklyn, N. Y.

NEW YORK ELECTRICAL CREDIT ASSOCIATION. Affiliated with the National Electric Credit Association. Secretary, Franz Neilson, 80 Wall St., New York.

NEW YORK ELECTRICAL SOCIETY. Secretary, G. H. Guy, 33 West 39th St., New York.

NORTHWEST SECTION, N. E. L. A. Secretary, N. W. Brockett, Pioneer Building, Seattle, Wash.

NORTHERN WHITE CEDAR ASSOCIATION. Secretary, R. N. Boucher, 743 Lumber Exchange, Minneapolis, Minn.

OHIO ELECTRIC LIGHT ASSOCIATION. Secretary, D. L. Gaskill, Greenville, Ohio.

OHIO SOCIETY OF MECHANICAL, ELECTRICAL AND STEAM ENGINEERS. Secretary, Prof. F. E. Sanborn, Ohio State University, Columbus, Ohio.

OREGON ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, F. C. Green, 291 East Morrison St., Portland, Ore.

PENNSYLVANIA ELECTRIC ASSOCIATION (State Section N. E. L. A.). Secretary-treasurer, H. N. Müller, Pittsburgh, Pa.

RAILWAY SIGNAL ASSOCIATION. Secretary-treasurer, C. E. Rosenberg, Times Building, Bethlehem, Pa.

SOCIETY FOR ELECTRICAL DEVELOPMENT, INC. General manager, J. M. Wakeman, 29 West 39th St., New York.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION. Secretary, Dean F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa. Annual meeting, Ames, Ia., June 22-25, 1915.

SOUTHEASTERN SECTION, N. E. L. A. Secretary-treasurer, Geo. H. Wygant, Tampa, Fla.

SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Secretary, H. S. Cooper, 405 Slaughter Building, Dallas, Tex.

VERMONT ELECTRICAL ASSOCIATION. Secretary-treasurer, C. H. West, Rutland, Vt.

WESTERN ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary, W. S. Boyd, 76 West Monroe St., Chicago, Ill. Annual meeting, Minneapolis, Minn., Jan. 26-28, 1915.

WESTERN SOCIETY OF ENGINEERS, ELECTRICAL SECTION. Secretary, J. H. Warder, 1737 Monadnock Block, Chicago.

WISCONSIN ELECTRICAL ASSOCIATION. Secretary, George Allison, 1410 First National Bank Building, Milwaukee, Wis. Annual meeting, Milwaukee, Jan. 18-20.

## Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED NOV. 24, 1914.

[Prepared by Robert Starr Allen, 16 Exchange Place, New York, N. Y.]

1,117,965. LAMINATED BRUSH FOR ELECTRICAL MACHINES AND METHODS OF MAKING THE SAME; O. E. Becker, Chicago, Ill. App. filed May 2, 1912. Carbon plates coated with copper and fused into a solid block which is cut at an oblique angle to the laminations.

1,118,004. ART OF TRANSMITTING SOUNDS BY MEANS OF HERTZIAN WAVES; W. Harrison, New York, N. Y. App. filed March 11, 1902. Employs an ultra-violet light.

1,118,024. ELECTRICAL SWITCH; J. H. Lawrence, Covington, Ky. App. filed Aug. 27, 1913. Permutation type, for automobile ignition circuits.

1,118,035. CONDUCTOR CABLE SUPPORT; W. F. Meschenmoser, New Dorp, N. Y. App.

filed Nov. 22, 1911. For supporting vertical trunk line cables; special form of clamping bushing.

1,118,064. ELECTRIC PROTECTION SYSTEM; W. M. Scott, Radnor, Pa. App. filed May 25, 1912. For protecting a generator running in parallel with another generator.

1,118,099. BATTERY-CHARGING SYSTEM; C. E. Bench, Binghamton, N. Y. App. filed Sept. 2, 1913. Controlled according to condition of battery and also by time-control mechanism.

1,118,100. TROLLEY STAND; F. W. Bishop, Cleveland, Ohio. App. filed July 19, 1911. Current taken off by arm pivoted centrally to the rotatable member of the trolley stand.

1,118,105. TROLLEY DEVICE; S. H. Coyne, Syracuse, N. Y. App. filed July 12, 1907. For raising trolley pole and lowering it when trolley leaves the wire.

1,118,120. SELECTIVE SIGNALING DEVICE; M. F. Geer and R. C. Leake, Rochester, N. Y. App. filed Dec. 8, 1910. Magnets operate sectors which control circuit.

1,118,121. PROTECTING SEAL; C. A. Gillingham, Lakewood, Ohio. App. filed April 27, 1914. For flashlamp cells.

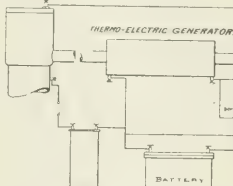
1,118,172. METHOD OF REPRODUCING ELECTRICAL VARIATIONS; H. de F. Arnold, Belleville, N. J. App. filed July 15, 1912. Amplifies without distortion.

1,118,173. ELECTRIC RELAY; H. de F. Arnold, Belleville, N. J. App. filed July 15, 1912. For amplifying voice currents originating in an incoming circuit.

1,118,174. ALTERNATING-CURRENT GENERATOR; H. de F. Arnold, East Orange, N. J. App. filed June 12, 1913. For generating undamped high-frequency alternations or oscillations.



- 1,118,175. ELECTRIC-RELAY APPARATUS: H. de F. Arnold, East Orange, N. J. App. filed June 11, 1914. *See also 1,118,176*
- 1,118,176. ELECTRIC-RELAY APPARATUS: H. de F. Arnold, East Orange, N. J. App. filed May 7, 1914. Secures amplified reproductions of variations of current energy of a thermoelectric generator.
- 1,118,188. ELECTRIC SWITCH: J. Desmond, Chicago, Ill. App. filed March 23, 1912. Automatic; for air-compressor motor.
- 1,118,219. SOUND-RECORDING APPARATUS: J. Noll, New York, N. Y. App. filed Feb. 3, 1914. Automatically records the message at a telephone station.
- 1,118,228. OSCILLATION DETECTOR: G. W. Pickard, Amesbury, Mass. App. filed Aug. 20, 1910. Conducting compound of sulphur not containing copper and a conducting solid oxide of zinc in electrical contact therewith.
- 1,118,230. TELEPHONIC INSTRUMENT: G. R. Preusse, New York, N. Y. App. filed Nov. 18, 1912. Gives loud-voiced or low-toned announcement in control of person ringing the message.
- 1,118,256. SWITCH: C. J. Anderson, Chicago, Ill. App. filed March 3, 1911. Solenoid-operated multiple switch for alternating-current motors.
- 1,118,269. MEANS FOR UTILIZING WASTE ENERGY: J. J. Simmen, Berkeley, Cal. App. filed Jan. 10, 1906. Thermoelectric generator operates by heat from engine exhaust and is used to supply ignition current.
- 1,118,290. FISH-WIRE REEL: B. Dahl, Minneapolis, Minn. App. filed July 17, 1913. For threading wires through conduits and then by reverse rotation drawing cable through conduits.
- 1,118,293. CARRIER-PIGEON SIGNALS: R. H. Holderfer, Baltimore, Md. App. filed May 25, 1914. Signals arrival of pigeon at the end of its flight.
- 1,118,296. ACCELERATING DEVICE FOR ALTERNATING-CURRENT MOTORS: W. D. Lutz, Allendale Borough, N. J. App. filed Jan. 7, 1911. Frequency changer controls successive operation of the circuit controllers.
- 1,118,311. AUTOMATIC RAILROAD BLOCK SYSTEM: P. J. Simmen, Berkeley, Cal. App. filed June 3, 1907. Single-track road with separate signals for incoming and outgoing trains.
- 1,118,320. ELECTRIC WATER-HEATING FAUCET: E. C. Webster, East Oakland, Cal. App. filed Nov. 11, 1913. Can deliver either cold or hot water.
- 1,118,324. ELECTRIC SWITCH: H. H. Berry and W. J. Markham, London, Eng. App. filed Sept. 16, 1913. Armor-clad type.
- 1,118,328. TEMPERATURE REGULATOR: C. R. Burlew, Yorkers, N. Y. App. filed Aug. 26, 1912. For controlling furnace drafts.
- 1,118,332. AMMONIA-SODA PROCESS: A. Clemm, Mannheim, Germany. App. filed July 24, 1913. Expels the ammonia by heat and electrolyzes the remaining concentrated solution of sodium chloride.
- 1,118,333. ELECTRIC REGULATOR: J. L. Creveling, New York, N. Y. App. filed March 16, 1910. For maintaining voltage constant in a circuit.
- 1,118,336. CAR TRUCK: O. E. Edwards, Jr., New York, N. Y. App. filed March 31, 1914. Bolster carried through the combined action of a leaf spring and a coil spring.
- 1,118,340. TRANSMITTER BRACKET: A. F. P. P. 1,118,340. Filed Nov. 15, 1911. Made of sheet metal.
- 1,118,371. ELECTRIC LOCOMOTIVE: R. Schottelius, Berlin, Germany. App. filed Oct. 21, 1913. Gears on the Jack-shaft are resiliently mounted.
- 1,118,380. VAPOR-ELECTRIC DEVICE: W. E. Story, Jr., Schenectady, N. Y. App. filed May 10, 1913. Maintains the anodes uniformly heated.
- 1,118,382. FLOWING SHIPS BY POLYPHASE INDUCTION: J. Thompson, Swampscott, Mass. App. filed Jan. 16, 1911. Turbines drive polyphase generators of the induction type which supply current to the polyphase induction motors on the propeller shafts.
- 1,118,387. ELECTRICAL-HEATING DEVICE: E. Weintraub, Lynn, Mass. App. filed Oct. 16, 1913. For furnaces operating in air up to 1300 deg. C, core of tungsten and a shell of silicon in close contact therewith.
- 1,118,392. ELECTRIC-COOKING DEVICE: H. P. Ball, Philadelphia, Pa. App. filed Nov. 26, 1912. Range with heat-insulated cooking pocket sunk below the top surface thereof.
- 1,118,399. ELECTRODE: J. T. H. Dempster, Schenectady, N. Y. App. filed May 20, 1904. Magnetite and titanium oxide with small amount of chromium oxide.
- 1,118,400. ELECTRODE: J. T. H. Dempster, Schenectady, N. Y. App. filed May 20, 1904. Magnetite and titanium oxide with an addition of chromite.
- 1,118,402. ELECTRIC INCANDESCENT LAMP: F. Dickenschied, Berlin, Germany. App. filed July 15, 1912. Filament supported in a special arrangement.
- 1,118,408. ARC LAMP: R. Fleming, Lynn, Mass. App. filed Sept. 22, 1906. Control of the consuming and non-consuming electrodes.
- 1,118,410. COHERER: C. A. Glass, Greensburg, Kan. App. filed June 9, 1908. Has a rotatable supported cup containing loose coherer particles.
- 1,118,414. FLAME-ARC LAMP: C. A. B. Halvorsen, Jr., Saugus, Mass. App. filed Dec. 27, 1909. Has pairs of parallel carbons arranged on converging lines.
- 1,118,416. VEHICLE SIGNAL: J. B. Hawks and H. R. Kennedy, Los Angeles, Cal. App. filed Nov. 19, 1913. Push-button-controlled solenoids turn semaphore into signaling positions.
- 1,118,418. ELECTRICAL TERMINAL DEVICE: R. H. Hederson, East Orange, N. J. App. filed Dec. 5, 1910. For preparing tungsten filaments; receptacles fitted to overlying with mercury and heated.
- 1,118,422. ELECTRIC MASTER CLOCK: A. Jobs, Zurich, Switzerland. App. filed May 5, 1914. Special arrangement of the contacts controlling the secondary clocks.
- 1,118,433. COMPENSATING WINDING FOR POLYPHASE COMMUTATOR MACHINES WITH DRUM ARMATURES: H. Meyer-Dellus, Baden, Switzerland. App. filed March 24, 1910. Has a two-part drum winding.
- 1,118,444. MAXIMUM-DEMAND INDICATOR: L. T. Robinson, Schenectady, N. Y. App. filed May 22, 1913. Accurately measures the maximum demand in a manner satisfactory to both consumer and central station.
- 1,118,446. INSULATING COIL: H. Roos, Charlottenburg, Germany. App. filed Sept. 17, 1910. Made of turns of flat conductor with interposed sheets of insulation.
- 1,118,454. ELECTRIC-COOKING APPARATUS: H. G. Weeks, Chicago, Ill. App. filed May 6, 1911. Range capable of economical carrying on all cooking operations of ordinary household.



1,118,269—Means for Utilizing Waste Energy

- 1,118,464. ARC-LAMP ELECTRODE: M. H. Ester, Boston, Mass. App. filed Oct. 22, 1909. Feed-regulating strip secured thereto and reinforced along its exposed edge.
- 1,118,467. PISTOL FLASHLIGHT: J. Block, New York, N. Y. App. filed June 10, 1913. Has a trigger carrying a contact bridging between the battery cell and lamp-end contact.
- 1,118,490. AUTOMATIC TELEPHONE SYSTEM: J. M. Hulsh, Toronto, Ontario, Canada. App. filed March 23, 1911. Diving connection with trunk line station is guarded from interference by any other substitution.
- 1,118,526. AIR BRAKE: G. B. Wolf, San Antonio, Tex. App. filed June 7, 1912. Has solenoid-operated control valves.
- 1,118,525. AUTOMOBILE SIGNAL: G. W. Barringer, Lawrence, N. Y. App. filed June 4, 1913. Has a telltale on dash to indicate condition of the rear signal.
- 1,118,545. WIRE CLAMP FOR INSULATORS: C. Giovannoni, Enterprise, Ore. App. filed Jan. 12, 1914. Wire-clamping plates having an adjustable connection with the insulator.
- 1,118,571. AIR AND ELECTRIC COUPLING FOR RAILROAD TRAINS: B. C. Nelson, Oakland, Cal. App. filed Dec. 27, 1912. Can be coupled without kneeling between the cars.
- 1,118,568. TIME-ELEMENT DEVICE: N. Wilkins, Milwaukee, Wis. App. filed April 17, 1911. Thermostat bars arranged in the form of a truss and forming with their common base a triangle.

- 1,118,616. POWER-TRANSMISSION DEVICE: V. G. Apple, Dayton, Ohio. App. filed May 9, 1913. Motor-generator for automobile starting and lighting; cannot be operated as starting motor when engine has been left in gear.
- 1,118,623. ELECTRIC-LAMP SOCKET: R. B. Benjamin, Chicago, Ill. App. filed Jan. 31, 1912. Has a coiled lamp-engaging spring which prevents the lamp being shaken loose from the socket.
- 1,118,632. AUTOMATIC VOLTAGE REGULATOR SYSTEM: G. A. Burnham, Essex, Mass. App. filed March 23, 1909. Regulating transformer and means to vary periodically its primary circuit automatically.
- 1,118,633. AUTOMATIC VOLTAGE REGULATOR: G. A. Burnham, Cliftondale, Mass. App. filed July 10, 1913. Make and break device constantly operates to shunt a moderate field resistance.
- 1,118,650. PRINTING-TELEGRAPH ALPHABET: D. S. Hulsh, Toronto, Ontario, Canada. App. filed April 20, 1911. Alternating-current system.
- 1,118,655. CALLING DEVICE: W. Kaissling, Chicago, Ill. App. filed July 25, 1910. For automatic and semi-automatic telephone systems.
- 1,118,678. ELECTRIC MEASURING INSTRUMENT: J. Patrick, Detroit, Mich. App. filed March 2, 1911. Special electromagnetic restoring means.
- 1,118,684. ELECTRIC-ARC LAMP: M. A. Ross, Chicago, Ill. App. filed May 19, 1913. Improved holder for lower electrode of a fixed focus lamp.
- 1,118,694. DISK STRAIN INSULATOR: L. Steinberger, Brooklyn, N. Y. App. filed Jan. 3, 1913. Has ridges arranged to reinforce the structure.
- 1,118,699. PERMUTATION ELECTRIC SWITCH: G. H. Gardner, Chicago, Ill. App. filed Aug. 28, 1913. Has a longitudinally movable switch-controlling stem.
- 1,118,717. ELECTRIC INDICATOR: J. W. Wiley and J. A. Kropp, Oak Park, Ill. App. filed July 30, 1912. For keeping record of time spent by employees on particular jobs of work.
- 1,118,731. RAIL BOND: J. R. Bowers, J. A. Potter and C. B. Darnell, Newburg, Mo. App. filed June 20, 1913. Rail bond is secured upon excessive separation of the rail ends.
- 1,118,742. SPEEDOMETER ATTACHMENT: A. E. Cole, Forest, Ill. App. filed Nov. 5, 1913. Sounds alarm at predetermined speed.
- 1,118,763. ELECTRIC SNOVE: W. V. Hardy, Indianapolis, Miss. App. filed Aug. 19, 1914. Particularly for heating press boxes.
- 1,118,765. ELECTRICAL SIGN: T. S. Hastings, Detroit, Mich. App. filed May 29, 1913. For representing line drawings of script in process of formation.
- 1,118,780. TELEPHONE TRANSMITTER: A. D. Jones, Philadelphia, Pa. App. filed May 7, 1914. Prevents packing of the carbon granules.
- 1,118,812. PRODUCTION OF GAS-TIGHT SEALS OR CLOSURES BETWEEN METAL AND VITREOUS MATERIAL: J. S. Sand, Nottingham, and F. Reynolds, London, Eng. App. filed Jan. 30, 1914. Applies lead under non-oxidizing conditions.
- 1,118,847. ATTACHMENT FOR TROLLEY CARS: W. Eggers, Baltimore, Md. App. filed Nov. 11, 1913. Guard supported wholly from the axis of the trolley wheel.
- 1,118,868. METALLIC-VAPOR LAMP: F. Kerschbaum, Cambridge, Eng. App. filed Sept. 8, 1913. Obtains light free from the effect of absorption by radial magnets.
- 1,118,872. ELECTRIC IRON: W. S. Lytle, Jr., San Francisco, Cal. App. filed March 19, 1914. Has an indicator lamp on the handle thereof.
- 1,118,878. COATING FLEXIBLE OBJECTS OF ORGANIC ORIGIN WITH METAL: R. Ratin, Nuremberg, Germany. App. filed Oct. 17, 1914. Uses a coat of drying oil that fixes the metallic dust upon the surface.
- 1,118,891. TRAIN-CONTROL SYSTEM: J. Ames, Montrose, Ia. App. filed July 1, 1912. Circuit arrangement for insulated block system.
- 1,118,900. MERCURY-TUBE SWITCH: T. B. Fresno, New York, N. Y. App. filed Jan. 4, 1912. Special mounting of contact needle, filler duct, etc.
- 1,118,905. SEAL FOR VAPOR-ELECTRIC APPARATUS: R. D. Moley, Lynn, Mass. App. filed March 6, 1913. Made flexible.
- 1,118,906. MANUFACTURE OF ELECTRICAL RESISTANCES: A. W. Maley, Handsworth, Birmingham, Eng. App. filed Oct. 8, 1910. Made of soft iron; case hardened to give rigid form.
- 1,118,910. AUTOMATIC TELEPHONE SYSTEM: A. H. Dyson, Chicago, Ill. App. filed Oct. 13, 1910. Metallic line system.

# Electrical World

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No. 24

## Business and the President

The points in the President's message to Congress which were of special application to business were his

general reference to business regulation and his direct references to pending conservation measures, government-owned merchant marine, trade needs in Central and South America, and economy in government expenditures. Mr. Wilson assures business that the program for legislation on regulation is virtually complete. He has not modified his opinion that the business legislation is ideal. All interests, large and small, will hope that the enlarged governmental powers will be directed so wisely as to keep that clear and firm road ahead which the prophetic vision of the Executive sees. If the conservation measures are passed, the real test of their effectiveness to stimulate use will follow. Criticising the closing of the door to initiative which would have had "use with conservation," the President adds: "We withhold by regulation." In view of the present repressive tendencies of regulation in some quarters the question arises whether or not Mr. Wilson meant to have his words apply to other grave matters in which regulation is seriously withholding necessary development. If he did, we wish he had so stated. Mr. Wilson sees that the unsupplied markets are looking to us and that duty and opportunity impel us to consider them. His wise counsel for moderation and economy in government expenditure is in whole-hearted agreement with the policy of every great business organization in the uncertainties which the terrible European war has brought. It is unusual in a government official. If the spirit and letter of it are taken home by every government servant, official and employee, it will do good in needed quarters. In tone, earnestness and thought the message of the President is admirable.

## Special Electric-Service Contracts

Special contracts are involved in an issue which has arisen between the Potomac Electric Power Company

and the Public Utilities Commission of the District of Columbia. They antedated the commission law, and the company has therefore taken the position that the commission had no control over them. The attitude of the commission is that the constitutional provision which forbids the impairment of the obligations of a contract was not intended to deprive Congress of the authority to exercise its police power in the regulation of public service companies in the District. As the answer of the company indicates the probability that the question will be taken to the courts for settlement, this specific case is a legal problem. The matter of special contracts

has, however, been discussed in other instances between representatives of companies and commissions, and it is reasonable to expect that in many such cases a satisfactory settlement can be made. In the District of Columbia decision both company and consumers are made liable to fines if they continue to give and receive service at the rates named in the special contracts. All are in the same boat. The decision does not put the burden of cancellation wholly on the company. It does not require the company to stand alone before the commission as a violator of the decision. If the commission is right, the company is not the only party to an unlawful contract. If the contract has to be violated, it apparently must be violated by both of the parties. If no questions of law or of impairment of contract obligations were raised, it might be possible to settle many cases of this nature upon the basis of public policy or ethics. That is to say, either the consumer might be so moved by a sense of civic duty that he would willingly forego the privileges he sought under earlier conditions, or the company might offer the same form of contract to all consumers whose conditions of demand and consumption were the same as those of the holder of the old special contract.

## Limited Trading in Stocks

As the opening of the New York Stock Exchange for limited dealings in bonds brought forth no dangerous

flood of foreign selling, the decision to permit restricted trading in stocks has followed. The exchange authorities have taken a course midway between the extreme courses that were advocated by those who felt that either unrestricted trading or complete closing was advisable. It is in every way desirable that selling shall not be allowed to demoralize prices. It is in the interest of those who are forced to sell securities in these troubled times that liquidation shall proceed quietly and in an orderly manner. If liquidation is not effected in this way, it will destroy the market and greatly lessen the values of the securities of those who have to sell. A condition approaching panic as a result of heavy selling would be seriously injurious not only to present prices but to the future market for stocks and bonds. The interests of foreign holders of securities and of the United States are protected by the rigid application of policies that will prevent wide fluctuations in quotations. In imposing limits upon trading the banking authorities have acted primarily to strengthen and hold safe the position of their institutions and of this country. Unfortunately, the conservation of financial safety here meant that many individuals who



wanted to liquidate at once could not do so at all or could do so only at ruinous cost. If, however, the restrictions had been removed for all of the individuals who wanted to liquidate, demoralization would have followed and all chances of reasonable markets for any one would have ended. By tiding the situation over for four months the banking authorities have reached a point where it appears to be safe to invite freer selling and freer investment buying. With four months of accumulation the buying power of this country must have reached a point where it seeks outlet. Many sections of the West are abounding in prosperity and should be ready to buy securities with funds that have come from great crops and high prices. If needy seller and willing buyer meet under conditions that will safeguard the initial trading in stocks, there will be a market sufficiently broad for their purposes and large enough to advertise to the country that proverbially timid capital has come from retirement and is seeking opportunity, but not so encouraging to speculators that it shall be in danger of running away uncontrolled and thereby endangering the banking position.

### The Southern Sierras Transmission System

In earlier issues we have given a full account of the works of the Southern Sierras Power Company. In the present issue its extremely important and interesting transmission system is brought to the front. The system as a whole involves the longest transmission distances yet regularly attempted, although the main straight-away transmission is scarcely as long as that of the Big Creek system, which has often been referred to in these columns. However, the most distant customers of the Southern Sierras line are actually across the Mexican border, 400 miles from the generating stations, although toward the southern portion of the system there are numerous ramifications covering a large part of the southern Californian territory. Perhaps the most interesting feature of the whole work is the comparative simplicity of the methods by which energy is transmitted and service is maintained. The center of control of the system is near Bishop, Cal., below the mouth of the canyon which contains the group of generating plants. This nerve center of the entire enterprise is free from elaborate buildings and intricate construction.

There is no huge building with a multiplicity of concrete casements and marble-lined halls bristling with switches. In fact, the switching apparatus is of the typical outdoor type which characterizes all the later work of the Southern Sierras Power Company, although the transmitting system is designed for 140,000 volts. The station buses and the disconnecting switches through which the outgoing and incoming lines are connected to them are mounted on a framework of galvanized steel, and the double long-distance line which carries energy to San Bernardino and thus distributes it to the Mexican border is tied into the bus system with pneumatically operated air-break switches of the

simplest possible construction. Even the instrument transformers are installed in the framework of the buses, and the leads are carried to the instrument room in which are also installed the pneumatic controlling devices for the synchronizing and other switches. The whole control system is noteworthy for its avoidance of the customary complications and the elimination of the enormous switchboard structures which delight the souls of too many engineers whose acquaintance with long-distance working is less direct and practical. Simple as is the control system, it seems to be entirely adequate for all the reasonable needs of one of the longest systems in the world. The whole system has been planned along singularly simple and effective lines and is remarkable not only for its length but for the vast area covered by its several radiating systems of distribution.

### Regulation of Long Transmission Lines

In the current issue Mr. R. A. Philip gives a most interesting account of the regulation methods employed on the Big Creek transmission system, which has already been described in our columns, and makes it the text of a very interesting general discussion of the problem of extremely long lines. Readers will remember that the Big Creek line is by a few miles the longest straight-away transmission system in the world and to meet the somewhat formidable conditions arising from line capacity the receiving end of the line is provided with two 13,000-kva synchronous motors for use as "condensers." No previous line has been long enough to impel the engineer to so striking a departure from regular practice. Long as it is, the Big Creek line is not long enough so to approach the critical length of one quarter wave as to demand in itself very radical treatment, but the method worked out successfully for its regulation is, as Mr. Philip shows, adequate to take care of lines even up to the critical length.

The actual working of the system with the condensers operated at "lagging current" during light load and at "leading current" during heavy load seems to produce admirable results in regulation, as might properly be anticipated. It is probable, however, that Mr. Philip considers it as a stepping stone toward the solution of a general problem rather than as the only working solution of a special problem. The use of such apparatus practically amounts to a systematic loading of a transmission line in the same sense that a telephone line is loaded, except that the Big Creek load happens to be at the end of the line and is variable to suit the load conditions. If transmission lines ever become as long with respect to the wave-length as are telephone lines, they will undoubtedly require loading at several points, which can easily be done in connection with substations for distribution, perhaps without even requiring any large amount of special apparatus for the purpose. An interesting possibility of these very long systems to which matters of loading are closely related is the possibility of actual resonance with the lower and often more formidable harmonics.

Although no energy-transmission line is nearly long enough to invoke resonance at the fundamental frequency, yet the figures which Mr. Philip gives show very clearly that the third or the fifth harmonic might easily come into play in some existing lines. Indeed, it is not at all unlikely that unrecognized line troubles may already have arisen from this particular situation. Of course, resonance at harmonic frequency is unlikely to imply an enormous rise in voltage, since the amplitude of the harmonic is small and the dampening conditions are likely to affect it more seriously than the fundamental. Yet, despite this, the effect can conceivably become rather formidable, and in studying the problem of loading it ought not to be left out of account.

### Methods of Expressing Brightness

Brightness is a quantity of great importance in illumination—first, because it is largely by contrast of brightness of retinal images that we are enabled to judge of the dimensions and distances of the corresponding external objects, and, second, because the delicate neuro-muscular mechanism of the iris diaphragm in the eye appears to be adjusted to respond to the maximum brightness of the retinal illumination. A single bright spot where the local ratio of light to area is large will determine the aperture of the diaphragm, on the principle that no small area of the delicate retina may be permitted to endure excessive stimulus, even though the rest of the field is very dull.

When an attempt is made to define brightness scientifically it must be recognized that in practice all luminous surfaces differ in brightness from point to point. Attention must therefore be confined to the brightness of one small element of the surface at a time, although one may properly speak of the average brightness of a surface. The customary and time-honored manner of defining the brightness of an element of a surface is to isolate in imagination a square centimeter frame of area at the center of the element, with the frame turned to face the observer, and to find how many international candles spread over this square centimeter would make the frame look as bright as the actual element of surface seen through the square centimeter frame. The brightness of this element is then so many apparent candles per square centimeter in the particular direction of the observer's eye.

As is pointed out in the letter from Mr. J. R. Cravath in our correspondence column, the brightness of the element may also be referred to that specific radiation of the element in lumens per square centimeter (or other unit of area) which, assuming perfect diffusion of the radiation in all directions, would produce the same ratio of light to luminous-image area at the observer's eye as is actually observed for the element. On this assumption the brightness of the element may be referred to the equivalent local emissive flux density at the element for perfect diffusion. The unit of brightness on this assumption is then expressible in apparent lumens per

square centimeter, instead of in apparent candles per square centimeter, the two numerical values being connected by the factor  $\pi$ . It is advantageous to express the brightness in apparent emitted lumens per square centimeter in a number of problems relating to illumination. Moreover, just as in magnetism the engineering tendency has been to abandon the notions of magnetic poles and polar densities in favor of magnetic flux and flux densities, so there is a strong tendency in modern illuminating engineering to abandon the corresponding notions of candles and candles per square centimeter in favor of luminous flux and flux densities.

### The Action of the Audion

The rain jet of electrons, flying from a highly heated surface through the interior of a vacuum tube, can be controlled by electric forces. A positively charged plate supported within the tube will attract and intensify the jet, while a similar plate negatively charged will repel and weaken the jet. The audion may be described as a highly exhausted chamber, containing an electrically heated filament as a source of electrons, a metallic plate or wing supported facing the filament, and a metallic grid, or coarse sieve, supported parallel to the wing between the wing and filament. By varying the potential impressed upon the grid the stream of electrons shot off from the hot filament can be greatly varied, and a considerable amount of the stream thus controlled, passing through the holes in the grid, bombards the wing behind and gives up thereto its aggregate charge and current. When skilfully constructed and adjusted, a relatively small change of electric potential, communicated to the grid, will produce a relatively large change in the bombardment intensity of the wing-plate, and therefore in the current strength which the latter can deliver to a local receiving circuit.

The article by Mr. E. H. Armstrong beginning on page 1149 illustrates the behavior of an audion receiver, in a very interesting manner, from experimental evidence. The key to the performance of the device is given in the characteristic curve between impressed grid potential and received wing current. In the sensitive region 1 volt of change in potential will be accompanied by a change of more than 2 milliamperes of wing current, whereas beyond the sensitive region a change of 1 volt will produce very little current change. In the ordinary electromagnetic relay of wire telegraphy or telephony the impulses received over the line cause a solid metal tongue to move bodily over against a contact stop and to close a local circuit through this contact. In the audion, regarded as a relay, the tongue is a jet of electrons impinging on a large contact plate through a grid. The impulses received from the antenna in radiotelegraphy vary the potential of the grid, which thus instantly alters the direction and intensity of the jet, so that the current through the plate undergoes instant corresponding variations. The beam of electrons has such extremely minute inertia that it is able to respond to very high impressed frequencies.



# The News of the Week

Activities and Events in the Electrical Field—  
Reports of Meetings—Commission Findings, Etc.

## FIRE DAMAGES THE EDISON PLANT

Storage-Battery Buildings and the Priceless Laboratory  
Saved from Harm

A fire at the great plant of Thomas A. Edison, Inc., at West Orange, N. J., which started early in the evening of Dec. 9, caused much damage to the property. The early reports indicated a loss of \$5,000,000 to \$7,000,000, but subsequent estimates materially reduced this figure, and some of the calculations placed it at less than \$1,000,000.

The fire started in the cabinet shop from some cause which had not been determined on the following day. It began a few minutes before 5:30 p. m. and spread rapidly. Of the thirty-four buildings composing the total organization, three brick buildings were destroyed. Five or six of the new concrete buildings constructed of Edison cement were damaged by cracking and the contents of the structures were destroyed. With generally comparatively slight exceptions, however, the concrete withstood the fire. The conclusion reached by one of the investigators after the disaster is that if the concrete buildings had had metal frames and wire glass for the windows the entire structure would have withstood the fire and the contents would have been saved.

Although 6000 people are employed in the plant, but one lost life is reported. This was of a foreman who is believed to have returned to the film-testing department to rescue some girls who were thought at the time to have failed to escape. As a matter of fact, the em-

ployees responded immediately to the fire alarm and left their respective buildings in an orderly way as they had been drilled to do.

The priceless laboratory containing the office, library and experimental rooms of Mr. Edison fortunately escaped the touch of fire. As soon as it was seen that the fire was gaining dangerous headway practically everything that could not be replaced in this building was removed to a point of safety. The records were taken to the homes and garages of Mr. Edison and Mr. M. R. Hutchison, chief engineer of the company, in Llewellyn Park. These records, including even the books composing the personal library of Mr. Edison, were restored to their accustomed places by 9:30 o'clock on the following morning. At the same time that the work of removal of these invaluable possessions was begun those who were trying to stop the progress of the fire made up their minds that they must save the laboratory. Streams of water were thrown on the building, men were posted on the roof and strong efforts were made to protect the buildings immediately adjoining. These efforts were successful.

When the fire started Mr. Edison was at his home. Word was sent to him immediately, and he went to the plant. He remained on the scene until about midnight watching the firemen and talking with his principal officials. The contest against the fire was hindered seriously by the insufficient water supply, which hampered the various fire departments until much damage had been done. Notwithstanding his sixty-seven years, Mr.



PART OF THE EDISON PLANT—THE UNHARMED LABORATORY AND STORAGE-BATTERY BUILDINGS ARE NOT SHOWN

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Edison persisted in staying at the plant until the final control of the disastrous blaze had been secured. To his men, who know that discouragement and failure are wholly without his vision, he continued to comment on the fire and on the plans for reconstruction which must follow immediately. So fully was the entire force imbued with this spirit that early in the morning of the following day, while streams of water were still being poured into burning and smoking debris and ruins of destroyed buildings, the reconstructive work was progressing. Forces of men were put to work immediately cleaning up the debris, calculations were made for reconstruction, and emergency plans for maintenance of all parts of the business were completed.

The following statement by Mr. Edison was authorized for the *Electrical World*:

"Part of our phonograph works was destroyed by fire last night, but my private laboratory, the Storage Battery Company and the Edison primary-battery department were not affected. Business of both battery departments will continue as usual and we will rebuild the phonograph works at once. A large quantity of diamond-disk phonographs were saved, our collection of master records is practically intact, and we expect to be in a position to resume regular shipments from temporary quarters in the near future.

"The prompt response of the fire departments of our own and nearby cities saved us from a much larger loss. The immediate co-operation given by the New York Telephone Company established almost complete service on a temporary switchboard before business hours this morning, and although our power cables were badly damaged, the Public Service Electric Company gave us emergency service so quickly that we had scarcely two hours' interruption to the work in our shops. We are therefore in a much better position to conduct our business than the early reports of the fire would indicate."

The danger in which the historic laboratory of Mr. Edison was placed recalls a project that has been under discussion more than once, and it is hoped that after this experience it may be carried out. As is well known, the center or heart of the vast establishment and group of buildings is the large brick building containing the laboratory, offices, library, experimental rooms of various kinds, and a portion of the machine shop. There is considerable of a fire risk attached to it, and unfortunately this is particularly true of the beautiful library, which occupies the entire front of the building. The library is open through to the ceiling on three or four floors, around which run galleries for books, and here also are stored some of Mr. Edison's most precious collections of minerals. Back of the library is a storeroom where Mr. Edison has endeavored to keep a supply of practically every kind of material under the sun that could possibly enter into his experimental work or finished inventions. All the vast library space proper is sheathed in handsome woodwork, and the floor is occupied by a number of tables, desks, etc., and presents to Mr. Edison from various sources; while over in one library alcove is the little iron bed on which Mr. Edison throws himself for a hasty snatch of sleep during many of his frequent nightly vigils.

It has long been recognized that the loss of this wonderful collection would be simply irreparable and would constitute loss not only to Mr. Edison personally but to the electrical and mechanical arts and industries as a whole, and indeed to the world. Mr. Edison has therefore been urged, and it is understood has had the idea under serious contemplation, to build somewhere on the slopes of the Orange Mountain between his home at the mountain crest and the shops at the foot a large concrete building made from his own cement, where

under absolutely fireproof conditions all these relics and this material could be stored and exhibited. In other words, there would be constituted an Edison museum which could be opened to the public once or twice a week and would undoubtedly be visited by a large number of people. Ordinarily it could be closed except for Mr. Edison's own use and purposes. It has also been suggested that Mr. Edison might leave this by bequest to the State of New Jersey or the city of Orange, or might even make the transfer at the present time without interference with his work and with the assurance of safety.

### Supply Jobbers at Birmingham

Birmingham flung wide her gates to welcome the Electrical Supply Jobbers' Association this week. Never before in the history of the organization has it convened so far south, and seldom have its members been more abundantly entertained. The host of the occasion was Mr. Oscar Turner, past-Jupiter of the Jovian Order and the only association jobber in Alabama. His efforts were reinforced by the Chamber of Commerce, the city officials, the Press Club, the Alabama Power Company and the Birmingham Railway, Light & Power Company. So lavish were the entertainment features that little time was devoted to business. The sessions, of which there were four, were held in the Hotel Tutwiler and at the Roebuck Golf and Automobile Club on Tuesday morning and afternoon, Wednesday morning and Thursday morning. All were held behind closed doors. Routine matters and questions having to do with the present state of business in the jobbing trade and the outlook were discussed. During the past six months business in the jobbing trade has experienced a falling-off of from 20 to 25 per cent, and while, in the estimation of very many, the outlook for the next six months is not roseate, neither is it discouraging. Prominent jobbers from all parts of the country expressed themselves as more than satisfied with the prospects, considering the general state of uncertainty in almost all other businesses. In fact, the general tone of optimism which permeated all the sessions and lobby talks of the jobbers was considered by the manufacturers to be indicative of a return to normal business conditions in the electrical industry.

Thursday morning's session was given over entirely to business statistics of the jobbing trade. Approximately 200 jobbers, manufacturers and guests were in attendance after the meeting adjourned. A great many left to spend the rest of the week at New Orleans. It was decided to hold the next meeting of the association in March in Chicago.

The entertainment features of especial note were the gridiron cabaret and smoker tendered by the Birmingham Newspaper Club to the men on Tuesday night, the barbecue at the Roebuck Golf and Automobile Club on Wednesday afternoon and the reception tendered by the Country Club on Wednesday night. During Thursday afternoon the visitors were taken on a trip through the great steel and industrial district of the Pittsburgh of the South. Teas, theater parties, automobile rides, golf tournaments and card parties were other features.

The first, second and third prizes in the jobbers' golf tournament were won by Messrs. G. W. Johnston, of Omaha; J. H. Doherty, of Montreal, and W. W. Low, of Chicago, respectively. Mr. C. L. Lichter, of Grand Rapids, won the "kickers' handicap."

The prizes awarded in the manufacturers' golf tournament were won by Messrs. J. P. H. De Windt, of Birmingham; R. T. Brooke, of Birmingham, and W. Grady, of Decatur, Ill., respectively. Mr. Frank E. Watts, of New York, won the "kickers' handicap."



## CHEAPER HOUSE WIRING

Description of the "Bare Concentric Wire" and Statement of the Advantages That Are Claimed to Lie in Its Use

BY W. H. BLOOD, JR., N. E. L. A. INSURANCE EXPERT

Recognizing that cheaper cost of house wiring would stimulate the electric-lighting business, the committee of the National Electric Light Association on the wiring of existing buildings has been on the lookout for anything that would accomplish the result. It was found that in England, and to some extent in Germany, a wire had been in use for several years consisting of a copper core, rubber-covered, and incased in a tube of copper or brass, the copper or brass being bare and constituting the return conductor. The results accomplished by the use of this wire seemed to be satisfactory and led the committee to believe that in the United States a similar class of installation might be found practicable. One manufacturer has taken an interest in the matter and has already made enough of the wire to know that it is a commercial possibility and has also designed a line of fittings which are remarkable because of their simplicity.

The idea of insulating with care one wire and running the other bare is not new by any means. Some of the ships in the United States Navy and many foreign vessels are provided with a single live wire, the steel hull of the vessels being used for the return circuit. A large office building in Providence several years ago was wired with one insulated conductor, the iron conduit forming the return for the branch circuits. Some ten or twelve years ago, when the writer first began to urge the grounding of secondaries, he publicly stated that the logical outcome of grounding one of the circuit wires would be running it bare and paying more attention to the insulation of the other wire. It was suggested that this could be accomplished by using a bare, flat copper band or bare stranded wires, which might be wound around the outside of the insulation covering the core. The present suggestion is simply a modification of this idea. The outer covering or copper conductor is to be made water-tight in order to protect the rubber insulation.

The use of this system, which may be designated as the "bare concentric wire system," will bring about many desirable results, with, so far as now anticipated, no undesirable ones. It is proposed to limit the use of the system to grounded installations and to branch circuits carrying 660 watts or less and for the present at least to require that it be run "in sight." It will of necessity be a great incentive to grounding secondaries; it will be an additional argument for omitting the fuses in all neutrals; it will mean that single-pole switches will be adequate; it will render insulating joints unnecessary. Its use, therefore, will greatly add to safety, and it is self-evident that it will also bring about a lower cost of wiring installation.

### Prevention of Electric Shock

When this system is in use it will be practically impossible to receive an electric shock of any kind, whether high-tension or low-tension, for a conductor at the potential of the earth will always be exposed, while conductors at higher potential than the earth will be insulated, inclosed and protected. The outer shell of all sockets and fixtures, pull chains, wire guards, etc., will be at the potential of the earth. By use of polarity plugs the same protection may be extended to portable lamps, heating devices, etc., so that every ordinary electrical device handled by the public will be absolutely safe.

The wire itself will probably cost about the same as two ordinary rubber-covered Code wires but the labor of installing will be decidedly less. The wire can be run across the ceiling and up and down the walls, fastened by means of neat metal clips. It may be papered over or painted or even embedded in the plaster; its installation entails no tearing up of the house, for it is a simple surface job and is neat in appearance.

This method of wiring in a sense is revolutionary; it is contrary to all present National Electrical Code rules, but it has already had the indorsement of many prominent Underwriters' representatives, and a special committee, appointed by Chairman Cabot of the National Fire Protection Association, is drafting rules covering its use which, it is expected, will be ready for consideration at the March meeting of the National Fire Protection Association.

It is expected that at first sight some may be inclined to condemn the use of such a system, primarily because "it is so different" from anything that has been in use before, but it is believed that the system is the perfectly logical outcome of the principle requiring that all secondaries be grounded. A careful consideration of the matter will convince most people that this system is safe, simple and cheap, which three prime requisites will materially help to increase the use of electric lamps in buildings not previously wired.

### N. E. L. A. Wiring Committee Meeting This Week

A meeting of the National Electric Light Association's committee on wiring of existing buildings, of which Mr. R. S. Hale, of Boston, is chairman, was scheduled for Dec. 10 at Nela Park, Cleveland. It was planned to discuss at this meeting an important report upon the standardization of plugs and receptacles with the object of enabling the purchaser of an electric flat-iron or other appliance within the present circuit limit of 660 watts to utilize standard receptacles without special wiring apart from the lighting circuit; to consider the further collection of unit prices for the formulation of comparative data leading to the ultimate standardization of costs for ordinary dwelling-house installations; to take up certain suggested revisions in the Cushing Standard Wiring Handbook; to consider the question of fuse elimination on the neutrals of grounded systems, the general subject of fuse standardization, and the status of concentric wire development.

Interest in the possibilities of concentric wiring is spreading all over the country, although comparatively little has been publicly available upon the subject as yet that is applicable to American practice. On this page is printed an article by Mr. W. H. Blood, Jr., insurance expert of the National Electric Light Association, which outlines the possibilities of so-called "pipe wiring" as developed abroad and as experimentally constructed by one of the large manufacturing concerns of this country with the intention of formally bringing the matter before the Underwriters for approval at the annual meeting in March, 1915. In this connection it is worth noting that a large central-station company which has been wiring between 1000 and 2000 houses a year under the present system estimates that it could increase this list by 5000 houses a year and reach into an entirely new class of business, provided that the cost of wiring could be reduced as indicated by the concentric development. The purpose of the committee is not to encourage any flimsy or unsafe construction but to work toward securing for this country by thorough discussion and sound engineering the benefits of lower-cost installations now so widely enjoyed in Europe.

## ELECTRICAL GRADUATES IN 1914

Statistics Concerning the Number of Students Taking Electrical Courses in the United States and Comparison with Former Years

During the past eight years there have been compiled by the *Electrical World* certain statistics relating to schools in the United States conducting systematic courses in electrical engineering. The former tabulations appeared in our issues dated July 27, 1907; Dec. 26, 1908; Feb. 10, 1910; Dec. 22, 1910; Nov. 11, 1911; Nov. 23, 1912, and Oct. 18, 1913. Below are given the data compiled for 1914. A comparison of the values given for the number of graduates in 1913 in the accompanying Table I with the corresponding values reported

TABLE I—STATISTICS OF POST-GRADUATE AND UNDER-GRADUATE STUDENTS IN 1905 AND 1914

Year	Class	Freshmen	Sophomores	Juniors	Seniors	Post-graduates	Total Graduates	Total Students
1905	First	1069	833	767	501	113	3,373	533
	Second	1398	1103	808	674	101	4,289	598
	Third	475	366	306	276	3	1,486	235
Grand totals		3142	2302	1941	1541	217	9,143	1366
1914	First	1313	990	864	791	98	4,056	641
	Second	1846	1200	881	680	89	4,705	679
	Third	581	360	283	240	2	1,466	284
Grand totals		3740	2550	2028	1720	189	10,227	1604

last year will show some difference attributable in part to revision in the statistics relating to the graduates, the actual rather than the predicted number being used in Table I herewith.

Reports have been received from 117 schools, 71 of which have been placed in the middle class. Class I includes twenty-five schools of the highest standing, the degrees from which confer more or less prestige on the

TABLE II—ELECTRICAL ENGINEERING STUDENTS AND GRADUATES

	Number of Schools	Students 1913-14	Graduates 1914	Total Graduates to June, 1914
Class I	25	4,056	641	10,186
Class II	71	4,705	679	8,028
Class III	21	1,466	284	2,915
Totals	117	10,227	1604	21,132

graduate. Class III includes twenty-one schools in which the instruction is quite elementary but which have regularly organized courses of instruction in electrical engineering. All others have been assigned to Class II.

During 1914 10,227 students received instruction in

TABLE III—COMPARISON OF STATISTICS FOR EIGHT YEARS

Year	1907	1908	1909	1910	1911	1912	1913	1914
Students	8929	9651	8670	9041	9515	8921	9443	10,227
Graduates	1358	1501	1473	1545	1614	1442	1366	1,604

electrical engineering, this number being 576 greater than the number in 1908, which held the record in attendance for five years. Over 21,000 students have

been graduated from electrical engineering courses in the United States, and doubtless more than 21,000 additional have received instruction for at least one year. A large number of the men receiving instruction enter lines other than electrical, but almost all of them find their college training useful.

## Street-Lighting Tables for 1915

In accordance with the plan inaugurated last year, the *Electrical World's* street-lighting tables for 1915 have been prepared as three separate schedules, correct respectively for the northern, middle and southern sections of the United States. An appropriate set of the tables will be distributed gratis to every central station and lighting plant in this country and Canada. On request the schedules will also be sent gratis to any subscriber desiring a copy.

The departure in issuing the tables as three different schedules based on geographical latitude was adopted to attain greater accuracy than was hitherto possible with a single set of tables. As a result the figures now cover the entire area of the United States and southern Canada with a maximum error of less than ten minutes. The northern tables are correct within five minutes for the States of Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, Michigan, Wisconsin, Minnesota, the Dakotas, Montana, Wyoming, Idaho, Oregon and Washington, and for southern Canada. The middle schedules (which are virtually a continuation of the tables for former years based on the latitude of Philadelphia) apply with an error of less than ten minutes to all the North and Middle United States lying north of the southern boundaries of Virginia, Kentucky, Missouri, Kansas, Colorado, Utah and Nevada, including the entire area of the States mentioned as well as all of California north of Monterey. The southern schedules apply to the States of North Carolina, South Carolina, Georgia, Florida, Alabama, Tennessee, Mississippi, Louisiana, Arkansas, Oklahoma, Texas, New Mexico, Arizona and that section of California south of Monterey.

As in previous years, the schedules give the times for lighting and extinguishing lamps on the "all-night system," the "Philadelphia moonlight system" and the "Fruend system," the data being arranged in three tables. The data in Table No. 1 have been compiled in such a manner that by following this schedule the lamps are lighted one-half hour after sunset and are extinguished one hour before sunrise, giving a yearly operation of about 3830 hours. An "all-night" lighting schedule, giving a yearly total of about 4000 hours, could be obtained by lighting fifteen minutes earlier and extinguishing fifteen minutes later than shown in this table. In the so-called "Philadelphia moonlight schedule" (Table No. 2), beginning the fourth night after new moon, advantage is taken of the moonlight, and on nights when the moon is full or nearly so the lamps are not lighted. On other moonlight nights the lamps are extinguished one hour after moonrise and lighted one hour before moonset. With this schedule the lamps are in operation about 2000 hours per year. Table No. 3 is calculated according to the system of Mr. Fruend and ignores the moon until after midnight throughout the year. The lighting hours after midnight are the same as those in Table No. 2. This schedule entails the use of lamps for about 3000 hours per year.

As above noted, a copy of these street-lighting tables may be obtained gratis by addressing the *Electrical World*, 239 West Thirty-ninth Street, New York City, and specifying the set of schedules desired.



### Large Contract Secured by Worcester Company

The Worcester (Mass.) Electric Light Company began service on Dec. 1 to the Denholm & McKay Company and to eighty new customers formerly receiving electricity from the so-called "Boston Store" isolated plant, which supplied energy to practically the entire block of buildings bounded by Main, High, Pleasant and Chatham Streets, in the heart of the business district. Under the new arrangement, which includes a twenty-year lease of the premises occupied by the Denholm & McKay plant and the purchase of its equipment, the engines and generating units now in place will be taken down and sold and a substation with two independent 13,000-volt, three-phase feeders from the Webster Street generating plant, 2 miles distant, will be installed. The company will operate the existing steam-boiler plant of the Denholm & McKay Company on a low-pressure basis, furnishing heat to all the premises in the block, and as soon as possible will serve all of the consumers of electricity in this area from the substation.

The territory covered is roughly 800 ft. long by 600 ft. wide and is one of the most crowded business areas in New England. Besides many small consumers it includes the Knowles Building, the Denholm & McKay department store, the largest in the city; the Clark-Sawyer Company, a large crockery and china establishment; the Rebboli Sons Company catering house, two "five and ten-cent" stores, the Knibbs electric garage, the Merchants' National Bank, which will shortly erect a new building on the present site; the Healey Cloak Company, the Young Women's Christian Association Building, the Hotel Newton, and other consumers. In most cases the lighting installations will be modernized with the aid of the company's illuminating engineering department, and while service was rendered by the isolated plant at 5 cents per kw-hr. against a maximum rate of 9 cents offered by the central-station company, the bills in some cases will be reduced as a result of engineering development, and in cases where they are increased every effort will be made to provide a standard of service worth the difference. There will be a total reduction in the cost of electrical service and steam heating for the entire block estimated at about \$4,000 per year, and it is estimated that the change will yield the Worcester Electric Light Company a total additional revenue of about \$42,000 per year, of which \$34,000 will be derived from electrical service.

The isolated plant contained four 150-hp boilers, which will be retained, and five steam-driven generators, consisting of one 35-kw turbo-set, two 75-kw and two 100-kw, 110-volt direct-current units of the reciprocating-engine type. The maximum demand on this plant of 385-kw rating was about 300 kw, the estimated connected load being about 500 kw. The owners of the plant became interested in the possibilities of central-station service as a result of the securing of a contract by the company for the lighting and motor-service supply to the new Worcester Trust Company building, at the intersection of Main and Franklin Streets. It was found on investigation that a large amount of live steam was being used in heating the various buildings in the block and that the demands of the electrical service at off-peak hours were insufficient to provide the quantities of exhaust steam needed, and the company was able to guarantee the economies of central-station service without making tests upon the steam plant or the taking of indicator cards prior to the award of the contract from the Denholm & McKay Company.

Under the new arrangement the Worcester Electric Light Company will replace existing steam-driven elevator pumps by one 100-hp and one 250-hp pump driven

by 2300-volt induction motors and supplying water under pressure to thirteen passenger and freight elevators. A 530-ft. deep well served by a steam pump will be equipped with a 7.5-hp motor drive, and an ammonia compressor now operated by steam will be driven by a new 20-hp motor. There will be about ninety motors in the entire block. A flaming-arc lamp installation in the cloak house mentioned will be replaced by an equipment of nitrogen-filled or straight tungsten lamps, and a new electric elevator will probably be required in the bank building. The substation will necessitate the purchase of transformers and switchboard equipment. Special arrangements are being made to take care of changing over to alternating-current service the equipment of something like a score of dentists now using direct-current motors in engine driving. To accomplish this the power engineering department of the company plans to install in each dental office a motor-generator set consisting of a 1/6-hp, 110-volt induction motor driving a 100-watt generator, each set being provided with a taper shaft at each end by which chucks for drilling, rag wheels for polishing, emery and buffing wheels can be placed quickly in service without the use of a dental lathe, the generator supplying energy in each case to the existing direct-current 110-volt engine motor, which consumes about 70 watts when in service. The induction motor is of sufficient size to take care of grinding without requiring the ordinary lathe motor's operation, and the cost of making the installation will not exceed \$43 per dental office, against \$170 if the existing equipment for engine service were discontinued. The landlord usually agrees to meet this cost.

### New York Company to Furnish Energy for New York, New Haven & Hartford Railroad

The United Electric Light & Power Company, New York City, has closed a long-term contract with the New York, New Haven & Hartford Railroad for supplying energy to assist the railroad company's generating station at Cos Cob, Conn., in carrying the electric-train load. To furnish the energy, the electric-service company is erecting a new substation at New York City which will be equipped similarly to the station at Cos Cob. Five double T-connected transformer banks will be used eventually, but only three are being installed at present. These will receive three-phase, twenty-five-cycle energy from the 201st Street generating plant of the United company at 24,600 volts and will step the pressure down to 11,500 volts from conductor to ground, so that single-phase energy can be employed for train operation and three-phase energy for bridge and signal operation. Two 20,000-kw, 6600-volt, twenty-five-cycle, three-phase Westinghouse turbo-generators will be added to the 201st Street generating station to care for the increased load which will fall on the generating station. It is reported that the substation equipment will be ready for operation by May 15, 1915. About 50,000,000 kw-hr. of energy will be supplied a year, according to estimates.

### Boston Street-Lighting Contract Signed

A ten-year street-lighting contract was signed by the Edison Electric Illuminating Company of Boston, Mass., and Mayor Curley on Dec. 7. The prices are to be reviewed by the Massachusetts Gas and Electric Light Commission by mutual agreement, and the contract contains a number of interesting provisions which will be given in a later issue. The company consented to dating the new prices back to July 1, 1914, which amounts to returning to the city treasury \$32,652.

### The Situation Before Congress

The third and last session of the Sixty-third Congress convened on Dec. 8. Notwithstanding the talk of hurrying the appropriation bills and special legislation urged by the President before the Congress comes to an end under the statutes on March 4 next, an extra session is expected by many well-informed people.

The Secretary of the Treasury submitted estimates of \$1,090,775,134 as the total appropriations needed for the coming fiscal year. This is \$3,393,962 less than the total of appropriations for the current fiscal year, and to that extent indicates economy in public expenditures. While this reduction represents a decrease in almost all activities, there are increased estimates for the army and navy branches of the service, both of interest to electrical industries. These are the only two departments of the government in which increased estimates are shown. The army estimate is \$105,866,850, as compared with the current appropriation of \$101,977,802. The navy estimate is \$142,619,033, against a current appropriation of \$141,393,217.

### Philadelphia Rate Case

The hearing in the Philadelphia Electric Company rate case was resumed before the Public Service Commission of Pennsylvania in Harrisburg on Dec. 2 and continued for several days. Mr. Frederic W. Fleitz, counsel for the company, announced that an inventory is in progress under the direction of Prof. Dugald C. Jackson. Mr. Frederick W. Ballard, commissioner and chief engineer of the division of light and heat of the city of Cleveland, was a witness on behalf of the city of Philadelphia. Announcement has been made that if a decision is not rendered by the commission by Jan. 1 the company will continue to supply energy for city lighting until the conclusion of the case.

### The Federal Trade Commission

Senator Cummins of Iowa has allowed it to become known in Washington that he thinks the positions of members of the Federal Trade Commission to be as important as appointments to the Supreme Court. For this reason, Senator Cummins stated, the qualifications of appointees will be scanned very carefully when nominations are sent to the Senate. It is likely that candidates will be asked to appear before the Senate committee to explain their past connections or views in regard to the Newlands act creating the commission and the Sherman act.

It is reported that Mr. Frank B. Lord, a newspaper writer of Washington, who is president of the National Press Club, will be made secretary of the commission.

Mr. John H. Fahey, president of the Chamber of Commerce of the United States, says that that organization has suggested to President Wilson that in appointing the commission he consider naming at least one member who is a business man familiar with foreign trade and having experience in that trade. Mr. Fahey said:

"It has been suggested that under existing conditions steps should be taken immediately to permit firms in this country to combine in the establishment of common selling agencies and otherwise work in harmony in the promotion of their foreign business, somewhat along the lines permitted by European countries. This proposal has been under consideration by the Chamber's trust committee, and a report is now in preparation which will go to the board of directors and will in

turn be submitted to its membership. It is the belief of the directors that a permanent committee of the chamber, composed of the most experienced business men whose services can be secured, to study continually the questions that will come before the commission, can be extremely useful. It has therefore decided to establish such a committee. The chamber will also suggest to the organizations in its membership the advantage of appointing committees of their own on the subject of interstate trade."

### Centralization of London Energy Supply

At a meeting of the London County Council on Nov. 10 the special committee on London electricity supply presented a second report on the subject of a unified system of electrical supply for London. It is proposed to establish the London Electricity Authority to deal generally with the question of supply in London and to have full powers of control over the new undertaking. The proposed area comprises the counties of London and Middlesex and parts of Essex, Hertford, Kent and Surrey. The county and county borough councils within the area would be represented on the authority, which would establish a "technical committee" to advise on technical and certain administrative matters.

The committee adheres to the principle of a combination of municipal control and private operation, and believes that the undertaking should be worked for a term of fifty years by a statutory company subject to control by the authority. To the authority would be given power to acquire by agreement or lease the undertakings of any company and local authorities in the area and to merge the undertakings. It would have power to take over the proposed undertaking at the end of fifty years on payment of a sum equal to the capital provided by the company for the purposes of the undertaking and also to take it over if the company failed in its statutory or contract obligations. Maximum charges for energy would be prescribed, but rates could be revised by the Board of Trade upon application.

The committee considers it an essential part of the scheme that a considerable portion of the capital should be furnished by the company. It proposes that the proportion in which capital is raised should be a matter of agreement between the authority and the company. The net revenue would be divided as follows: (1) Interest at the assumed rate of 4 per cent on capital furnished by the authority; (2) sinking fund, to be owned by the authority, at the rate of about 2 per cent per annum on the whole capital of the undertaking; (3) interest on the capital furnished by the company at the assumed rate of 4 per cent; (4) reserve fund calculated at one-half of 1 per cent per annum on the whole capital of the undertaking. Surplus profits above interest, sinking fund and reserve provisions would be divided equally between authority and company until the latter had received enough to pay a further 4 per cent interest upon its capital expenditure, making a total of 8 per cent. Further profits would, as regards 75 per cent, be utilized in rebates to consumers, while the remaining 25 per cent would be divided equally between authority and company.

The finance committee of the County Council concurs in the recommendation that a sinking fund of 2 per cent is adequate and has taken under consideration the provision of a reserve fund of one-half of 1 per cent. It concludes that necessary capital for extensions could be borrowed more cheaply by the new authority or the company than by the present owners. The estimated new capital expenditure is \$5,000,000 for the first period of five years, and thereafter about \$1,000,000 annually.



### Senate Committee Hearing on Water-Power Bill

The Senate public lands committee began hearings on the so-called Adamson water-power bill on Dec. 9. This is the first of the administration conservation bills which President Wilson in his address to Congress urged should be passed at the present session. The measure has already been passed by the House.

The first day of the hearings, which are expected to continue for a week or more, was given over to Mr. Edward C. Finney, a member of the board of appeals of the Interior Department, who appeared at the request of Secretary Lane to urge the passage of the bill. Senators Clark of Wyoming, Smoot of Utah and Robinson of Arkansas indicated by their questions that they believe the Adamson bill gives too much power to the Secretary of the Interior.

Senator Clark said that the bill should be so amended that if an applicant for a lease for a water-power site on the public domain complied with all the regulations laid down by the bill and the department the Secretary of the Interior should be compelled to grant the lease. He pointed out that the Secretary, under the bill, would have power to refuse to grant a lease even if the applicant had complied with all the requirements. Senator Clark does not want the Secretary to have discretion. Mr. Finney said he thought that some discretion ought to be lodged in the Secretary and that no Secretary would discriminate in favor of or against any applicant.

A large number of witnesses both for and against the bill have signified a desire to be heard. The Governors of Utah and Colorado will be heard.

### Investigation of United Gas Improvement Company by Department of Justice

The Department of Justice is understood to have practically completed an investigation of the United Gas Improvement Company of Philadelphia, under which it is believed possible that a suit for its dissolution under the Sherman anti-trust act may result.

At the office of Mr. George Carroll Todd, assistant to the Attorney-General, it is not possible to obtain details of the intentions of the government with respect to the company, according to information from a Washington representative of the *Electrical World*, but an inquiry there as to the truth of a report that the Department of Justice is considering the point of law whether there can be interstate commerce in light and a monopoly of it met with the reply that the United Gas Improvement Company not only sells light but is the owner of or controls the Welsbach company and other companies which sell light fixtures and appliances in interstate commerce.

The report on the investigation by federal agents is said to have been in the hands of Mr. Todd for some time. He is in charge of the investigation of anti-trust cases for the Department of Justice and is expected to have a conference with Attorney-General Gregory, and the latter with President Wilson, with a view to reaching a decision as to the wisdom of instituting a suit in equity against the company.

Inquiry at the Department of Justice as to what the investigation, which it is admitted there has been made, shows as to the operations of the company was met with the reply that no details will be made public until some decision in the case is reached. The Department of Justice, it is pointed out, under this administration, has filed but few suits to break up alleged "combinations."

The United Gas Improvement Company obtained a perpetual charter under the laws of Pennsylvania in

1885, with "power to construct, maintain or manage any work and furnish all materials, implements, instruments, etc., with power to hold securities of any form and dispose of same."

### Resolutions on the Death of Chairman Barker

The surviving members of the Massachusetts Gas and Electric Light Commission have spread upon the official records of the board a resolution relative to the death of the chairman, Forrest E. Barker, at Washington, D. C., on Nov. 21.

The resolution, in mentioning the fact that Mr. Barker, while a member from Worcester of the General Court of 1885, drafted, introduced and carried through the Legislature the bill creating the board, the first tribunal of the kind in the country for the regulation and supervision of gas and electric light companies, says: "Without derogation to the memory of his early associates, it may be said in all truth that from the outset his was the master spirit and that he, with his wide, clear vision, projected the board's course and, like a true pilot, held it on its way to the port of sane, intelligent efficiency. And in accomplishing this he, without chart or compass—for there were no precedents—announced principles in the board's decisions so elementary and fundamental as to be generally accepted by courts and commissions as sound in law and satisfying to the universal sense of justice. His accurate and thorough knowledge of the law and his equally accurate and thorough knowledge of the technical and business details of the public utilities under the board's supervision enabled him to grasp the delicate and complicated problems arising from their relations to municipalities and the people, and to bring to their solution constructive work of a high and enduring order, which has had, we are convinced, the approval and appreciation not only of the great body of consumers and investors in the securities of our public service corporations, and all directorates that have at heart the welfare of their community as well as their companies, but also that larger public that of late years has exhibited such a vital and intelligent interest in the proper regulation of public utilities."

### Attack on Niagara Falls Power Companies

Mr. J. Horace McFarland, president American Civic Association, in his address at the tenth annual convention of the organization in Washington, on Dec. 3, attacked water-power companies using Niagara Falls water. He denied the contention of the power companies that the scenic beauty of Niagara Falls is not being marred. Mr. McFarland said:

"The power companies contend that the scenic beauty of Niagara Falls is not being marred, but you have only to investigate the reports of the government engineers to see how much harm has already been done and how little further the power companies may go if more than a remnant of the Falls is to remain. The engineers have asserted that if all of the water-power of the Falls should be used, a total of between 1,000,000 hp and 2,000,000 hp could be produced. The production of energy already amounts to 500,000 hp per day.

"It is not enough to limit the amount of water-power which may be developed on the American side of the river. We must prohibit the importation of any more power than is now being sold by the Canadian companies in the United States. The Canadian companies now receive, by the use of this water, more than \$10,000,000 revenue per annum. Let us do our utmost to secure the speedy enactment of a law which will compel the Canadian companies to stop where they are."

# CLEVELAND MUNICIPAL PLANT DISCUSSED

Abstract of Discussion Before the American Society of Mechanical Engineers

Following the presentation by Mr. Frederick W. Ballard, commissioner and chief engineer of the division of light and heat of the city of Cleveland, of a paper on the "Design and Operation of the Cleveland Municipal Electric-Light Plant" before the American Society of Mechanical Engineers in New York, on Dec. 3, the subject was discussed.

Mr. Walter C. Allen

Mr. Walter C. Allen, electrical engineer, Washington, D. C., in a written discussion said that the paper omitted a description of the distribution systems. The loss in distribution from the Brooklyn station for 1913 was given as 27.4 per cent, while the loss for the first eight months of the present year, with the Fifty-third Street station operating with it during the last six weeks of that period, was 20.2 per cent. The loss in August with both stations operating was given as 16.25 per cent. In the absence of any further information regarding improvements in the distribution systems, the reader must assume that this increased efficiency is brought about by the use of alternating current in the low-tension system instead of direct current through rotary converters.

Mr. Robert L. Brunet

Mr. Robert L. Brunet, public service engineer, Providence, R. I., sent a written discussion. He said that with low rates for energy it seems only fair to state that the load-factor of 40 per cent will possibly be realized, based on a peak of 18,000 kw, but when the peak of 18,000 kw is reached the generating equipment will undoubtedly have to be increased in order to insure reliability and continuity of service. A diversity factor in a central station is the basis of profit. In making a study of the income of various central stations Mr. Brunet has found that the income per \$1 of investment varies in most private plants from 20 per cent to 25 per cent. Mr. Ballard estimated an income of 33 per cent per \$1 of investment. This figure in itself seems relatively high. It is Mr. Brunet's belief that it will be reduced somewhat by the fact that when the peak reaches the estimated maximum of 18,000 kw the distribution system will be so extended that the actual investment will be greater than the figure used at this time.

Prof. Edward W. Bemis

Prof. Edward W. Bemis, of Chicago, in a written discussion, said that he believes that no candid student of the subject can doubt that Cleveland is securing better results by competition than state regulation would secure. Quoting the statement of Mayor Hocken of Toronto, at the conference of mayors in Philadelphia, that results were being secured by competitive methods in that city, Professor Bemis declared that if these experiments continued to succeed, state regulation will have to cease allowing companies returns on unearned increments, donation and surplus earnings invested in their properties, or existing laws in the various states will be changed where necessary to permit direct municipal competition under proper safeguards of publicity and uniform accounting, referendum on bond issues, etc. When the efficiency of public operation approaches that of private operation the handicaps upon the latter, through its demand for returns which public operation never makes, such as going value and the increased cost of replacement as compared with actual costs, etc., to say nothing of differences in the demanded rate of return, will prove serious. Whether that time

has yet arrived and how far private companies will awaken to the situation, as they have been doing in England, will have a varying answer with every community and with changing conditions.

Mr. James R. Cravath

Mr. James R. Cravath, electrical and illuminating engineer of Chicago, said that whether the estimated maximum load of 18,000 kw can be brought to the station under conditions existing in Cleveland with a distribution system cost sufficiently low to bring the total investment in power plant and distribution systems to only \$3,000,000 of course remains to be demonstrated. The cost of a central-station distribution system, of course, depends very much upon the character and distribution of the load. If the station can be fully loaded with a distribution system covering a small area and serving mainly large power consumers, the cost may even be under that given by Mr. Ballard. If the distribution system is to cover a large city where the load density is necessarily low because of the necessity of dividing the business with a competing central station, existing experience indicates that it is very doubtful whether the station can be loaded to 18,000 kw with a total investment of \$3,000,000. The value of the power station being \$1,000,000 leaves \$2,000,000 of the \$3,000,000 investment for distribution system. With 18,000 kw maximum load this corresponds to a cost of \$111 per kw for distribution system. On a similar basis the cost of the entire plant would be \$167 per kw of maximum load for station and distribution system. It is probably not correct to take the cost of the South Brooklyn system as a criterion of the cost of the Fifty-third Street plant with its distribution system when completed, but it is interesting to note that the South Brooklyn system complete on a basis of 1500 kw capacity cost \$365 per kw of station capacity. If the station is not fully loaded, the cost per kw of maximum load would be higher than this. It is possible that by cultivating the large motor-service business and ignoring the low-load-factor lighting business, such as residences and early closing stores, a 40 per cent load-factor might be maintained from the start in an enterprise like that at Cleveland. The natural tendency of rates as low as those given in Mr. Ballard's paper would be to load up the plant with low-load-factor business unless great care was exercised to prevent it. Depreciation on the complete new plant is assumed at 3 per cent, calling for an average life of plant of twenty-two years. It is doubtful whether this is a sufficient allowance for depreciation, even though it may be in accord with the customs of some private corporations.

Mr. Alex Dow

Mr. Alex Dow, president Detroit Edison Company, said that he had followed the construction and operation so far of the plant with a great deal of interest. It is in a neighboring town. It is dealing with the problems with which he deals from day to day and the consulting engineer is an old friend. The plant is a good plant. It is a credit to Mr. Ballard, to the consulting engineer and to the city officers that let them go ahead and make a good plant. There is much in the paper that is speculative. Mr. Dow called attention to the fact that all through these estimates it is made very clear that these were based upon certain assumptions. One discussion, by Mr. Bemis, seems to think that the case is settled, demonstrated. It is not. It will be proved some day, and Mr. Dow said he hoped that on the day when the proof is completed the result, whatever it may be, will be revealed by Mr. Ballard. What he needs first is a distributing system, which he has not got, and, second, a load, which he has not got, and, third, the



keeping of accounts in the manner acceptable to a public service commission. If that be done, he will know the answer, and Mr. Dow hoped he would give it.

#### Mr. Reginald Pelham Bolton

Mr. Reginald Pelham Bolton, of New York, said that the present operation and that of at least several succeeding years will result in a loss on fixed charges which may largely increase the liabilities. The assumption of so large an annual output as 60,000,000 kw-hr. with a load-factor of 40 per cent depends upon two features—first, the superior desirability of the service from the point of view not only of price but of character and continuity; second, the character of service attracted by the inducements of the rates. The service is to be only alternating current in face of the conceded extent of direct-current service in the best business part of the city. For much of the business of Cleveland, therefore, the service offered will be of unattractive character and much direct-current machinery would have to be altered or discarded for its operation. The rates are such as to offer little inducement to those consumers whose usage is the most desirable in producing a high load-factor. The rates do not include any service charge and are drawn merely on the relation of connected capacity and monthly consumption.

Mr. Bolton asked if there were any data in the paper which justified the expectation that the small consumer can be served at the rate of 3 cents without loss, which must be borne by other consumers or by a deficit in operation. The propriety of the construction, in advance of a determination of business to be secured, of this large station in its completed form must be regarded as dubious from a financial and business standpoint. The anticipations of financial success of the system, so far as they are based upon the facts and figures of past operation, are of doubtful probability.

#### Report of Secretary of the Interior Lane

The annual report of Mr. Franklin K. Lane, Secretary of the Interior, to the President, which has been transmitted to Congress, contains the following:

"Bills for Western development have passed the House but not the Senate—the general leasing bill, so called, and the power bill. Through these the wise development of the natural resources may be secured, and the reclamation fund, which is annually diminishing with the sale of the public domain, may, particularly through the general leasing bill, secure a much-needed replenishing.

#### Power and General Leasing Bill

"These measures commended themselves so heartily to the favor of the House of Representatives that they were both passed without a roll call. These bills aim to make available for the upbuilding of the West through irrigation whatever moneys may come out of their enactment. The reclamation fund in the first instance is to have these moneys, and later such revenue is to be divided in equal portions between the states whence the resources come and the federal government. Had there been such a law during the past ten years it has been estimated that the United States could have had for reclamation work not less than \$50,000,000 as a 10 per cent royalty upon the oil produced from government lands.

"These measures come from a real need. Existing law is not fitted for the uses to which it is put. Water-power will not be developed under a revocable permit law. Capital asks more insurance against arbitrary action. The West needs water-power. There are many sites held in reserve which should be used. Develop-

ment, however, will not take place until a law is passed which will give such promise of safety to the investor as a reasonable man may ask. The Ferris bill will meet this need, for it gives a fifty-year lease of the government site or other needed government lands. At the end of that period, however, the government may take over the plant, paying for the right-of-way, water rights and lands only their actual cost and for all other property (excepting franchise or good will) its reasonable value. This bill does not give to the engineer-promoters who represent great syndicates of capital all that they wish, for they ask a permanent right to lands or their use practically without condition. I take it, however, that the day for granting such favors has passed. It is the judgment of men of wide experience that this bill will bring development where power is needed.

"The general leasing bill is called for chiefly by the existence of certain absurdities in our laws. As for coal, the bill permits a lease to be made of 2560 acres but does not repeal existing laws under which coal land may now be purchased from the government. The government is to-day prosecuting men for violating the law in taking up, through 'dummies,' more than the 160 acres allowed. The real defense of these men is that 160 acres is not enough for a modern mine, and they are right. Perhaps if men are given an opportunity to lease the lands they will not risk the embarrassments of prosecution. And the government might appear more fair in giving the alternative of purchasing a small amount or leasing more.

#### The Patent Office

"The Patent Office by change of method has enabled an applicant to secure a patent in two-thirds of the time that formerly was necessary. From Jan. 1, 1914, to Nov. 14, 1914, it granted 4703 more patents and sent to issue 11,257 more applications than in the same period of 1913. It has substantially reduced the accumulation of pending applications and has increased the surplus receipts of the office for the fiscal year from \$158,030 in 1913 to \$240,856 in 1914. It accomplished these results without increasing the office force."

#### NATIONAL CIVIC FEDERATION MEETING

##### "Governmental Versus Private Enterprise" Discussed by Men Prominent in Business and in Labor Circles

One session of the fifteenth annual meeting of the National Civic Federation, held at the Hotel Astor, New York, on Dec. 4 and 5, was devoted to "Governmental Versus Private Enterprise." Mr. Samuel Gompers, president of the American Federation of Labor, presided.

Prof. Jeremiah W. Jenks, of New York University, who opened the meeting, said that the Post Office Department, so far as any one can learn, has made no statement of cost accounting in connection with the parcels post, so no one can determine whether it is really carrying cheaper than do the express companies or whether, as seems not improbable, the difference in charges to shippers is made up by the low rates forced upon the railroads against their will or by shifting the burden upon other branches of the postal service or upon the taxpayers.

Concerning the question of whether municipal utilities shall be owned and managed by the municipality or by private companies under municipal control, Professor Jenks asks what are to be the guiding principles—Better service? Cheaper Service? Even free service? Revenue? Whatever the principles may be, the actual facts should be known. If we are to compare costs, let us have identical systems of cost accounting. If the

question is service, let us know whether the people prefer to stand or to wait for half an hour before they get a ride, as the speaker had done more than once in Paris and other Continental cities. If the government is to take the telephone and telegraph, why? For better service? For cheaper service? For the effect upon the people in the way of protection? We must seek a guiding principle and be sure of our facts. The state ought to undertake nothing without very careful consideration of the principles on which it is acting and without accurate, definite knowledge of the facts by which it should be guided.

Congressman David J. Lewis spoke in favor of public ownership of the telephone and telegraph service. "Postalization" of telephone and telegraph service would bring under the control of the government the only outstanding means of communication. Manifestly competition in electrical means of communication is wasteful. On economic grounds that field belongs to monopoly, which alone can discharge the functions with proper regard to the price. The speaker pointed out one difference between the express companies, which have been affected by the parcel post, and the telephone and telegraph companies, which would be affected by public ownership. He said that the express companies were really only preferred shippers on the railroad, while the telephone and telegraph companies have large investments of their own capital in plants.

Mr. F. R. G. Gordon, of Boston, organizer of the American Federation of Labor, gave facts and statistics to controvert the argument and statements of Congressman Lewis. He said that practically every telephone and telegraph government system is run with extraordinarily poor service, although paying about one-third of the wages to operatives that are paid by the American Telephone & Telegraph Company and the Western Union Telegraph Company. He said that the so-called wonderful Post Office Department of the government is the worst managed big business in the country. The Post Office Department is the recipient of very large favors from other departments of the government because of the failure to introduce cost-accounting principles between the various departments. The Post Office Department does not pay for either use or care of many buildings which it occupies. Mr. Gordon said that to take over the telephone and telegraph system would mean that all of the people would be taxed for the benefit of the 5 or 6 per cent who use the service and are best able to pay the bills therefor. He declared that public ownership was cursed by red tape and was characterized by inefficient service, poor wages and large deficits.

Dr. Frederick C. Howe, Commissioner of Immigration at New York, in his argument in favor of public ownership, declared that probably the political and moral gains would be even more important than the financial and social gains. Public ownership removes one of the principal causes of corruption from politics.

Mr. J. W. Sullivan, a member of the Typographical Union of New York, made an address on "Municipalization or a Just Regulation—A Plea for the Facts." He quoted a statement made by Dr. Howe that forty-four of the fifty largest cities in Great Britain had municipal electric-light plants. In "London Municipal Notes" for January, 1914, this statement appears: "The return on last year's working on electricity undertakings belonging to municipalities showed that forty-five are being run at a loss to the ratepayers." In an analysis of the census of production report on electricity, the London Municipal Society publishes the statement that if the municipal electricity undertakings of the United Kingdom were taken over by companies the cost to the consumer would be lowered by \$800,000, the basis of this

inference being the census cost per unit as sold by company and public authority. The story of the figures told by the United States census report of 1912 is that in purchasing and in the number of employees the outlay of the companies runs far below that of the municipalities, while in the items by which the accounting may be confused or evaded the municipalities can insert small figures and postpone the final day of exact reckoning.

Municipalism has carried ruin to labor organization in both its economic and political forms, declared Mr. Sullivan. Were all Britain to imitate the attitude of Glasgow's municipal committee and managers toward labor, no employee would be permitted to be active in politics, no man would be taken on at work without a civil service examination, no trade agreement could be thought of, no liberty of association among the wage workers could exist, no work at his trade could be found by a man once blacklisted, and no labor movement would be tolerated in the country.

#### Federal Trade Commission

Mr. Seth Low, president National Civic Federation, in his address at the opening session, said that there is every reason to believe that under the Federal Trade Commission law many dishonorable business practices may be ended. In no respect is it more important that such a commission should investigate conditions than in order to bring to light the strange and embarrassing complexities that affect the interstate trade of the United States by reason of our federal system. The agents which do interstate trade are created by the states and not by the general governments, while the interstate business that is done by these agents is controlled by the general government and not by the states. President Low expressed the hope that the commission will strive steadily and from the beginning for exclusive national control.

Mr. August Belmont, chairman of the workmen's compensation department, said in his annual report that twenty-four states now have workmen's compensation laws in operation; forty-one legislatures will convene this winter, and the people in industrial states not having such legislation seem to be keenly alive to the fact.

#### Expanding Home Industries

Mr. John Hays Hammond said that there can be no doubt that the most important economic lesson of the war is the complete vindication of the policy of building up and expanding our home industries. The keynote of our economic and fiscal legislation must ever be to preserve unimpaired the purchasing power of our domestic market. We must either curtail the capacity of our factories, which would result in throwing out of employment millions of wage earners, and the disorganization of complementary industries as well, or we must depend upon the exploitation of foreign markets for the relief of our congested home industries.

A report was presented by a preliminary committee on foreign inquiry which made an investigation of the question "Should There be a Systematic Scheme of Compulsory Sickness Insurance Advocated for State Legislation in the United States?" The members of the committee were Messrs. J. W. Sullivan, chairman, representing wage earners; Arthur Williams, representing employers, and P. Tecumseh Sherman, attorney and social insurance specialist. With respect to national health insurance, national non-employment insurance and old-age pensions, the committee concludes that when any plan for compulsory social insurance is proposed in the United States which disposes of the difficulties presented by immigration and the lack of labor exchanges it will be time enough to dwell on the remaining obstacles to the system.



## PUBLIC SERVICE COMMISSION NEWS

## Massachusetts Commission

The Gas and Electric Light Commission has authorized the sale of gas by the gas and electric department of the city of Holyoke at 90 cents per 1000 cu. ft. The city admitted at the hearing that the price is below the cost of production as defined in Section 115, Chapter 742, Acts of 1914. The board points out that improvements in the works are expected to reduce the cost of production and increase the sale of residuals, that electrical energy is rapidly superseding gas for lighting in Holyoke and that price is an important element in encouraging the use of gas for other purposes, that the gas business in Holyoke has borne more than its proportionate share of expenses common to both gas and electric plants, and that the price may be reduced as an experimental measure.

## District of Columbia Commission

The Potomac Electric Power Company, in a letter sent to the commission, expresses dissatisfaction with the decision directing the annulment of four special contracts and reserves all right to appeal therefrom by the commencement of proceedings in equity in the Supreme Court of the District of Columbia. The company asks the commission to set aside the order on the ground, among others, that the requirements of the commission are unlawful and constitute an impairment of the obligation of contract. It states that the contracts have not been shown to be unjustly discriminatory within the meaning of the public utilities commission law. Such compliance with the order as shall be yielded by it, the company says, pending the final result of any proceedings that may hereafter be instituted by it, will not be a waiver of this protest or a voluntary compliance but will be rendered under protest against the order and "under the duress of criminal proceedings and ruinous and destructive penalty to which it might otherwise be exposed."

Testimony in regard to the pending physical valuation of the public utilities of the District of Columbia has been given before the sub-committee of the appropriations committee of the House of Representatives. Major Kutz, engineer commissioner, and Commissioner Siddons stated that the work of physical valuation will be completed by Sept. 1, 1915. It was stated that Prof. Edward W. Bemis, who is in charge of the work of valuation, is paid at the rate of \$100 per day for his services, but he is not to work over seventy-five days in a year. The chief engineer is paid \$50 per day and is employed two-thirds of each month. The chief accountant is paid \$30 per day for approximately twenty days per month. It was also stated that at least two of the utilities whose properties are being valued for the commission are making independent valuations at the same time and that proportionately the cost to them of their valuations is greater than the cost to the commission for its work. Both the Washington Railway & Electric Company and the Capital Traction Company have organized valuation forces.

## California Commission

The Railroad Commission of California has dismissed the complaint brought by the city of Coalinga against the Coalinga Gas & Power Company. The city alleged that gas rates were excessive and unreasonable and asked for a reduction from \$2 to \$1 per 1000 cu. ft. The company contended that its revenues were decreasing constantly because of a falling off in population. On investigation the commission found that the earnings at the present time are only slightly in excess of 7 per cent, which was held to be not unreasonable under existing conditions.

## Current News Notes

**PITTSBURGH ELECTRICAL ASSOCIATION.**—At the meeting of the Pittsburgh Electrical Association on Dec. 2 a protest was entered against the proposed ordinance of the City Council abolishing the fee charged for electrical inspection. A committee was appointed to call on the Mayor and urge modification of the plan.

\* \* \*

**NORTHERN WHITE CEDAR ASSOCIATION.**—The next regular meeting of the Northern White Cedar Association, formerly the Northwestern Cedarmen's Association, will be held at Minneapolis, Minn., Jan. 26 and 27. The association's committee on poles comprises Messrs. H. W. Reade, Escanaba, Mich.; A. T. Naugle, Chicago; Joseph Meloney, Spooner, Minn.; E. L. Clark, Minneapolis, Minn., and T. M. Partridge, Minneapolis, Minn. Mr. H. E. Boucher, 743 Lumber Exchange Building, Minneapolis, is secretary.

\* \* \*

**CITY MANAGERS DISCUSS CONTRACTS WITH PUBLIC SERVICE COMPANIES.**—At the meeting of the City Managers' Association held at Springfield, Ohio, Dec. 2, Mr. C. E. Chappell, city manager of Big Rapids, Mich., discussed the handling of public service corporations and contractors on municipal work. Eight city managers were in attendance, representing 50 per cent of the American municipalities having this business form of government. The next convention will be held at Dayton, Ohio, which is under similar rule.

\* \* \*

**NEW OFFICERS OF CHICAGO ELECTRIC CLUB.**—At the meeting of the Chicago Electric Club on Dec. 3 officers for 1915 were elected as follows: President, Mr. W. R. Pinckard, Westinghouse Electric & Manufacturing Company; vice-president, Mr. W. D. Ray, vice-president and manager Northern Indiana Gas & Electric Company; secretary, Mr. O. H. Caldwell, *Electrical World*; treasurer, Mr. A. B. Hatch, secretary Pelouze Manufacturing Company; board of managers: Prof. P. B. Woodworth, Lewis Institute; Mr. R. I. Phillips, secretary-treasurer Pitt Engineering Company; Mr. W. G. E. Peirce, chief commercial agent Chicago Telephone Company; Mr. Ray Palmer, commissioner of gas and electricity, city of Chicago, and Mr. A. L. Eustice, president Economy Fuse & Manufacturing Company. The club now has 640 members and a treasury balance of about \$4,500.

\* \* \*

**MEETING OF AMERICAN ECONOMIC ASSOCIATION.**—The twenty-seventh annual meeting of the American Economic Association will be held at Princeton, N. J., on Dec. 28 to 31. The American Statistical Association and the American Sociological Society will hold their annual meetings at the same time and place. Several joint sessions will be held. The first session is to be a joint meeting addressed by the presidents of the three associations—Messrs. John H. Gray, John Koren and Edward A. Ross. The morning session on Dec. 29 is to be on "Speculation on Stock Exchanges and Public Regulation of the Exchanges." Papers will be presented by Messrs. Samuel Untermyer and Henry C. Emery. The afternoon session on Dec. 29 will be on "Market Distribution." The morning session on Dec. 30 will be a joint meeting with the American Statistical Association to discuss "The Statistical Work of the United States Government"; the afternoon session will be devoted to "The Relation of Education to Industrial Efficiency" and "The Effect of Inheritance and Income Taxes on the Distribution of Wealth." The concluding session on Dec. 31 will be a joint meeting with the American Sociological Society on "The Public Regulation of Wages."

## Hydroelectric Development on Bishop Creek, Cal.—IX

Transmission system of the Southern Sierras Power Company and the vast territory covered by its lines—Control station in Owens Valley—Details of towers and cables. By C. O. Poole

REFERRING to the map of California and Nevada (see Part VII, *Electrical World*, Nov. 28, Fig. 61), if from a point about the center of Churchill County, Nevada, more than 100 miles north of the parallel through San Francisco, a line be drawn in a southerly direction to the southern extremity of California, an idea may be had of the vastness of the territory covered by the transmission system of the Southern Sierras Power Company and the great distance between the terminals of its lines.

The real center of this extensive network is near Bishop, Cal., in what is known as Owens Valley. From this center of control the various lines radiate in all directions.

Standing at this point and looking westward toward the Sierras, the observer sees the canyon down which

it connects with the transmission system of the Pacific Power Company and, with a total length of 170 miles, delivers energy to the mines of central Nevada.

To the east parallel lines may be seen ascending the steep slopes of the White Mountain Range and losing themselves from sight in the clouds about the summit.

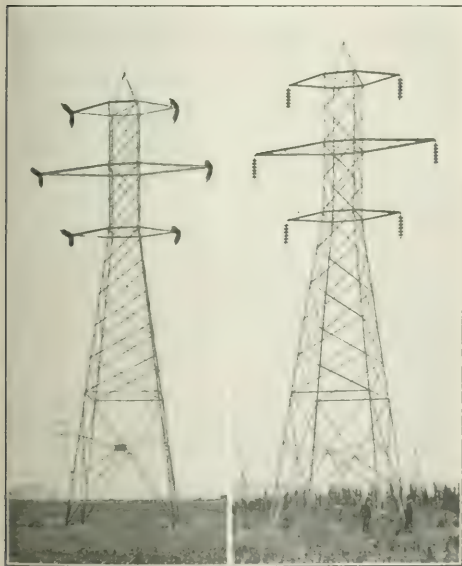


FIG. 66—ANGLE TOWER AND DEAD END      FIG. 67—STANDARD TOWER OF SYSTEM

the waters of Bishop Creek turbulently rush after being liberated from the wheels of the generating plants in the mountains above. Several lines are seen emerging from the canyon's entrance, these being the lines over which the generating plants transmit their output to the distributing center just mentioned.

To the north a line is seen disappearing among the rugged hills at the upper end of the valley. Intersecting the tortuous winding of Crooked Creek, traversing the interesting region of the Casa Diablo Hot Springs and skirting the shores of picturesque Lake Mono, this line goes to Jordan, Cal., where, at the Mill Creek plant,

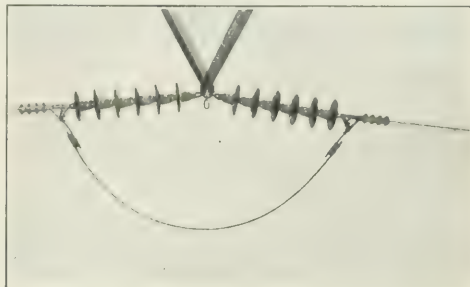


FIG. 68—STANDARD DEAD-END CONNECTION

These are the feeders for the transmission system of the Nevada-California Power Company, which, with a total length of 404 miles, supplies the towns and mines of southern Nevada previously described.

Southward a double-circuit line stretches ribbon-like down the valley, its tall steel towers apparently becoming dwarfed on the far-distant horizon. If the observer were to leave this viewpoint and travel south to the little Mexican town of Mexicali, he would not be likely to realize that the lights along the rows of flat adobe buildings and the hum of the nearby cotton gins were the result of the energy in the small tumbling stream he had seen rushing from the narrow canyon in the shadow of the snow-capped Sierra peaks hundreds



FIG. 69—CLAMP FOR ALUMINUM-STEEL CONDUCTOR

of miles to the north. But such is the case. From the point of delivery in the Owens Valley, over mountain ranges and across sandy wastes below the level of the sea, the lines of copper and aluminum convey the power of the mountain stream for a distance of 400 miles to the southern boundary of the United States.



### Control Station

At the control station are the headquarters of the superintendent of transmission, and from this point the switching, patrolling and repairing of all lines is directed. The station itself is of the outdoor type typical of all the recently built stations of the Southern

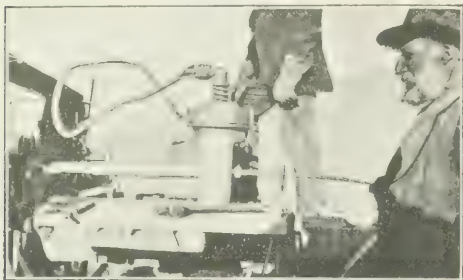


FIG. 70—HYDRAULIC JACK USED IN MAKING CONNECTIONS ON ALUMINUM-STEEL CONDUCTORS

Sierras Power Company. The spacing and insulation of all conductors is for 140,000-volt operation.

A rectangular structure of galvanized steel serves as a support for the station buses and the single-pole disconnecting switches through which all of the incoming and outgoing lines are connected to the buses. The ultimate arrangement of the station provides for a double set of buses, but at present only one set is installed, it being the intention to install the second set when future lines are brought in to the station.

The double-circuit, 140,000-volt tower line ties into the station through Bowie double-break, horn-type switches mounted on 45-ft. steel towers. These switches have a rating of 25,000 kw and are pneumatically operated.

Between the switch towers and the central structure are installed the electrolytic arresters and shunt transformers. Series transformers are installed in the framework of the bus structure itself, and from series and shunt transformers the secondaries are carried in conduit to the instrument and control board, upon which are mounted voltmeters, ammeters and watt-hour meters. On this board are also the control valves for operating the Bowie switches. The control of these switches was designed with particular attention to the use of the switch for synchronizing purposes. Because of the long stroke of the 36-in. blades swinging through an arc of almost 180 deg. it was necessary to provide for a midway position of the blade, so that at the moment of closure the remainder of the stroke could be made quickly and with much less violence than if the full stroke were attempted. Indicating lamps above the control valves show the position of the blades at all times. Air for the operation of the switches is furnished by a small motor-driven compressor with automatic pressure regulator and receiver tank.

The control board is housed in the headquarters of the transmission superintendent, which is a fairly large building of substantial concrete construction situated at a point central to the apparatus about the station. Comfortable living quarters are fitted up in one end of this building for the use of an assistant, the superintendent living in a cottage adjacent to the station.

One of the other lines leaving the station is protected by a three-pole automatic Bowie switch, the remainder being tied to the station bus through single-pole disconnecting switches. Fig. 75 is a general view of the control station.

At the present time the lines are all being operated at 55,000 volts, pending the installation of a bank of transformers at the control station, after which the voltage of the tower line and the steel-pole lines will be raised.

### Tower Line

A double-circuit tower line was constructed during the latter part of 1912 from the control station to San Bernardino, with a total length of more than 238 miles. In this distance there are four sectionalizing stations, dividing the line into five sections with an average length of about 50 miles each. These stations, which are in or near the towns of Lone Pine, Inyokern, Randsburg and Victorville, will be described later.

The towers used conform closely to standard transmission-tower design in this country and were manufactured by Milliken Brothers, of Staten Island, New York. The middle one of the three cross-arms is made longer than the others because of the trouble that some companies have experienced when using arms all of the same length by reason of the lower wire dropping all or a large part of its sleet load and swinging up into the conductor above it, or because of one wire creeping more than another and thus changing the relative sag.

The vertical spacing of the arms is 10 ft., and from the ground to the apex of the tower, where the ground wire is clamped, is 70 ft. The four legs of the tower are bolted to stubs 6½ ft. long. These stubs have a 12-in. by 20-in. plate of channel iron on their lower end and are set 6½ ft. in the ground. The towers were assembled in the most convenient position for raising and

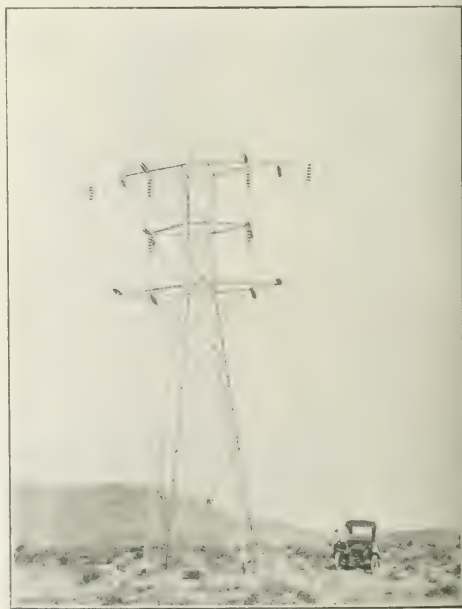


FIG. 71—TRANSPPOSITION TOWER

were raised by the use of shear legs and a team of horses. Where the stubs are buried in good firm soil no concrete is used if the tower is not subjected to more than usual strain. At many points in the line, however, the soil is of a light sandy character and could not be depended upon for anchorage. In all such places the stubs were concreted in, using about 4 yd. of concrete to the tower, with a mushroom type of concrete anchor at

the bottom of the stub. The towers have an average spacing of 660 ft., or eight towers to the mile. Standard towers weigh 3700 lb. each, and for points in the line at which severe angle strain occurs a tower of the same design but weighing 4700 lb. is used.

Towers at horizontal angles of less than 2 deg. are not dead-ended. When the horizontal angle is greater

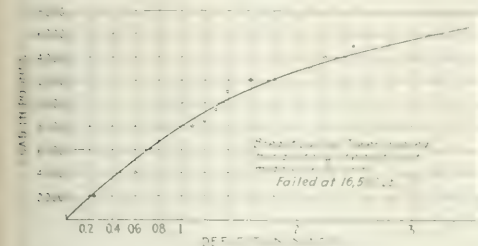


FIG. 72—TEST OF STANDARD TRANSMISSION TOWER

than 2-deg. dead-ends are put in, and when above 8 deg. the tower is guyed. When a greater angle than 22 deg. is turned the heavy type of tower is used. Fig. 66 shows a dead-end tower and Fig. 67 is a standard tower.

The line specifications provided for the dead-ending of the line conductors once every 5 miles in level country, and in addition it was decided that when any vertical angle at a tower was greater than 4 deg. 20 min., with apex down and standard spans adjoining, the line should be dead-ended at that tower. Suspension insulators, of both Locke and Ohio Brass Company manufacture, with six units in the assembled insulators, are used. The same number of disks as of strain insulators

and with the axis line of the groove tangent to it is a circular boss around which the steel core is wrapped once and fastened by a J-clamp. For splicing the cable a special two-part aluminum sleeve connector is used. A McIntyre sleeve of soft steel is used for joining the ends of the steel core, a piece of pipe being put over the sleeve before the twist is made. The two sections of aluminum sleeve having been slipped back over the cable before joining the ends of the steel core, they are next screwed together and the ends compressed by a small portable hydraulic jack (Fig. 70). In this manner the strength of both the steel and the aluminum is

TABLE II—CONSTANT FOR CABLE

	Steel	Aluminum	Total Cable
Number wires in cable	1	6	7
Diameter, inches	0.188	0.188 each wire	0.564
Weight per foot, pounds	0.0935	0.0325 each wire	0.2885
Modulus of elasticity	$30 \times 10^6$	$10 \times 10^6$	$12 \times 10^6$
Elastic limit, pounds per square inch	130,000	14,000	
Coefficient of expansion, per Fahr.	0.0000064	0.0000128	0.00001052
Ultimate tensile strength, pounds	3560	384 each wire	5864

developed and the conductivity of the joint is considerably greater than that of an equal length of cable.

TABLE I—SAG (IN FEET) OF ALUMINUM-STEEL CABLE

TENS.	TEMPERATURE, DEG. FAHR.													
	0	10	20	30	40	50	60	70	80	90	100	110	120	
500	3.2	3.6	4.0	4.4	4.8	5.2	5.6	6.0	6.5	7.0	7.4	7.9	8.4	
600	3.0	3.5	4.0	4.6	5.1	5.6	6.1	6.7	7.2	7.8	8.3	8.9	9.5	
700	2.8	3.3	3.8	4.4	5.0	5.6	6.2	6.8	7.4	8.0	8.6	9.2	9.9	
800	2.6	3.2	3.7	4.3	4.9	5.5	6.1	6.7	7.4	8.0	8.6	9.3	10.0	
900	2.4	3.0	3.6	4.2	4.8	5.4	6.0	6.6	7.3	7.9	8.5	9.2	9.9	
1000	2.2	2.8	3.4	4.0	4.6	5.2	5.8	6.4	7.1	7.7	8.3	9.0	9.7	
1100	2.0	2.6	3.2	3.8	4.4	5.0	5.6	6.2	6.9	7.5	8.1	8.8	9.5	
1200	1.8	2.4	3.0	3.6	4.2	4.8	5.4	6.0	6.7	7.3	7.9	8.6	9.3	
1300	1.6	2.2	2.8	3.4	4.0	4.6	5.2	5.8	6.5	7.1	7.7	8.4	9.1	
1400	1.4	2.0	2.6	3.2	3.8	4.4	5.0	5.6	6.3	6.9	7.5	8.2	8.9	
1500	1.2	1.8	2.4	3.0	3.6	4.2	4.8	5.4	6.1	6.7	7.3	8.0	8.7	

is used in the dead-ending of line wires. Fig. 68 shows a standard dead-end. The line cable is composed of six strands of aluminum with a center core of plow-steel wire, each strand having a cross-sectional area of 34,970 circ. mil. The high tensile strength of the steel core is sufficient to allow the entire strain of the cable to be borne by the steel alone and makes it possible to string the cable at greater tension and with less resultant sag than would be allowable if a conductor of aluminum alone were to be used. A tension of 1500 lb. at 70 deg. Fahr. was used in stringing. For successfully dead-ending this aluminum steel cable it was necessary to design a special clamp in order that the tension of the steel center might be developed. This clamp, shown in detail in Fig. 69, is a malleable-iron casting with a large eight-bolt clamping section for gripping the entire conductor. The groove of this section is aluminum-lined. Back of the eight-bolt clamp



FIG. 73—FAILURE OF TOWER

Eighty-five per cent of the combined strength of the steel and aluminum is developed.

Three complete transpositions are made in each circuit of the line. For this purpose towers with a special arrangement of arms are erected at intervals of about 27 miles and the conductors have a relative change of position at each of these towers. Fig. 71 shows one of the standard transposition towers.



## Towers

In a line having almost 2000 towers every pound of metal saved per tower means the saving of a ton altogether. Hence the necessity for good design and proper distribution of material. The towers are designed to withstand a wind pressure of 14 lb. per square foot on the tower and 12 lb. per square foot on the wires. The tower is also expected to stand up with all the cables cut in any span. The builders designed a tower to meet

lb. to pull the stub. The ground broke in a circle 5 ft. 8 in. in diameter.

## Aluminum-Steel Cables

Aluminum-steel cable can be stretched with less sag than copper, being lighter and stronger. The cable in this case was strung at 1500 lb. tension at 70 deg. Fahr. As the temperature rises and the sag increases the steel core takes all the strain. On the other hand, at lowest temperature when the sag has decreased and ten-

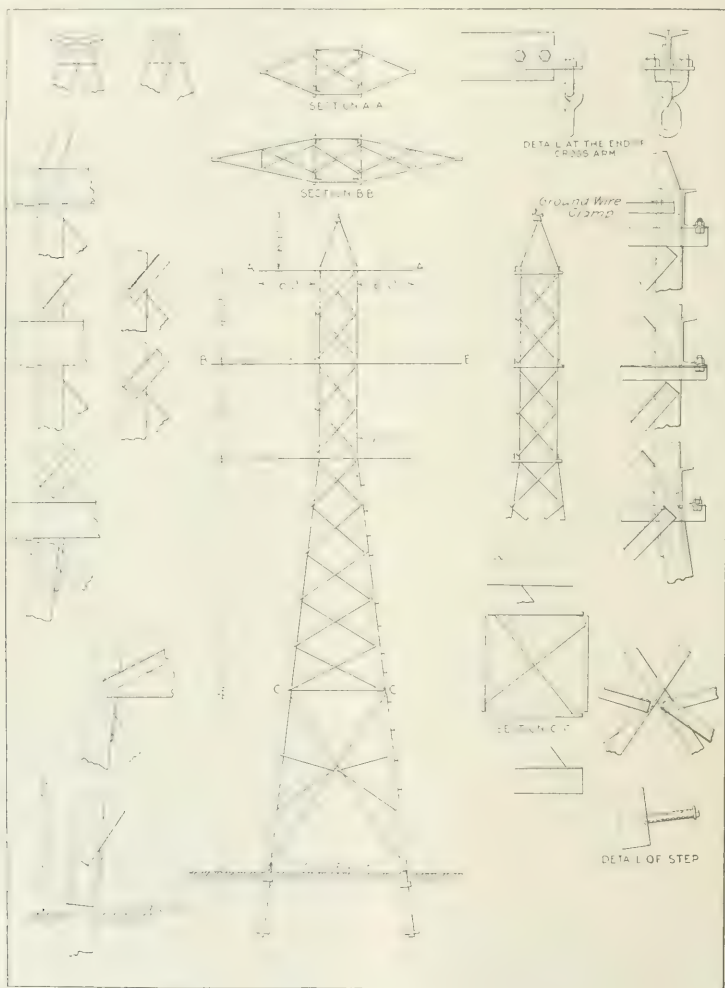


FIG. 74—DETAILS OF TRANSMISSION TOWER

specifications, guaranteed not to weigh more than 3700 lb. and to withstand a pull of 12,000 lb. without permanent set, applied horizontally in line or across line, near the top of the tower at the center of the middle cross-arm. Fig. 74 shows the design. A tower was prepared and tested, with the result, as shown in Fig. 72, that the tower failed at 16,500 lb.

Fig. 73 shows the failure of this tower in the lower corner member. The ground stubs were next tested, the stub being buried 6 ft. 6 in. deep in dry foundry sand and the load applied vertically. It required 35,000

lb. to pull the stub. The ground broke in a circle 5 ft. 8 in. in diameter.

tion increased the aluminum takes a portion of the strain, this being due to the difference in expansion of the two metals. The accompanying tables give the sag and the constant for cable.

In addition to having to dead-end at horizontal angles, it is necessary to dead-end when the line starts up hill or when the grade on a hillside becomes steeper. To determine at what change in grade this will become necessary, a curve

$$Y = \frac{wX^2}{2h} \text{ is drawn,}$$

where  $w$  = weight of wire per foot = 0.29 lb.

$h$  = tension at lowest temperature = 2500 lb.

The center of a span at any grade can then be located on this curve by

$$\frac{dy}{dx} = \frac{wx}{h} \tan a$$

$$x = \frac{h \tan a}{w}$$

If the spans overlap, it will be evident that no upward

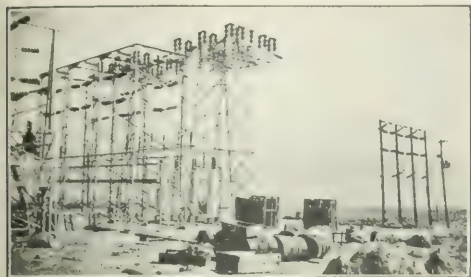


FIG. 75—CENTRAL STATION AT BISHOP END OF LINE

lift can be given to the suspension. On the other hand, if they do not overlap, there will be an upward lift, particularly at low temperature, and they must therefore be dead-ended.

## LONG TRANSMISSION LINES

Comparison of the Keokuk-St. Louis and the Big Creek-Los Angeles Systems—Their Lessons for Future Construction

By R. A. PHILIP

TWO long transmission lines have recently been completed by the Stone & Webster Engineering Corporation. The first, from Keokuk, Ia., to St. Louis, Mo., is 143 miles long, and the second, from Big Creek, Cal., to Los Angeles, Cal., is 240 miles long. A comparison of these two lines shows how increased length modifies line phenomena and that line lengths are approaching a limit where ordinary methods of operation must fail.

The Keokuk line comes within the range of customary methods, but the electrical design of the Big Creek line presents a different plan of operation which indicates the direction in which the design of the longer lines of the future may be expected to tend as the new difficulties become more pronounced.

On long transmission lines it has been noted that the voltage at the delivery end has invariably been higher than that at the generating end when the line is carrying no load. Theory indicates that this is also true for short lines but that the amount of rise is inappreciable and may, therefore, be neglected. The rise of voltage in a transmission line is a special case of what occurs when a relatively small condenser is charged with alternating current through inductance. The voltage across the terminals of the condenser rises to a higher value than the applied voltage. The percentage rise obtained depends on the relative amount of capacity and inductance. One particular relation between capacity and inductance produces the phenomenon called resonance, where the rise becomes indefinitely great.

As lines grow longer the capacity reactance decreases and inductive reactance increases with consequent increase in voltage rise. One particular length of line

gives the relation which produces resonance. If voltage is applied to a line of this length it will build up indefinitely, that is, until something happens. The voltage may increase until the insulators arc over or puncture, or the charging current may become great enough to burn out the generator. If the source of supply is feeble, the building up may be limited by the dissipation of the available energy in line loss.

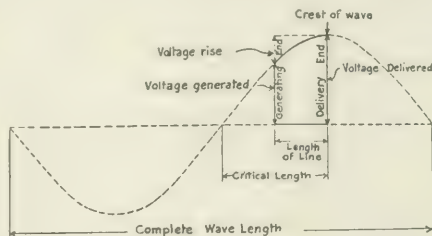
The length of line which produces resonance depends on the frequency alone, that is, for each frequency there is a critical length where resonance occurs. The length of line which produces resonance is one-fourth of the natural wave-length, or 1800 miles for twenty-five cycles, 900 miles for fifty cycles and 750 miles for sixty cycles. These lengths are then the critical lengths for these frequencies.

In a line of critical length ordinary methods of operation must fail, for it is impracticable to charge the line with the receiving end open. The critical length, therefore, furnishes a measuring stick for determining whether a line is long or short. When the critical length is so far off that it may be disregarded, the line may be classified as short, while a line long enough to require those precautions which are essential in the vicinity of the critical length is a long one. On this basis the Keokuk line is short but the Big Creek line is nearly, if not quite, long.

In comparing the electrical characteristics of lines of different frequency the relative length in miles does not furnish so good a basis as does the proportion each maintains to its respective wave-length. The wave-length is an inconveniently large unit, but, like a circular arc, it may be considered divided into 360 deg. to give a convenient unit. For electrical purposes the length of transmission lines may, therefore, be better stated in degrees than in miles. At a frequency of twenty-five cycles each 20 miles is one degree of length, at fifty cycles each 10 miles, and at sixty cycles each eight and one-third miles is a degree.

On this basis of comparison, the length of the twenty-five-cycle Keokuk line is about 7 deg., and the fifty-cycle Big Creek line about 24 deg. The critical length in all cases is 90 deg.

At no load the voltage rises along a transmission line in proportion to a sine wave, the delivery end always being at the crest of the wave. This makes the relation between generated and delivered voltage very simple. Taking the delivered voltage as unity, the generated voltage is proportional to the cosine of the length of the line expressed in degrees. As the cosine of 7



RELATION BETWEEN DELIVERED VOLTAGE AND GENERATED VOLTAGE ON LONG TRANSMISSION LINES

deg. is 0.99 and of 24 deg. is 0.91, it follows that the generated voltage is 99 per cent of the delivered voltage on the Keokuk line and 91 per cent on the Big Creek line.

Even on the Big Creek line the ratio of delivered to generated voltage is not so great as to require any extraordinary precautions. The diagram shows that for



longer lines the delivered voltage will increase to double and triple the generated voltage and at the critical length the ratio is as one to zero, that is, infinitely great.

The Big Creek line, therefore, differs from the Keokuk line, not in requiring new methods because of the rise in voltage, but in providing methods, though for other reasons, which would make the operation of a line of critical length possible.

The Big Creek line is a new departure in providing, at the delivery end of the line, synchronous condensers which are considered an integral part of the line design. In fact, the generators and condensers, each with their voltage regulators, are considered with the line as one unit of design. While the principal function of the synchronous condensers is to furnish leading current, thereby raising the voltage at the delivery end when the line is loaded, they have an almost equally important secondary function of furnishing lagging current for reducing the delivered voltage at no load. By raising the voltage at full load and lowering it at no load, the condenser makes it possible to maintain a constant emf of 150,000 volts at each end of the line over the whole range of load. For present purposes it is sufficient to consider the effect of this plan at no load only.

With no load on the line, but with the synchronous condensers running, because they are to be considered as a part of the line itself and not an external load, half of the charging current of the line will come from the condensers and half from the generators. Under these conditions the crest of the sine wave of voltage is no longer at the delivery end of the line but is moved to the middle of the line. This change is equivalent to substituting two separate lines each of 12 deg. of length for one 24 deg. long. The maximum voltage now occurs at the middle of the line, and as the cosine of 12 deg. is about 0.98 the generated and delivered voltage will be about 98 per cent of the maximum. That is, the rise of voltage has been cut down from about 10 per cent to 2 per cent of the generated voltage.

As before stated, the length of the Big Creek line is not sufficient to make control of voltage rise necessary, but the radical nature of the step taken in providing such control is apparent in the case of a line of the critical length. Under ordinary operating methods the rise on such a line figures as infinite and its operation is impossible. With a condenser at the delivery end as part of the line, the length of the line is virtually reduced from 90 deg. to 45 deg. As the cosine of 45 deg. is 0.71, the voltage at the ends of the line will be 71 per cent of that in the middle, or the rise will be about 41 per cent of the terminal voltage—a large but not impossible amount. Without condensers the delivered voltage would be infinitely greater than the generated voltage, while with the condensers the voltage at the two terminals would be equal. The Big Creek plan, therefore, makes possible the operation of lines of the critical length.

The controlling of voltage rise is only one of the several useful functions of the condensers. In so far as they are used for this purpose they are not so very different from reactance coils, and if this were their only function they might with advantage be replaced by such coils. That is, reactance coils connected in multiple with the transmission line at the delivery end or at intermediate points would properly hold down the voltage at no load, but would fail to raise the voltage at full load as is desirable.

Such reactive coils on a transmission line would be closely analogous to the "loading coils" used on telephone lines, the purpose being substantially the same; that is, to neutralize the effect of the distributed electrostatic capacity of the line by adding a partly distributed inductance.

On telephone lines the problem was met much earlier than on transmission lines because of the higher frequencies used and the greater lengths of line operated. Taking 500 cycles per second as an ordinary telephone frequency, the wave-length is only 360 miles, and telephone lines over 2000 miles long are in use. Thus telephone lines have already covered several complete wave-lengths while transmission lines have not yet attained a length of one-quarter of one wave.

It appears that the long transmission line, like the long telephone line, will differ from the short line in being "loaded." The problems of "loading" transmission and telephone lines are not quite identical so that somewhat different solutions may be expected. The Big Creek line is probably the first systematically "loaded" energy-transmission line and indicates that transmission-line "loading" practice will diverge from telephone practice from the beginning. Telephone lines are "loaded" with coils of fixed inductance, while transmission lines will probably be "loaded" with synchronous machines which will act as reactors at no load and as condensers at full load.

The Big Creek line is "loaded" at its terminals only, and this is sufficient, as the line covers only about one-seventh of a wave-length. On longer lines intermediate "loading" may be desirable. For example, the quarter-wave-length line has a rise of 41 per cent at the middle when "loaded" at the terminals. An additional "loading" at the middle would reduce this to about 8 per cent.

On still longer lines resonance may occur even with terminal "loading," so that intermediate "loading" will then be essential. Thus a line covering half a wave-length may act as two lines of a quarter wave-length if "loaded" at the terminals only. The voltage at the middle point would then build up indefinitely unless restrained by intermediate "loading."

### Referendum Proposed in Duluth, Minn.

Following the rejection by the Duluth Edison Electric Company of the offer of the city for its property, the city commissioners passed an ordinance appropriating \$85,000 to build the first unit of a competing plant. A petition for a referendum on this ordinance has been circulated, and it has been signed by a sufficient number of people to require submission of the matter to the voters. The price offered by the city for the property was \$1,107,941.

In his letter declining the offer, Mr. W. A. Hartman, president of the company, gave the capitalization in the hands of actual investors as follows: Common stock, par, \$500; preferred stock, \$1,150,000; bonds, \$1,132,000; total, \$2,782,000. The bonds and preferred stock cost present holders not less than 95. The common stock has sold for somewhat less. The price offered by the city, therefore, is less than the amount of outstanding bonds. Mr. Hartman said: "The price suggested by the city is wholly inadequate. Every facility was given to the city to make a complete inventory and valuation of the company's property. The apparent purpose of the engineers in figuring prices was to adopt such method, varying it where necessary to accomplish their purpose, as would produce the lowest possible valuation of physical property. Then, without waiting for the figures showing the cost to the company of its property and its value as an income-producing plant, it adopted the wholly arbitrary and inadequate amount of \$200,000 as a so-called going value."

Mr. Hartman says that the city and its inhabitants have the best of service at reasonable rates with power to regulate both service and rates.

# Operating Features of the Audion

Explanation of its action as an amplifier,  
as a detector of high-frequency oscillations  
and as a "valve." By E. H. Armstrong

**A**LTHOUGH the audion has been in use for several years as an amplifier and a detector of high-frequency oscillations, the explanations advanced to account for its action do not appear to be satisfactory. With the idea of pointing out some features of operation which heretofore do not seem to have been

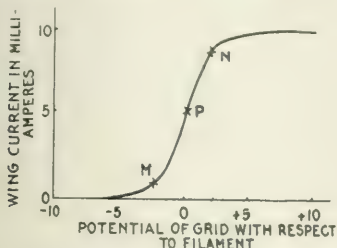


FIG. 1—VARIATION OF WING CURRENT WITH GRID POTENTIAL

appreciated, the following explanation and oscillograms are given.

The audion is essentially an electron relay; that is, the exhaustion is carried to such a point that the amount of gas present is exceedingly small, and the current between the hot and cold electrodes is entirely thermionic, the absence of gas making impossible the presence of positive ions. The operating characteristic of such a relay is as shown in Fig. 1. This characteristic was obtained in the manner indicated in Fig. 2.

The potential of the grid with respect to the filament was varied in steps between  $-10$  and  $+10$  volts, by means of the potentiometer *P*, corresponding readings of grid voltage and wing current being taken in order to plot the curve of Fig. 1. The characteristic shows that, starting with the grid and filament at zero potential difference, a negative charge imparted to the grid produces a decrease in the wing current and a positive

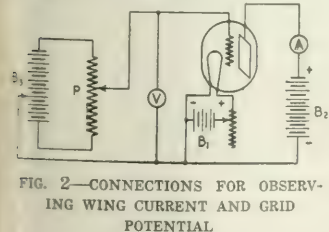


FIG. 2—CONNECTIONS FOR OBSERVING WING CURRENT AND GRID POTENTIAL

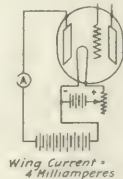


FIG. 3—CONNECTIONS GIVING TWO VALUES OF WING CURRENT

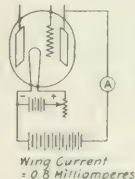
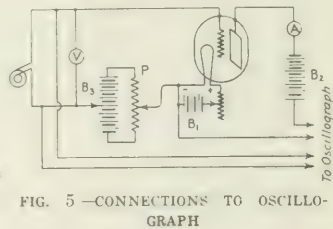


FIG. 4—CONNECTIONS TO OSCILLOGRAPH



with respect to the filament, but only one grid was employed. It was found that, under similar conditions of filament temperature and voltage of the battery *B<sub>2</sub>*, a considerably smaller current was obtained between the filament and plate on the side in which the grid was inserted. In both measurements the grid was left entirely free of any connection with the rest of the apparatus. Obviously the grid obstructed the flow of the thermionic current. Investigation showed that this was due to the charge accumulating on the grid when exposed to bombardment by the electrons passing from

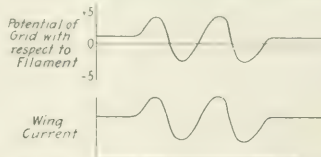


FIG. 4—TIME VARIATION OF GRID POTENTIAL AND WING CURRENT

the filament to the wing. The electrons pass readily enough into the grid but cannot easily escape from it, and as a consequence of this negative electricity piles up on the grid. The potential assumed by the grid when exposed to this bombardment may be several volts negative with respect to the negative terminal of the filament, it may be the same as the negative terminal, or it may be positive with respect to the negative terminal, but it will always be negative with respect to the potential of the field in the plane of the grid which would exist if the grid were removed from the bulb. The negative charge on the grid, therefore, impedes the flow of electrons from filament to plate, causing the decrease in the wing current. The placing of a positive charge on the grid from an external source tends to neutralize the negative charge on the grid, thereby permitting an increase in the wing current. The addition of a negative charge to the grid increases the deflection

of the electrons and produces a further decrease in the wing current. This is the fundamental action of the audion when used either as an amplifier or a detector. The reason for this action will appear upon examination of the behavior of an audion of the type shown in Fig. 3.

The wings of the audion were placed symmetrically

of the electrons and produces a further decrease in the wing current.

An alternating emf impressed between the grid and the filament causes variations in the wing current in the manner indicated in Fig. 4, the positive alternation producing an increase and the negative alternation a decrease in the wing current. This is the action in



volved in the audion when it is used as an amplifier.

To substantiate the above and other actions, the writer, working in conjunction with Prof. J. H. Morecroft, of Columbia University, has secured oscillograms which substantiate the idea just presented. Fig. 5

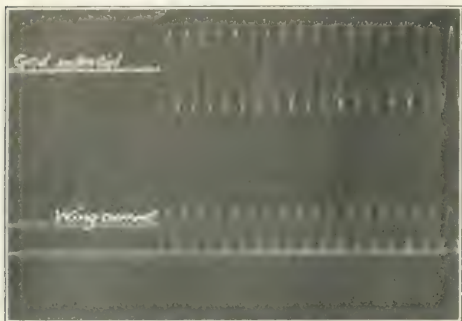


FIG. 6—ACTION OF AUDION AS AN AMPLIFIER

shows the arrangements with which the test was carried out.

The potentiometer  $P$  was used to adjust the grid to a potential corresponding to point  $P$  at the center of the operating part of the curve shown in Fig. 1. The audion is capable of handling the greatest amount of

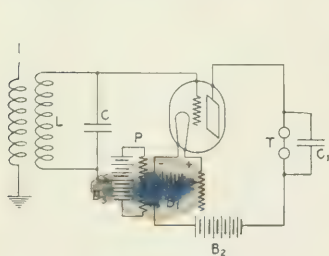


FIG. 7—USE OF AUDION AS AN OSCILLATION DETECTOR

energy as an amplifier when the grid potential is adjusted to this point.

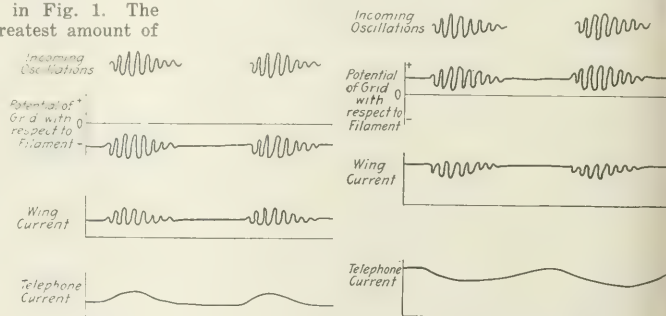
Fig. 6 shows the oscillogram of the action as an amplifier. The result bears out the explanation already given.

The action of the audion as a detector of high-frequency oscillations is quite different from its action as an amplifier. Since the incoming oscillations are of too high a frequency to affect directly the telephone receiver, the audion must be so connected and adjusted that the cumulative effect of a group of oscillations in the grid circuit is translated into a single low-frequency pulse or variation in the telephone current. This may be done in two ways, one depending on the non-linear form of the operating characteristic of the audion and the other depending on the so-called "valve" action between hot and cold electrodes at low pressures.

Fig. 7 shows the connection used for operating in the first-named manner. The potentiometer  $P$  is employed for the purpose of adjusting the potential of the grid to point  $M$  on the characteristic curve of Fig. 1. The action is much the same as in one of Professor Fleming's methods of using his valve. A group of high-frequency oscillations impressed on the grid causes corresponding high-frequency variations in the continuous current in the wing circuit, but owing to the fixing of the grid

potential at the lower bend in the curve by adjustment of the potentiometer in the grid circuit, the amplitude of the positive part of the high-frequency current in the wing circuit exceeds the amplitude of the negative part. As the positive half-waves are greater than the negative half-waves, more electricity flows in one direction than the other, and the condenser  $C$ , through which the high-frequency current in the wing circuit flows, becomes charged, the side connected to the battery  $B$ , having the positive charge. This charge accumulates in  $C$ , in a relatively short time, approximately that of the duration of a wave train.  $C$  then discharges through the telephones  $T$ , the rate of this discharge being determined by the constants of the telephones and the condenser. It is probable that this discharge is aperiodic or nearly so. In any case the main part of the discharge through the telephones is in the same direction as the current due to the battery  $B$ , and constitutes an increase in the current in the telephones. As this action is repeated for each group of oscillations, a series of wave trains causes what might be regarded (in its action on the telephones) as an alternating current in the telephones superposed on the continuous current and having a fundamental frequency equal to the number of wave trains per second. The action is shown diagrammatically in Fig. 8.

If the potential of the grid is adjusted to the upper bend in the curve of Fig. 1, as at point  $N$ , the funda-



FIGS. 8 AND 9—ACTION OF AUDION AS AN OSCILLATION DETECTOR

mental action will be the same, but the effect of high-frequency oscillations in the grid circuit on the wing current will be reversed. The amplitude of the negative part of the high-frequency oscillations in the wing circuit will exceed the amplitude of the positive part and

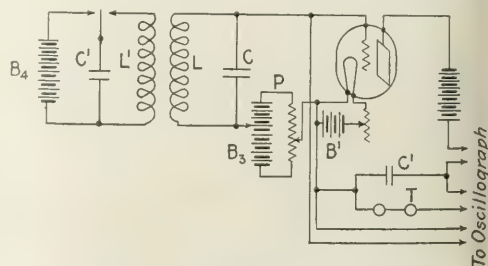


FIG. 10—CONNECTIONS TO OSCILLOGRAPH

the condenser  $C$ , will become charged, but in the opposite sense, the side connected to the battery  $B$ , becoming negative. The discharge of the condenser through the telephones will therefore be in the opposite direction to the flow of the continuous current of the wing circuit

and will constitute a decrease in the telephone current. Diagrammatically the action is as indicated in Fig. 9. Oscillograms bearing on these actions were obtained in the manner indicated in Fig. 10. Oscillations were set up by the discharge of the condenser  $C$  through the

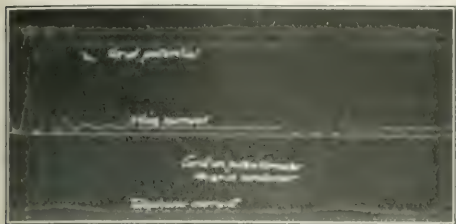


FIG. 11—OSCILLOGRAM OF ACTION AS A DETECTOR

inductance  $L'$ , which was coupled with the inductance  $L$  of the tuned grid circuit. To permit the use of an ordinary General Electric oscillograph, an oscillation frequency of about fifty cycles per second and a group frequency of two or three cycles were employed. The action of the audion is the same regardless of frequency, provided that the circuit constants are suitably modified to fit the frequency employed. In this case the oscillation frequency of the circuit  $C'L$  was fifty cycles and the circuit  $LC$  was accordingly tuned to the same frequency. The capacity of  $C_1$  was selected to correspond to the low frequency employed. Figs. 11 and 12 show oscillograms taken as indicated in Fig. 10, with the grid potential adjusted respectively to the lower and upper bends of the operating characteristic.

It will be observed that the telephone current reaches in Fig. 11 its maximum value, and in Fig. 12 its minimum value, when the oscillating current has almost died away. This effect would be shown more plainly with a higher oscillation frequency, but even at the frequency used it is quite evident.

To make use of the "valve" action between hot and cold electrodes for the detection of high-frequency oscillations a connection as shown in Fig. 13 is used.

In this case a condenser  $C_2$  is inserted somewhere in the circuit between the grid and filament to prevent the flow of a continuous current between them, and the grid is therefore left free to assume a potential determined by its position with respect to the filament and wing. Usually this will be somewhere near the center

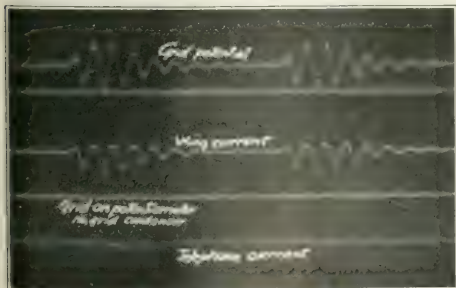


FIG. 12—OSCILLOGRAM OF ACTION AS A DETECTOR

of the operating part of the curve of Fig. 1; that is, near point  $P$ . Now the action for incoming oscillations, as far as the closed oscillating circuit, filament, grid and condenser  $C_2$  are concerned, is identical with the rectifying action of the Fleming valve. An incom-

ing wave train sets up oscillations in the closed circuit  $LC$  which are rectified by the "valve" action of the filament and grid, and the rectified current is used to charge the condenser  $C_2$ . Electrons pass readily enough

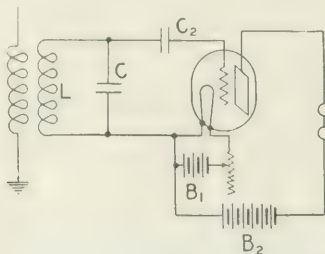


FIG. 13—USE OF AUDION AS A "VALVE"

into the grid but cannot easily escape therefrom, and a negative charge is built up on the side of the condenser connected to the grid. The negative charge thus imparted to the grid cuts down the flow of electrons from the filament to the wing, producing a decrease in the wing and telephone currents. At the end of a wave

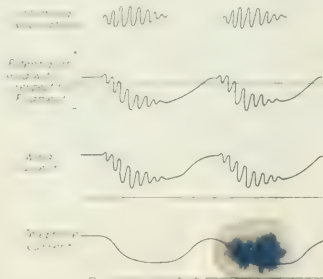


FIG. 14—ACTION OF AUDION AS A "VALVE"

train the charge in  $C_2$  gradually leaks off and the wing current returns to its normal value. The charge and discharge of this condenser take place in the manner indicated in Fig. 14.

One group of oscillations produces a single low-frequency variation (decrease) in the telephone current

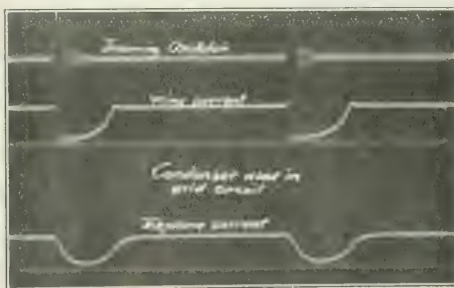


FIG. 15—OSCILLOGRAM OF ACTION AS A "VALVE"

and a series of wave trains produces a corresponding series of low-frequency variations in the telephone current. In Fig. 15 is shown an oscillogram of the behavior of the audion when the "valve" action is employed for the detection of oscillations.



With the means at hand it was impossible to ascertain the variations of the grid potential, as the leak introduced by connecting the oscillograph to the grid would destroy the cumulative action in the grid condenser. The grid potential, however, varies in exactly the same manner as the wing current. It will be seen that the fundamental detecting action is that of a valve, the high-frequency oscillations being rectified between the filament and grid, thereby causing a charge to accumulate on the grid and in the grid condenser. The charged grid then exerts a relay or trigger action on the wing current so that the audion is at once a rectifier and an amplifier. A somewhat similar combination of rectifying and amplifying actions occurs in the arrangement shown in Fig. 7. The action of the audion is being further studied by Prof. Morecroft and the writer in the research laboratory in electro-mechanics, Columbia University, and the results of these investigations will soon be published.

### High-Potential Voltmeter Based on Corona Pressures

Striving by experiment to determine the relation between the corona current and the increase in air pressure which occurs if direct-current corona takes place in an inclosed space, members of the physics department of the University of Illinois, Urbana, have hopes of being able to construct a high-potential voltmeter based on this pressure phenomenon. Professor Jacob Kunz, in describing some of the experiments before the American Physical Society, stated that the tests covered potentials ranging from 3000 volts to 15,000 volts and that manometer deflections as great as 25 cm had been observed. Professor Kunz emphasized the fact that the pressure noted was not due to heating of the air, for the liquid used in the manometer responded instantly upon the application of potential. Curves plotted between potential and pressure from data obtained thus far approximate very nearly to straight lines.

### The Electron Theory and Metallic Selenium Crystals

Since the usual free-electron hypothesis does not offer an explanation of (1) the increase of light sensitiveness with pressure, proportional to the conductivity of metallic selenium crystals in the dark, (2) why the change of conductivity by pressure or electrical fields is limited to the region of the crystal under stress, and (3) why the increase of light sensitiveness is limited to the region under pressure and is practically unlimited as to what region of the crystal is illuminated, Prof. F. C. Brown, Iowa State University, Iowa City, has proposed a modified form of the electron theory to satisfy all the fundamental experiments thus far recorded. This new view supposes that a large portion of the conducting electrons in the crystal are ordinarily fixed in the crystal structure in varying degrees of stability. When an electric field is established across the crystal a certain average number of these fixed electrons is rendered unstable or free. The divergence from the usually accepted notion is the conception that these electrons remain free only for a relatively short interval of time. Thus in these crystals the current increases with voltage more rapidly than is required by Ohm's law.

The effect of the increase of pressure is to lessen the degree of the stability, so that the mean interval before the recombination of the electrons is increased. "Obviously," says Professor Brown, "this seems to ex-

plain satisfactorily the increased light sensitiveness with increased pressure, and also the exact proportionality observed. It also explains the limitation of this increase to the region of the crystal under pressure. The transmitted light action observed by Prof. L. P. Sieg and myself is probably a mechanical disturbance propagated in the crystal, and enters into this theory only as the disturbance keeps electrons out of their fixed positions. If it were not for this rapid recombination of the electrons, the change of conductivity by pressure or electrical forces should be noticeable throughout a given crystal structure."

In closing his remarks, which were made before the American Physical Society at Chicago, Professor Brown suggested that a study of the conductivity changes very near the region of applied pressures might give some information as to the rate of combination of the electrons.

### Valuation in Houston, Tex.

Messrs. James E. Allison & Company, of St. Louis Mo., have submitted a report on the rate case of the Houston (Tex.) Lighting & Power Company 1905. They represented the company and reported on the capital now invested in the property and entitled to a return. In the letter of transmittal they say that they were aware that the report was to be submitted to the consideration of the Mayor and commission of the city of Houston in connection with a contemplated regulation of rates. A report on the property has been made by Messrs. Lyndon & Elrod, representing the Mayor of Houston.

In stating that valuation for rate making is comparatively new, the report says that the Wisconsin commission "is the one which is in great part responsible for the adoption of theoretical depreciation, and it is a very curious commentary on the theory of its member put forth in the early part of their work that while in nearly all of their cases they figure out the depreciated value, yet when they come actually to assign the amount of capital entitled to returns, the effect of depreciation cannot always be traced clearly in their announced result. The commission, while it has not yet admitted the error of applying this theory, has generally raised the figures of its valuations as not to bring the results very seriously in question. There seems to have been what may be called an instinctive recognition of a just amount which has often been assigned in the commission's reports without making it very clear just how it was arrived at.

"Notwithstanding that by such methods of arriving at practical justice the Wisconsin commission has preserved itself from bringing about an impossible state of affairs in that State, yet its doctrine, which it does not always follow, has gone forth and has been adopted in many other places without that careful analysis which should have been given it. The consequence is that while Wisconsin has in some quarters gained a reputation for fair treatment of its utilities and may have so far escaped complete stagnation in utility enterprises, other localities which have followed the doctrines of Wisconsin without following its practice are already beginning to feel the effect of a theory of regulation under which private capital will not enter the public service."

An appendix to the report includes papers on the subject of depreciation by Mr. James E. Allison, Prof. Allen A. Young, Cornell University; Prof. J. Lawrence Laughlin, University of Chicago; Prof. W. F. Gephart, Washington University, and Prof. Lewis H. Hane, University of Texas.

# Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods and Current Practice Among Successful Utilities

## Electrical Irrigation Paid for Itself in a Year

During last summer several of the more progressive farmers living between Wichita and Newton, Kan., bought and installed electric motors to pump water for irrigating alfalfa fields. One of these men, who purchased a 35-hp motor, irrigated 100 acres of land, from which he cut more than 5 tons of alfalfa to the acre during the season. The entire acreage was watered twice for each of the five crops, and the total cost of securing the water was \$2.25 per acre a season. Mr. T. Harvey, sales manager of the Kansas Gas & Electric Company, says that the farmer raised 250 tons more alfalfa than he would have been able to secure without irrigation. The pump and motor installed cost about \$3,000 and the ditches cost about \$1 per acre. Hence the first year's excess crop more than paid for the irrigating equipment.

## Economy of Perforated Post-Card Billing

Customers' electric-service bills in Topeka, Kan., are made out on a stamped post-card form and mailed to the addresses without cover. The card used is divided by a perforated line into two parts, namely, the bill and the return coupon. When a customer presents his card and the amount of his bill at the cashier's window the card is slipped into a machine which clips the coupon at the perforated line and stamps the bill "Paid." The canceled bill is handed to the customer and the clipped coupon is taken with many others and sorted according to the file number it carries. The use of the machine at the cashier's window saves much time for the customer standing in line on discount days.

If, instead of calling at the company's office, the customer elects to pay his bill by check, he detaches the

Party addressed on opposite side To The Topeka Edison Co., Dr.		Rate Schedule on file at Company Office	Mo. Oct., '14
Statement of Meter: ELECTRIC			
Oct. , 1914			
Sep. , 1914			
Difference	X		
Consumption			
K. W. Hours	Discount,		
Net Bill, if paid by Nov. 10th.			
Delinquent,			
When remitting by check, kindly detach and send coupon only, canceled check being your receipt.			

PERFORATED POST CARD FOR BILLING

coupon from the post-card bill and sends the coupon with the check. This coupon immediately identifies him on the company's books. Although the bill which the customer holds is not stamped paid, he always has the canceled check to serve as a receipt, and the expense of mailing receipts to these customers is eliminated.

## Purification of Milk by Electricity

In recent years the agitation for pure milk, especially in the cities, has been persistent, and many methods have been devised to treat the product and to kill the pathogenic organisms which it may contain. Apparatus for electrically treating milk on a commercial scale

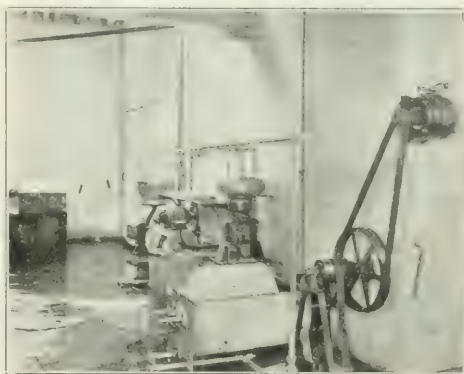


FIG. 1—MOTOR-DRIVEN CLARIFIER AND DUMPING TANK

has been installed and is now operating in the Long Ridge Dairy Company's plant at Stamford, Conn., and scientific investigations demonstrate that the electric system possesses all the requirements essential to success.

After being passed through a clarifier which removes dirt and other foreign matter from the liquid, the milk is conveyed to a device developed by the Goucher Electric Purifying Company, 32 Union Square, New York, and is subjected to electric energy at a potential of about 2200 volts. The results of this process, as shown by a large number of bacteriological and pathological tests, indicate that a great step forward has been taken in the scientific and proper treatment of milk, rendering it free from all disease-carrying organisms without any impairment of its digestive or nutritive qualities.

The milk arrives at the plant in large cans and is emptied into a dumping tank shown at the right of Fig. 1. From the dumping tank the milk is pumped to a clarifier operated by a 0.5-hp motor. The motor and clarifier are connected together by rope drive as shown in the illustration.

From the clarifier the milk passes to a 400-gal. mixing tank, part of which is shown to the right of Fig. 2. Paddles attached to a rod running lengthwise of the tank and belt-connected to a 1-hp motor are made to oscillate so as to mix the milk thoroughly. From the mixing tank the milk is conveyed through a rotary pump driven by a 1-hp motor to steam-jacketed coils and thence to the electric purifier. A thermostat is used to regulate the temperature and the flow of the milk.

The purifier consists of three electrodes which are of an alloy casting, the base of which is aluminum. These electrodes are separated by a composition disk



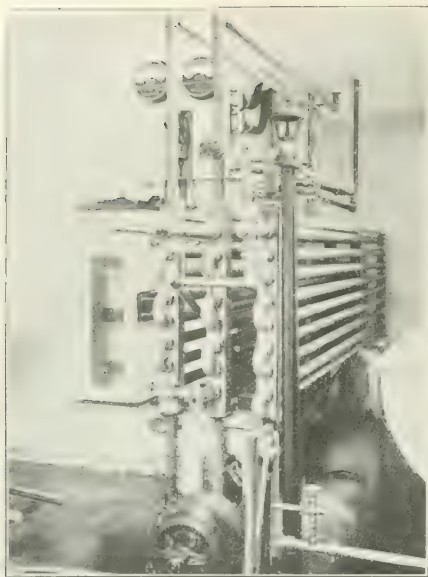


FIG. 2—HEATING AND COOLING PIPES

having a 0.5-in. hole drilled in the center through which the milk is passed. Above and below the electrodes are similar disks. The electrodes are cylindrical, as shown in Fig. 3, but are hollowed out at each end, the hollow being a spherical depression. Two  $\frac{5}{8}$ -in. holes are drilled in the castings away from the center through which the milk is forced. A  $\frac{1}{8}$ -in. hole drilled in the center serves as a drain at the finish of a run. The milk is pumped upward from the bottom of the purifier. The device is

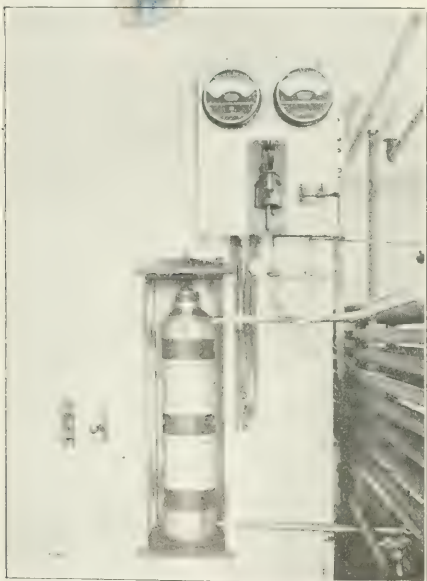


FIG. 3—ELECTRIC PURIFIER WITH SWITCHBOARD AND INSTRUMENT PANEL

inclosed in a cabinet, the door of which cannot be opened until the switch is opened. For this purpose use is made of a special switch which also acts as a latch. Part of the switch is attached to the door, as shown in the illustration, and the other to the cabinet. The rated output of the purifier is 1000 quarts an hour.

The temperature of the milk passing out of the purifier is about 158 deg. Fahr. From the purifier the milk is passed through water-cooled coils and thence through a series of brine pipes, finally being conveyed to a bottle-filling machine. A 10-hp motor is used to operate the refrigerating apparatus which provides brine for cooling the milk and a refrigerator for storing the milk before delivery.

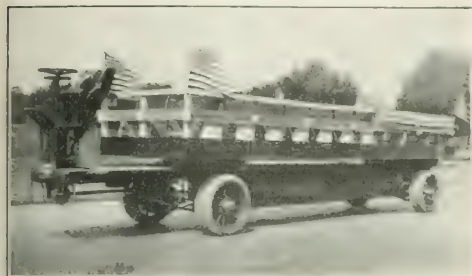
Energy is obtained to operate the various motors and the purifier at a pressure of about 220 volts from the service lines of the Stamford Gas & Electric Company. A step-up transformer is used to change the pressure to 2200 volts.

### Liability of Electric Company Using Joint Poles

The Supreme Court of Missouri recently handed down a decision in the case of Hill vs. the Union Electric Light & Power Company (169 S. W., 345), affirming the judgment of the Circuit Court granting the plaintiff \$18,000 for the loss of his fingers and thumbs and for other injuries sustained. The plaintiff's evidence tended to show that the city of St. Louis owned a line of poles the primary purpose of which was to support wires for its police signaling system. The Bell Telephone Company, the Union Electric Light & Power Company and the Kinloch Telephone Company were duly authorized by the city to use the poles also. The wires of the city were the top ones, those below belonging to the Bell Telephone Company; the electric-light company's wires came next, and the Kinloch company's wires were at the bottom. The lighting company's circuits carried energy at 2300 volts. One of the old poles was removed by the lighting company, which erected a new pole in its stead with the foot-steps driven therein; but the cross-arms of the other company had not been installed nor had any of the telephone or signaling wires been attached to the pole. After a wind and rain storm a trouble-man of the Kinloch Telephone Company, following his usual calling, located trouble at the new pole mentioned, and in order to correct it ascended the pole in the usual manner. While engaged in disentangling the wires he received the injuries complained of. It was held that where an electric-light company using a line of poles owned by a city and also used by a telephone company with the permission of the city replaced an old pole with a new one, but did not put the cross-arms in place or attach the wires, as a result whereof a defectively insulated wire came in contact with the step, it was guilty of negligence, rendering it liable for injury caused to a telephone employee by contact with such step or hand-hold. It was also held that if, as claimed, the new pole was not erected in the place of an old one authorized to be removed, it was a public nuisance and, irrespective of negligence, the lighting company was liable for injuries sustained by a telephone employee while on such a pole for the purpose of disentangling telephone wires. In answer to the appellant's contention of contributory negligence in that the trouble-man did not wear rubber gloves the court pointed out that the evidence introduced by both the appellant and the respondent conclusively showed that none of the employees of the Kinloch or of any of the other companies mentioned ever wore rubber gloves in the performance of the duties the respondent was engaged in when injured.

# Electric Pole Truck Converted to Passenger Car

In the accompanying illustration is shown one of the Philadelphia (Pa.) Electric Company's 6-ton electric pole trucks which was converted into a passenger-carrying vehicle during the fall outing of electrical industries at Observatory Hill, Philadelphia. The truck, which was equipped to seat fifty passengers comfort-



POLE TRUCK EQUIPPED FOR PASSENGERS

ably, made seven round trips on the afternoon and evening of the outing, carrying 350 persons. This company is extremely well satisfied with the performance of its electric trucks. Each day its 1000-lb. trucks make an average of 52 miles in ten and a half hours with eighteen stops; the 2000-lb. trucks, 53 miles in nine hours with six stops, and the 4000-lb. trucks, 65 miles in eleven and three-quarter hours with fifteen stops.

## Successful Flat-Rate Campaign at Muncie, Ind.

In May, 1911, the Indiana properties of the American Gas & Electric Company started a controlled flat-rate campaign with solicitors furnished by the Excess Indicator Company working with the Muncie company's regular solicitors. A wiring schedule averaging about \$1.50 an outlet was agreed upon by the electrical contractors in some of the cities, and the gratifying results which have been obtained throughout the territory are given in the table herewith.

DATA SHOWING RESULTS FROM FLAT-RATE CAMPAIGN

	Customers May, 1911	Customers December, 1913	Flat-Rate- Controlled Customers, December, 1913	Per Cent Increase	Average Monthly Income from Flat-Rate- Controlled Customers
Muncie			174		\$1.18
Hartford City			279		1.02
Indianapolis	4,254	6,721	286	50	1.02
Bedford			90		1.02
Elletts			35		1.02
Marion			508		1.05
Jefferson	3,315	1,705		74	
Union					
Parsons					
Alexandria	340	685	437	7	1.10
Elwood	798	1,939		143	

In the Muncie territory the population is about 45,000, and among this number there are 6721 customers. Deducting 721 store-lighting and motor-service customers, there remain 6000 residence customers out of an approximate total of 9000 (or 66 per cent) connected to the company's lines. The population in the Marion territory is about 30,000, and here the company has 5795 customers, of which 700 are store-lighting and motor-service customers. Hence approximately

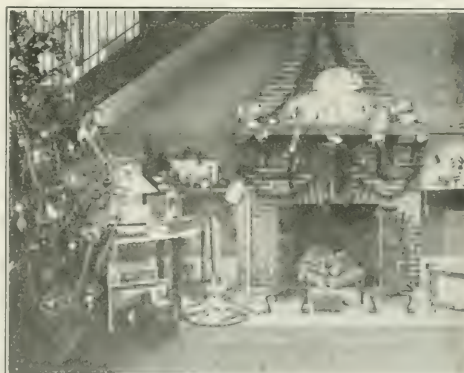
5100 residences out of a possible 6000 (or 85 per cent) are using electricity. In and about Elwood and Alexandria the total population is 20,000, and the company has 2574 customers, of which number 400 are store-lighting and motor patrons. Thus, with 2174 residences, or 54 per cent of the possible 4000, using electricity, the saturation is not so high as in the other districts. These latter properties have been under the management of the American Gas & Electric Company for only two years, but in that time their business has really increased 127 per cent and further growth is confidently expected.

While but 23 per cent of the residences in these districts were receiving energy on a controlled flat rate in December, 1913, it is said with authority that many customers were taken on the controlled flat rate who could not have been secured on another basis. Data on changes in customers' installations show that 21 per cent of all persons taking service on a flat rate later installed meters.

## Early Christmas Suggestions in Electric Shops

Department stores and other shops which sell goods suitable for Christmas gifts are this year, more than ever, urging the buying public to do its Christmas shopping early. Daily newspapers in some of the larger cities are using front-page space to urge early Christmas buying. Everywhere is the tendency to do away with the period of rush and crush which formerly preceded Dec. 25.

Electrical dealers, realizing the necessity of competing for Christmas business with other lines of trade, are making preparations to use window and showroom displays carrying Christmas suggestions throughout the entire month of December. Many think the Christmas campaign should really begin with vigor as soon as Thanksgiving Day is past, as that early holiday arouses thoughts of the festival days to follow. The picture herewith shows an interior display which has been used effectively in the office of the Union Electric Light & Power Company, St. Louis, Mo. The open fireplace with the children's stockings hanging from the mantel



ELECTRICAL CHRISTMAS DISPLAY WITH THE HUMAN-INTEREST TOUCH

gives the display the homelike touch which made it so successful and attracted even more attention than the electrical devices alone could have commanded. A realistic fire in the grate was simulated by concealing an electric fan behind the grate logs and directing its blast upward so that ribbons of red paper tied to the fan guards leaped toward the chimney like tongues of flame.



## Illumination and Wiring

### Tailor's Workbenches Equipped for Electricity

In the workroom at Thurn's, a fashionable New York ladies' tailoring establishment, is one of the best electric-iron equipments in this country. Twenty-two flatirons are employed, six of which weigh 12 lb. and require



PART OF PRESSING-ROOM EQUIPMENT

770 watts, ten weigh 9 lb. and require 675 watts, and six weigh 6 lb. and require 475 watts. The largest ones are employed to press heavy materials, while the 6-lb. irons are used on silks, chiffons, etc. The tables at which the irons are used are specially equipped. Over each bench is an iron-pipe arch to which is attached a device which keeps the flatiron cord from sagging and rubbing on the material which is being pressed. The wires feeding the irons are conveyed to the cord supports through the conduits forming the frame. Fastened to each conduit containing a riser are a snap, switch, a pilot lamp and an outlet for a cord connected with a special flatiron stand. When an iron is placed on one of these stands it automatically reduces the energy supplied to the iron one-third, thereby preventing overheating. Over each table are suspended two drop lamps with reflectors. Electricity used in this establishment for driving sewing machines and lighting nearly 800 tungsten lamps, as well as operating the flatirons, is supplied by the New York Edison Company.

### Cable Splicer's Portable Tool Box

To facilitate the movement of a cable splicer's tools in his daily travels about the city a compact, substantially built pushcart tool box is furnished to him



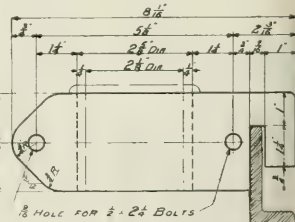
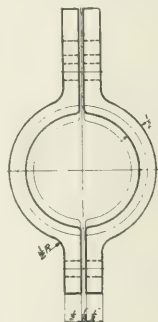
A CONVENIENT TOOL BOX

by the electrical department of the Twin City Lines, Minneapolis, Minn. This box is arranged with shelves and bins, and is large enough to hold a complete cable splicer's kit. In addition to the tools generally used in this class of work, this box is fitted with a kerosene-oil furnace with a reservoir sufficiently large for two days' work, a fire extinguisher, a bank of lamps, rubber gloves and a first-aid outfit consisting principally of supplies for the treatment of burns. The box is built of 0.75-in. hard pine reinforced with 1-in. by 1-in. by 0.125-in. angles, and is mounted on an axle with 36-in. wheels. The principal dimensions and materials are shown in the accompanying illustrations.

### Cable Support for Vertical Drops

When installing underground circuits obstructions are frequently encountered making it necessary to drop cables from one level to another. If the drop is considerable, the weight of the cable should be taken off the upper duct, otherwise the sheath may be dented by

the excessive bearing pressure. A supporting clamp which proved satisfactory in an underground installation at the Pittsburgh Crucible Steel Company's plant, Midvale, Pa., where the drop was 29.5 ft., is illustrated herewith. The clamps were fastened to the cable about 7.5 ft. apart and hung on angle irons supported horizontally across the manhole. The clamps each consisted of two



SLOTTED CABLE CLAMP SUPPORTED ON ANGLE IRON

wrought-iron straps inclosing a hardwood bushing which was used to protect the cable from injury. By tightening up bolts through holes in the straps on opposite sides of the cable the bushing was made to grip the cable firmly. Slots in the straps permitted of hooking them on the angle irons.

### Avoiding Phase Reversal

Semi-annually the Commonwealth Edison Company, Chicago, gives prizes to its employees for meritorious suggestions. The first prize, \$50, was recently awarded to Mr. E. C. Prichard, of the street department, for the following suggestion:

In several cases troublemen and foremen have reversed rotation of three-phase motors fed by two transformer banks while trying to restore service after one phase of the line has opened in the station.

The present procedure is to cut the phase wire at the fault over to the other live phase and then go to each customer and reverse secondary connections at the service switch. It is difficult to reach these secondary connections, especially in the night, and should the

troubleman fail to reverse the service before the customer wants to use it damage may result. Therefore it is suggested that the troublemen and foremen shall receive a copy of the list of changes indicated in the table herewith. These could be made on a cable pole or a transformer pole should the occasion arise.

#### CHANGES TO AVOID PHASE REVERSAL

Transformer Connected to Phase	Phase Open	Change to Be Made
A-B A-B	A B	B to A, C to B A to B, C to A
B-C B-C	B C	C to B, A to C B to C, A to B
A-C A-C	C A	A to C, B to A C to A, B to C

In some cases these changes can be accomplished by reversing potheads and in other cases by using temporary jumper wires.

### Opportunities of Illumination with Gas-Filled Lamps

Concentrated-filament gas-filled lamps equipped with parabolic reflectors have opened wonderful opportunities for illumination which would be impracticable with arc-type searchlamps or ordinary lamps and reflectors because of the cost of equipment and operating energy. Among possibilities with stereopticon-type tungsten lamps are the illumination of bulletin boards, statuary, large building exteriors, etc. The accompanying illustrations show the exterior of the public library at Hartford, Conn., and of an inn illuminated by lamps placed at a distance from the buildings. Four 500-watt gas-filled lamps equipped with 16-in. parabolic reflectors having a focal length of 3 in. were placed across the street from the library to give the intense illumination



FIG. 1—HOTEL FRONT ILLUMINATED BY ONE 500-WATT LAMP

shown. The front of the inn was illuminated with one 500-watt unit which was equipped and installed in a similar manner.

A still greater field for these lighting units is the illumination of painted signs along railroad rights-of-way and on the walls and roofs of buildings. Signs, water tanks and smokestacks bearing white-letter ad-

vertisements can be brought out conspicuously against the black background of night by illuminating in this manner. The lighting units may be placed from 50 ft. to 200 ft. from the surface to be illuminated, depending on the best location available for installing the searchlamps. If the units are placed fairly close to the object they are intended to light, it is necessary to throw the lamps out of focus to spread the rays. This can be ac-



FIG. 2—PUBLIC LIBRARY ILLUMINATED BY FOUR 500-WATT LAMPS

complished by placing the filament behind the focus, thereby utilizing a larger percentage of the light flux than could be used if the lamp were in front of the focal point.

Where signs are surrounded by a dark background it has been found that 2 watts per sq. ft. of surface illuminated gives satisfactory results. For dull white letters 500-watt lamps are best, but glossy white letters can be made legible from a greater distance with 250-watt lamps than with 500-watt units because of the reduction of glare in the former instance.

## Letter to the Editors

### Methods of Expressing Brightness

*To the Editors of the Electrical World:*

SIRS:—In America the brightness of a source of light or of a reflecting surface (sometimes called intrinsic brilliance) has usually been expressed in terms of the candle-power per unit area, the most common terms being the candle-power per square inch or per square centimeter. The expression of brightness in candle-power per unit area has the sanction of the committee on nomenclature and standards of the Illuminating Engineering Society\* and the I. E. S. definitions of brightness have been included in the standardization rules and definitions of the American Institute of Electrical Engineers.

It is to be carefully noted that the brightness of a surface in apparent candles per square inch as it appears to the eye when viewed from a particular direction or measured with a brightness photometer does not necessarily give any indication of the actual output of the surface in lumens per square inch or per square foot, just as a measurement of candle-power in one particular direction from a lamp equipped with a concentrating reflector does not indicate the mean spherical candle-

\*Transactions I. E. S., 1912. Vol. III, page 728.



power or the total output in lumens of the lamp. Only when the surface emits light like a perfectly diffuse reflector—that is, appears equally bright when viewed from any direction—can the apparent candles per square inch of a surface be used for calculating the total output in lumens per square inch of the same surface. The apparent candles per square inch measurement of such a surface is the same when viewed from any angle, but since the projected area of the surface as viewed from different angles varies according to the cosine of the angle between a line normal (90 deg.) to the surface and a line from the point of measurement to the surface, the total candle-power received from the surface and the illumination resulting therefrom will vary according to the cosine of this angle. Hence, in the language of the mathematical physicist, such a surface emits light according to the cosine law. A reflecting surface of this kind is called "perfectly diffusing," or "matte."

The measured brightness of a perfect matte surface expressed in apparent candles per unit area can be shown mathematically or by actual test to be equal numerically to the lumens emitted per unit area divided by  $\pi$ , or 3.14. If a surface does not emit or reflect according to the cosine law (that is, does not appear equally bright when viewed from all directions) there is no means of telling from a single measurement what the mean value of the candle-power per unit area or the output in lumens per unit area may be because there is no constant ratio between the one value of apparent candles per unit area and the lumens output per unit area. For example, an observer obtains the impression of much greater total light reflected from a piece of glossy paper by viewing it from the particular angle at which he receives most of the glare or gloss effect than he would obtain by viewing it from some other angle. That is to say, a single brightness value can be used for calculating the mean spherical candle-power, the total luminous flux or the lumens output of a surface only when the surface is of the perfectly matte or diffusing type.

Sometimes brightness is expressed in foot-candles. Such an expression, when unexplained and unmodified, is likely to be rather confusing. The term foot-candle is usually employed to express the density in lumens per square foot passing through any plane. The plane under consideration may be, for example, either a reflecting surface or an incandescent surface source of light. In the case of a flat incandescent surface source, the light is usually emitted according to the cosine law, and the surface appears equally bright in all directions. When the brightness of such a source is expressed as 1000 ft.-candles, for example, the surface is identical in appearance to the eye with a source which would emit 1000 lumens per square foot if emitting in accordance with the cosine law—1 ft.-candle being equal to a flux density of 1 lumen per square foot.

As explained above, when the same method of expressing brightness is applied to a surface not emitting according to the cosine law there exists no constant mathematical ratio between the output in lumens per square foot and the brightness as viewed from any particular direction. To avoid possibility of confusion, therefore, the plain term "foot-candle" must be modified before being applied to the brightness of primary sources.

When dealing with secondary or reflecting surfaces the use of the unmodified term "foot-candle" leads to still greater confusion. In addition to the fact that the surface may not reflect according to the cosine law, there is a chance for some confusion as to whether the term foot-candle is being applied to the incident flux density or the emitted flux density. Of course, what the surface receives and what it gives out, either actually or as manifested by brightness, are entirely

different quantities. The absorption of the reflecting surface may be, say, from 15 to 99.5 per cent, and the character of the surface may vary from perfectly matte to smooth and specular like a mirror.

The terms "foot-candles" and "lumens per square foot flux density" define exactly the quantity of luminous flux per square foot passing through a given plane, but they afford no idea as to the distribution of that flux from that plane. In other words, when using the unmodified term "foot-candles" to express brightness an attempt is being made to reverse the impossible proposition before discussed; to make the luminous flux output values per square foot express the brightness or intensity in any particular direction is manifestly impossible for reasons already stated.

However, for surfaces which emit according to the cosine law (that is, incandescent plane surfaces as an example of primary light sources, and perfectly matte diffusing and reflecting surfaces as secondary light sources) an expression of the emitted flux density in lumens per square foot or foot-candles provides an exact idea of the brightness of such surfaces.

The writer believes that the term "apparent foot-candles" might very well be used to express brightness, with the understanding that 1 ft.-candle of brightness would be identical in appearance to (a) that produced by an illumination of 1 ft.-candle upon a perfectly matte diffusing and reflecting surface of 100 per cent reflecting power, or (b) that of a surface source of light emitting at a density of 1 lumen per square foot, such flux being emitted in accordance with the cosine law. To the eye (a) and (b) are identical in appearance.

The expression of brightness in "apparent foot-candles" rather than in "candle-power per unit area" carries with it certain advantages both in calculation and conception.

In some cases of calculation where the light source in question is, for example, the sky or some surface approaching closely a perfect matte or diffusing surface, a statement of the brightness in apparent foot-candles is equivalent to a statement of the output in lumens per square foot. The lumens output of the source can then be determined without multiplying by 3.14, as is necessary when the brightness is expressed in apparent candles per square foot.

To the man who is familiar with illuminating engineering and who is accustomed to thinking in terms of foot-candles the statement of brightness values in "apparent foot-candles" might be helpful in forming a conception or mental picture of such values. To the man who is not familiar with illuminating engineering "apparent candles per square inch" doubtless conveys much more information than "apparent foot-candles." To the illuminating engineer a statement that a certain surface is apparently as bright as if it were a perfectly diffusing and reflecting surface illuminated with a given number of foot-candles conveys perhaps a more definite meaning and in many cases he has to make merely a mental calculation of the probable reflecting power or coefficient of diffuse reflection of the surface in question in order to judge approximately the foot-candle illumination incident upon the surface. Such a method of expression therefore might be of such aid in the study of brightness values as substantially to promote interest in brightness studies, and these studies are of much importance if advance is to be made in illuminating engineering work.

In reducing apparent candles per unit area values to apparent foot-candle values the following conversion factors are useful: When the unit of area is the square foot multiply by 3.14, the square inch by 452, the square centimeter by 2918, and the square meter by 0.2918.

Chicago, Ill.

J. R. CRAVATH.

# Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

## Saving Horseflesh and Money

Instead of employing an extra team of horses to help pull wagon loads of dirt out of a deep excavation at Independence, Kan., the Kansas Gas & Electric Company has been using a 15-hp, 220-volt, three-phase motor to make the heavy haul. The building under construction, in the background of Fig. 1, is an addition

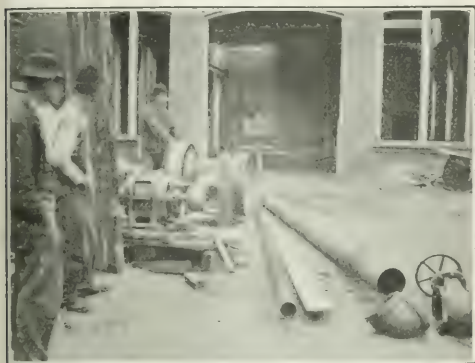


FIG. 1—MOTOR PULLING WAGON FROM EXCAVATION

to the company's power station and will house a 500-hp gas engine and generator. To secure a solid foundation for the gas engine an excavation about 10 ft. in depth was necessary. The motor belted to a jack shaft drives



FIG. 2—SWITCH AND WINDING-DRUM ARRANGEMENT

the winding drum (Fig. 2) through a paper friction clutch and pulls the wagon load of shale out of the pit without difficulty. Mr. W. R. Murrow, manager of the Independence company, says it is doubtful whether two teams of horses could have pulled the loads from the pit when it neared its ultimate depth. It is certain that the motor was operated at a large saving.

## Location of Reactors

In choosing the location for current-limiting reactors it should be considered whether the generators alone, the feeders or both are to be protected and how the voltage regulation will be affected. With reactors in the generator leads the chief protection is given to the generators, as the current which will flow into a faulty feeder will be that which can be supplied by all of the generators operating in parallel. If the busbars are sectionalized by reactors, the current is limited to that which can be supplied from the faulty feeder's particular bus section plus a small amount from adjacent sections. Reactors in the feeders alone will limit the current in the feeders and prevent considerable disturbance to the rest of the system during short-circuits. Some of the advantages of each method can be obtained

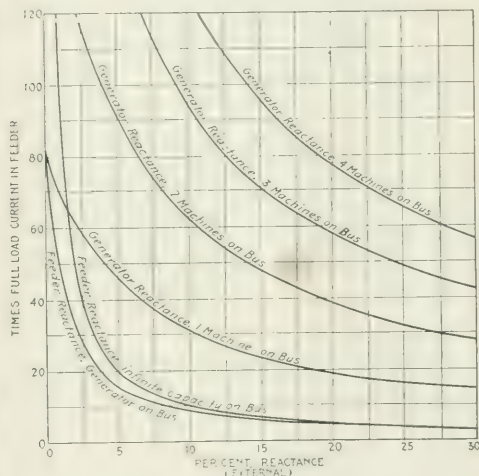


FIG. 1—COMPARISON OF REACTANCE REQUIRED IN FEEDER AND GENERATOR CIRCUITS

by employing reactors in each of the locations mentioned, but attention should be given to the effect which such an arrangement will have on the voltage regulation of the system and the synchronizing power of the machines when conditions are normal. Too much reactance in the generator and busbar circuits may cause considerable voltage fluctuation with change in load. Furthermore, a fault on one feeder may lower the pressure on practically the entire system.

Feeder reactors, on the other hand, are less bulky than those required to produce the same effect in generator leads, but more units have to be installed. The curves shown in Fig. 1, which were presented recently before the American Electric Railway Engineering Association, compare the amounts of reactance required to limit the current to the same value when the reactors are placed in the generator leads and when they are placed in the feeders. These curves are based on an



installation where the feeder rating is one-fifth each generator's rating. The inherent reactance of the machines was 6 per cent, and the short-circuit was assumed to exist in a feeder circuit at the station. From the curves it can be seen that a larger percentage of reactance is required in the generator circuit than in a feeder to limit the current to the same value. If

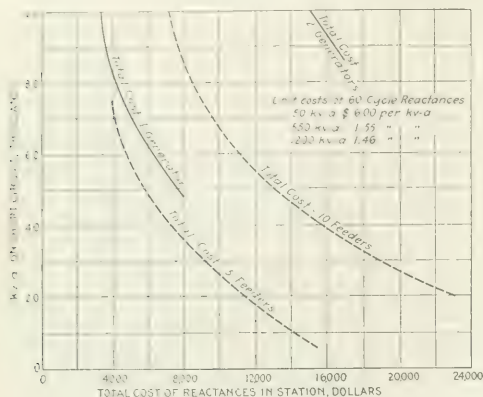


FIG. 2—COMPARISON OF TOTAL COST OF REACTANCE FOR FEEDER AND GENERATOR CIRCUITS

more than one generator is installed in a station, the ratio of generator to feeder reactance is considerably increased.

A comparison of the total cost of feeder versus generator reactors required in a station to allow the same short-circuit current is given by the curves in Fig. 2. In plotting them consideration was given the reduced cost per kva rating for large reactors such as are required in the generator leads. For a station of one generator and five feeders, while the cost is still in favor of feeder reactors, the advantage is not so great as would be expected. For more than one generator, however, the curves show a considerable saving in using feeder reactors.

Another item to consider is the space occupied by the coils, as this affects the size of the building and consequently the overhead charge. Sixty-cycle air-core reactors made by one manufacturer vary in size from 0.0715 cu. ft. per kva for 475-kva reactors to 0.3 cu. ft. per kva for 50-kva units. The numerical value of the reactance of any coil depends on the frequency and inductance. Since the inductance is proportional to the square of the number of turns of conductor, the size does not increase as fast as the reactance. A coil having a reactance of 1 ohm at twenty-five cycles would have a reactance of 2.4 ohms at sixty cycles and its kva rating would be increased proportionately. On the other hand, to secure the same rating at twenty-five cycles the number of turns would have to be increased approximately 155 per cent and the size of the coil a corresponding amount.

### Turbine Placed in Operation Quickly

Under ordinary circumstances patrons of the Springfield (Mo.) Gas & Electric Company are supplied with electricity brought into the city over long transmission lines from Joplin and from the White River hydro-electric development, but in emergencies the load is carried by the steam plant at Springfield, and some rather remarkable speed records have been made in transferring it from the transmission line to the steam

station. Fifty seconds is the shortest time yet recorded for shifting the load to the station's 1800-kw turbine. When this record was made the station load was 900 kw, and the turbine, in anticipation of trouble from a storm, was being turned over slowly, taking steam from the station's boiler plant. Several boilers are always in use generating steam for the adjoining gas works, so that the turbine can be warmed up without undue expense when lightning threatens. From a standstill it has been possible on nearly all occasions, declares Mr. William Smith, the power-station engineer, to place the turbine in operation in one and one-half minutes.

### Chemical Economy in Boiler-Water Treatment at Leavenworth, Kan.

By treating the water when hot instead of at ordinary temperatures the Leavenworth (Kan.) Light, Heat & Power Company effects considerable saving in the amount of chemicals used for water softening. Formerly water was admitted to the mixing tank without regard to its temperature. But with the present plan water to be treated is taken from the condenser after it has served its purpose as circulating water. Ordinarily this water ranges in temperature from 105 deg. to 120 deg. Fahr. and the lime and soda ash act much more readily in this water than in colder water. When the present scheme was first tried the feed water was made so soft that the boilers gave trouble on account of priming, but after the quantity of chemicals used had been sufficiently reduced excellent results followed.

### Automobile Used for Testing Purposes

Some time ago the Washington Water Power Company, of Spokane, Wash., made some oscillograph tests on its transmission system, and among these were tests on the effects of switching on a long line. The test was made at the end of the line where there was no available electricity, and the illustration shows the power station devised to furnish 110-volt direct current, which was required to operate the oscillograph lantern and motors. An old direct-current motor was used as a generator, and a rheostat was employed to set the voltage. The latter was then controlled by the speed, which was governed by throttling the automobile engine. According



PORTABLE POWER PLANT

to Mr. J. P. Byron, the company has also used a small direct-current generator to give the lightning arresters their initial charges. By grounding one commutator bar to the frame and adding an insulated collector ring on the commutator in such a way as not to interfere with the brushes, thirty-five-cycle alternating current at about 78 volts was obtainable. A bar of the commu-

tator opposite to the one already grounded to the frame was connected to the collector ring, the brush of this collector ring forming one leg of an alternating-current circuit and the frame of the generator being used as the other leg. Since it requires more than 250 volts to give the aluminum arresters their initial charge, a small step-up transformer was employed with excellent results.

### Concrete Cistern Built on Station Roof

The Kansas Gas & Electric Company in building an addition to its present gas-engine station at Independence, Kan., is placing the cooling-tower cistern on



FIG. 1—TRANSVERSE SECTION OF ENGINE-ROOM EXTENSION

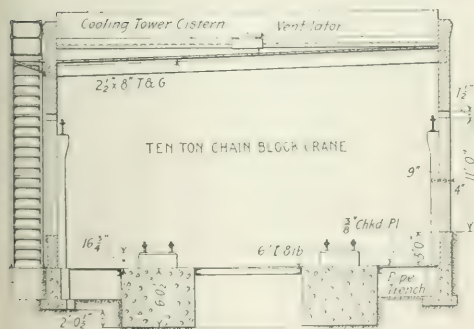


FIG. 2—LONGITUDINAL SECTION OF ENGINE-ROOM EXTENSION

the roof of the new structure. The concrete basin is shallow, measuring about 3 ft. deep by 15 ft. wide by 35 ft. long. It is supported on I-beams, and protruding bolts buried in the concrete have been arranged so that the baffle structure can be securely anchored to the basin. As city water is used exclusively for cooling in the engine jackets, water cost becomes an important item at Independence, and the new cooling tower, it is expected, will effect a considerable saving.

Roof construction in the new building is also somewhat unusual. As shown from the transverse section herewith, 2.5-in. by 8-in. tongue-and-groove sheathing is laid on furring strips supported by I-beam rafters. A composition roofing will be laid on the heavy sheathing. When completed the building will house a 500-hp gas engine and an alternating-current generator.

### Synchronizing Frequency Changers

When an eight-twenty pole frequency changer rated at twenty-five to sixty-two and a half cycles is started on the lower frequency and must be synchronized with a system operating at the higher frequency it frequently happens that the two sources are 180 deg. out of step. To avoid slipping a pole to obtain the proper phase relation, the Edison Electric Illuminating Company of Brooklyn employs a double-blade, double-throw switch in the field circuit of the twenty-pole generator. If, after bringing the machine up to speed, it is found that the frequency changer is not in phase with the system to which it is to be connected, the field switch can be reversed and the phase relation corrected. With ma-

chines having different numbers of poles it is not so easy to correct the phase relation, as there will not always be 180 electrical deg. difference between the phases of the frequency changer and the system to which it is to be connected.

### Depreciation of the Equipment of an Electric Plant

Please state average acceptable figures on which to base estimates of depreciation of electric-plant property and equipment.

L. M. N.

In general, plant and substation buildings may be assumed to have a useful life of about fifty years, making the average depreciation about 2 per cent. To boilers, piping, generators, electrical equipment, etc., lives of twenty years are assigned. Of these, boilers, piping and generators have net salvage values of 4 to 6 per cent at the end of that time, thus making their rate of depreciation from 4.7 per cent to 4.3 per cent per annum. Allowing 10 per cent salvage value for electrical equipment, the rate of depreciation becomes 4.5 per cent. Storage batteries, with a useful life of twenty years, go out of service with a salvage value of 17 per cent, making the net depreciation 4.15 per cent per year. Poles and pole-line equipment are assigned values of 12 per cent at the end of twenty years' service, resulting in a depreciation rate of 4.4 per cent. Wire, after sixteen years' estimated usefulness, has the high scrap value of 40 per cent, making the depreciation rate 3.75 per cent. Line transformers and customers' meters may be assumed to have the same life as the other electrical equipment named, twenty years, but at the end of that time they have a salvage value of 10 per cent, making the net depreciation rate in the case of these instruments 4.5 per cent.



# Digest of Current Electrical Literature

Abstracts of Important Original Articles Appearing  
in the Periodical Electrical Press of the World

## Generation, Transmission and Distribution

**Power-Factor in Electric Mining Installations.**—L. G. F. ROUTLEDGE.—A paper read before the (British) Association of Mining Electrical Engineers. The general cause of a low power-factor in mining installations is the use of induction motors. The following nine methods for the improvement of low power-factor are discussed: (1) Increasing the kva rating of generators and transformers; (2) increasing the size of transmission and distribution systems; (3) the automatic series and parallel transformer systems; (4) installation of synchronous motors or rotary converters; (5) Burnand's method of transformer devices with small motors; (6) installing phase advancers and polyphase commutator motors; (7) Kapp's vibrator; (8) connecting static condensers to the system; (9) running spare generators as motors disconnected from prime movers. The author discusses briefly the relative cost of the different methods and concludes that where motors above 130 hp or 140 hp are in operation the largest improvements of power-factor from a commercial point of view are to be obtained by connecting phase advancers or vibrators to the rotor circuits. Where all the motors in use are smaller than 130 hp, the static condenser seems to hold the field entirely owing to the way it may be subdivided and small units attached to different parts of the circuit.—*London Iron and Coal Trades Review*, Nov. 6, 1914.

## Installations, Systems and Appliances

**Siamese Central Station.**—FRANCIS B. SHAW.—The first part of an illustrated description of the government electric generating station at Bangkok, Siam. It is built near the water-power pumping station, to which it supplies large amounts of energy. Rice husk is used as fuel, since Siam is a large producer of rice, and in Bangkok alone there are a large number of rice mills. Large quantities of rice husk are produced in the processes of milling. A certain amount of this is used by the mills to produce the power they require, but there is always a considerable surplus. In appearance it closely resembles the husk of wheat; it is a very bulky fuel and must be dried. The article is to be continued.—*London Elec. Review*, Nov. 6, 1914.

**Automatic Voltage Regulation.**—C. C. GARRARD.—The first part of an article in which the author divides automatic regulators into three classes: (1) the vibrating-contact type, (2) the pendulum type and (3) the rheostat type. In the present instalment he gives illustrated descriptions of the Tirrill and Fuss automatic regulators, which are examples of the vibrating-contact type. The article is to be concluded.—*London Electrician*, Oct. 30, 1914.

**Induction Regulators.**—ZEDERBOHM.—An English translation in abstract of his recent German article on a simple theory of the induction regulator and its arrangement for automatic operation, etc.—*London Electrician*, Nov. 6, 1914.

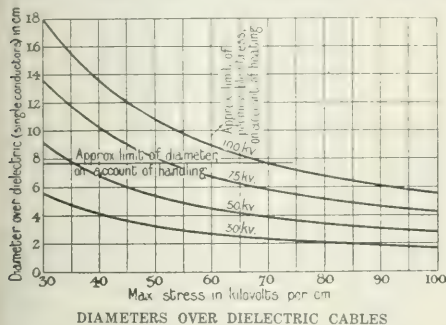
**Electricity Supply in Germany.**—The prevalence of a state of war is having a varying effect upon supply undertakings in Germany. In the capital, where the Berlin Electricity Works Company possesses practically

a monopoly of the business, the company experienced an increase of 3.2 per cent in the total supply of energy in kilowatt-hours in July, as compared with the corresponding month in 1913, but in August a decline of 21.9 per cent took place, as contrasted with the equivalent month in last year, while the official figures for September show a reduction of 20 per cent. Toward the end of October, however, it was estimated that the return for the whole month would show an improvement. The company's financial statement for the year ended with June 30, 1914, indicates that the sum of \$1,280,000 has been written off for ordinary depreciation, as against \$1,395,000 in 1912-13, and a further amount of \$250,000 has been devoted to special depreciation of investments on account of the war. The balance of net profits, which is not definitely stated for the moment, permits of the payment of 4.5 per cent on the preference capital of \$5,000,000 and 12 per cent on the ordinary shares of \$11,000,000, being the same rates as in the preceding year. The number of customers advanced by 4639 to 48,455, and the connections in kilowatts increased by 24,963 kw to 280,684 kw, and the sales reached 267,590,000 kw-hr., or 15,490,000 kw-hr. in excess of 1912-13. In the case of the Elektricitäts Lieferungs Gesellschaft, which owns a number of supply works as well as being financially interested in others, the number of customers recorded in September was several thousands greater than in the same month of last year, but the output in kilowatt-hours was less than in September, 1913. Since the beginning of January, however, the deliveries to the end of September have amounted to 45,594,532 kw-hr., or 8,057,178 kw-hr. more than in the equivalent nine months of 1913. The Sächsische Elektricitäts Lieferungs Gesellschaft, which is one of the so-called overland supply undertakings, occupies a similar position, inasmuch as the consumption decreased in September, notwithstanding a considerable augmentation in the number of customers over the corresponding month in last year, but the total turnover in the nine months shows an appreciable increase in kilowatt-hours.—*London Elec. Review*, Nov. 13, 1914.

## Wires, Wiring and Conduits

**Cables.**—C. J. BEAVER.—The first part of a long paper illustrated by diagrams read before the (British) Institution of Electrical Engineers. The author discusses the construction of conductors for high-voltage cables and then discusses grading the dielectric, taking up inter-sheath grading versus capacity grading, as well as methods of inter-sheath grading, and then compares several designs of 75,000-volt single cable. In the commercial manufacture of paper-insulated cables a breakdown stress of about 200 kv (root-mean-square value) per centimeter may be regarded as the maximum obtainable in the present state of the industry. For purposes of guaranteed tests an average safe figure of, say, 120 kv to 150 kv per centimeter may be taken as representing good practice. The original design of a cable, however, has rather more direct reference to the test pressure than to the working pressure for which it is ultimately to be used; and therefore, as test pressures specified for from 50-kv to 100-kv cables are likely

to be of the order of two and one-half to three times the working pressure, the maximum stress under working conditions will be from 40 kv to 50 kv per centimeter or thereabout. This is a fair practical working limit from another point of view also, namely, that heating due to dielectric hysteresis becomes appreciable at stresses of from 60 kv to 70 kv per centimeter under continuous working conditions, and there are several points of view from which such heating is undesirable in important extra-high-tension transmission cables. The curves give an idea of the effect on the diameters of cables of the permissible limits of maximum stresses. The limit lines divide the diagram into three parts. The lower left-hand area represents conditions where stress and diameter conditions do not render grading absolutely essential. In the upper left-hand area the conditions render grading imperative. This area represents conditions which, as regards both electric transmission requirements and cable construction limits, may be considered to represent the present situation. It may be noted that the introduction of one inter-



sheath serves the purpose of bringing a given cable from the upper to the lower left-hand section of the diagram. The conditions which call for grading appear to be (a) working pressures exceeding 50 kv, (b) maximum stresses above 60 kv per centimeter, (c) where cable diameters would exceed, say, 3 in. The author discusses electrostatic effects in high-voltage cable practice and tests of high-voltage paper cables. He then discusses paper-insulated cables, the physical and chemical properties of component parts of the cable and troubles due to outside sources, and in the same way he discusses rubber-insulated cables. The paper is to be concluded.—*London Electrician*, Nov. 13, 1914.

#### Electrophysics and Magnetism

**Experiments on the Active Deposit of Radium.**—E. M. WELLISCH.—When radium emanation is mixed with any gas there is a definite limit to the fraction of the active deposit which settles on the cathode in an electric field. This limiting value is independent of the pressure of the gas, provided the latter is high enough to prevent appreciable recoil on the walls of the containing vessel. It is, however, in general, dependent on the nature of the gas with which the emanation is mixed. The values assigned in a previous paper were 89.2 per cent for air and hydrogen, 80.7 per cent for carbon dioxide and 10 per cent for ethyl ether. The physical meaning of this limiting value is that it represents the fraction of the total number of deposit particles which possess a positive charge at the end of the recoil path before either columnar or volume recombination has had a chance to become operative. The small value of the limit in the case of ethyl ether was surprising and was ascribed to the large density of ionization produced by the deposit particle during its

motion of recoil. It had previously been shown that with air or hydrogen the deposit particles are either positively charged or neutral; it became of interest to ascertain whether negatively charged particles were present when the emanation was mixed with ether. It is now found that when emanation is mixed with ethyl ether practically all the deposit particles are neutral.—*Philos. Mag.*, October, 1914.

**Distribution of Energy in the Different Types of Gamma Rays Emitted from Certain Radioactive Substances.**—JADWIGA SZMIDT.—An account of an experimental investigation the general results of which are as follows: The absorption of the soft gamma rays from radium D in gases is the same as the absorption of X-rays from a "K" radiator with a corresponding atomic weight. The absorption of the soft gamma rays from radium D follows an additive law. The ionization produced by the soft gamma rays from radium D in sulphur dioxide, carbon dioxide and air is proportional to the absorption of the same rays in these gases. This does not hold for sulphuretted hydrogen. For the hard gamma rays from radium B and radium C ionization is proportional to absorption. The hard gamma rays in radium D possess from 17 to 35 per cent of the total gamma energy belonging to radium D. The distribution of energy in radium B + radium C in equilibrium is 1 : 45 : 639 for the soft rays from radium B, the hard rays from radium B and the rays from radium C.—*Philos. Mag.*, October, 1914.

#### Units, Measurements and Instruments

**Thermopiles.**—W. W. COBLENTZ.—An account of a very extended experimental investigation of various modifications of bismuth-silver thermopiles, composed of bismuth and silver wires with rectangular absorbing surfaces of tin attached to the junctures of these two metals. The novelty of the design consists of a series of overlapping receivers, forming a continuous surface which has all the advantages of a good bolometer with none of its disadvantages. Data are given on the relative sensitivities of thermopiles of bismuth silver, bismuth copper, bismuth alloys and bismuth iron. It is shown that the attainment of a high radiation sensitivity in a thermopile is mainly a question of neatness of construction (low heat capacity, conductivity and emissivity) and that the thermoelectric power is of secondary importance. The radiation sensitivity of a thermopile of bismuth and silver is almost (within 10 per cent) as high as that of a thermopile of bismuth alloy having a 55 per cent higher thermoelectric power. These thermopiles have practically the same radiation sensitivity as a good air bolometer, and they are not so easily disturbed by air currents. They embody practically all the good qualities (except instantaneousness of action) of the bolometer. Experiments are described on the radiation sensitivity of a thermopile as a function of the area exposed and of the thermo-conductivity and emissivity; also as a function of the external and the internal resistance. It is shown that the external (galvanometer) resistance may be two or three times the internal resistance without decreasing the sensitivity more than 10 per cent. After correcting for the difference in internal and external resistance, it was found that the radiation sensitivity of the thermopiles having all the elements in series was nearly as high as that of the thermopile having the elements joined two in series-parallel. A radiometer attachment to monochromatic illuminators is described which enables the operator quickly and easily to determine the energy value of the stimulus. This is of importance to physiologists, psychologists, biologists and physicists who are investigating the effect of light stimuli upon matter. A thermopile with a thin blackened strip of manganin or



platinum in front of it is described. This is a modification of the Angström pyrheliometer, and it affords a quick and an accurate method for the measurement of radiant energy in absolute measure. Special designs of thermopiles are described. They include stellar thermopiles, thermopiles for measuring nocturnal radiation, thermopiles to be used as photometers, thermopiles with the receivers in the form of U-shaped troughs for physiological problems, and miscellaneous thermopiles for measuring small electric currents in radiotelegraphy, etc. In an appendix notes are given on galvanometer mirrors, vacuum galvanometers, the most efficient combination of thermopile and galvanometer resistance, the test of stellar thermo-elements on stars, and the maintenance of high vacuums by means of metallic calcium.—*Scientific Papers, Bureau of Standards*, No. 229.

#### Telegraphy, Telephony and Signals

*Telephone Statistics.*—K. DOHMEN.—In the city of Hamburg every telephone connection which is made is automatically counted. The author gives a summary of the statistics so obtained since the starting of the new telephone exchange in 1910. The curves for the different years show the same peculiarities in fluctuation during different months, although the curve for each successive month is higher by a certain amount than the curve for the preceding year. It is thus easy to determine the possible demand of the future. In every year there are pronounced maxima in telephone connections in the weeks before Easter and Christmas, while there is a minimum in June and July, during which months there are school vacations. Curves are also given for the number of telephone calls during the different hours of the day and different days of the week. Monday is the busiest day. Every day the telephone calls increase from 7 p. m. to 9 p. m. and have a maximum from 9 a. m. to 11 a. m.; they decrease again rather regularly from 11 a. m. to 3 p. m., when another increase follows with another maximum between 5 p. m. and 6 p. m.—*Telegr. u. Fernspr. Technik*, Oct. 15, 1915.

*Submarine Cable Cores.*—R. M. SAYRES.—While the theoretically most economical proportion of conductor and insulator weights cannot be chosen in a cable for practical reasons, this is not a serious disadvantage, as the saving which would be obtained by the use of the ideal proportion would not be very great.—*London Electrician*, Nov. 6, 1914.

*Generator of Telephone Currents.*—An illustrated description of an alternating-current machine for carrying out measurements with currents of such a frequency as are used in telephony. The machine was originally designed by Ad. Franke and has been modified for higher frequencies and greater capacities by the Siemens & Halske company.—*Zeit. f. Feinmechanik*, Oct. 20, 1914.

*Measuring Wave-Lengths.*—HANS VOGT.—A brief illustrated article on the principle of instruments for measuring wave-lengths used in wireless telegraphy.—*Zeit. f. Feinmechanik*, Sept. 5, 1914.

#### Miscellaneous

*Exposition.*—ERNST WINKLER-BUSCHER.—The first part of a report on the electrical exhibits at the Swiss Exposition in Berne.—*Elek. Zeit.*, Oct. 22, 1914.

*Sweden.*—A statistical paper giving figures on the electrical import trade of Sweden in 1911 and 1912.—*London Elec. Review*, Nov. 6, 1914.

*British Electrical Trade.*—F. M. DENTON.—A letter pointing out that there is a good deal of prejudice still existing in Great Britain against technical college training, one firm candidly stating that technically trained students are of no use "for dividend earning." The author points out that the British must abandon

such viewpoints if they intend to capture and hold electrical trade from Germany. The author thinks that the capture of much of the electrical trade by Germany has been largely due to her system of technical training of engineers and to the fact that German manufacturing firms of importance have well-equipped departments for research. In both respects England must make progress. Some notes on telegraphy and telephony are added. With respect to the former the writer says that "the standard Morse sounder of the G. P. O. is listed at £1 15s., and costs the G. P. O., I believe, £1 5s. If properly designed, it would cost less than 10s. Its majestic swan's neck, its elaborately arched bridge piece, its intricate spring adjustment, its squared and polished surfaces—all in massive brass—such design might be worthy of an artistic ironmonger, but is not worthy of an engineer." With respect to the telephone, he says: "When I find that the telephone directory of London, with its 9,000,000 inhabitants, is no bigger than that of a city of less than one-tenth its size in the United States, I conclude that something is wrong with our methods.—*London Electrician*, Nov. 6, 1914.

## Book Reviews

*GESAMMELTE ELEKTROTECHNISCHE ARBEITEN, 1897-1912.* By Dr. F. Eichberg. Berlin, Germany: Verlag von Julius Springer. 492 pages, 415 illus. Price, 16 marks.

An interesting compilation of Dr. Eichberg's previously published papers is presented in this volume. They are arranged substantially in order of publication date. They commence with researches on arc lamps in 1897, undertaken at the Vienna Technische Hochschule, and they end with alternating-current electric-railway systems. A detailed list of the patents granted to the author during the same period is appended. The descriptive style is very consistent throughout, and the treatment is largely diagrammatic or geometrical. The value of the book is not merely historical or for reference. It also indicates to the student of electrical engineering how persistent effort may lead from one successful achievement to another. The volume will have special interest to the student of the single-phase alternating-current motor.

*ELECTRIZITÄTSZÄHLER FÜR GLEICH, WECHSEL UND DREHSTROM: DEREN THEORIE, BESCHREIBUNG UND EICHUNG.* By H. W. L. Bruckmann. Leipzig: Oskar Leiner. 224 pages, 206 illus. Price, 8.5 marks.

An elementary textbook on electricity meters, their principles of operation, their installation, maintenance and testing. It is written by an engineer for engineering students of metering, for meter inspectors, and for the electrical fraternity in general. The book is divided into nine chapters relating to the following topics: Principles and historical outline; direct-current ampere-hour meters; direct-current watt-hour meters; principles of energy registration; alternating-current watt-hour meters; three-phase meters; meters for special rates; meters for special purposes; testing of meters. The treatment is clear, logical and well illustrated by diagrams. A large amount of special information is appended in tables and curves, such as the various types of magnetic field construction used, etc. The chapter on the testing of meters is especially well developed. The volume will be of service to students of electrical engineering, and particularly to those desiring to obtain information on meters in European service.

# New Apparatus and Appliances

An Illustrated Descriptive Record of Recently Developed  
Manufactured Products of Interest to Electrical Readers

## Vest-Pocket Flashlamp

A flashlamp which is inclosed in a case similar to a cigarette case is being placed on the market by the American Ever Ready Works, 304 Hudson Street, New York. A small tungsten lamp is used, and both lamp

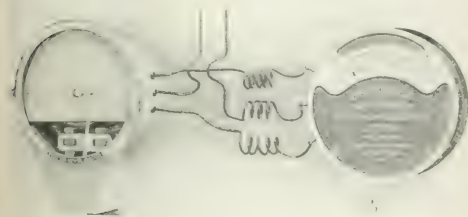


FLASHLAMP WITH FOLDING CASE

and battery are renewable. The three following sizes are being made:  $\frac{5}{8}$  in. by 1.5 in. by  $\frac{2}{8}$  in.,  $\frac{3}{4}$  in. by  $1\frac{1}{8}$  in. by  $\frac{3}{4}$  in. and  $\frac{3}{4}$  in. by  $2\frac{3}{8}$  in. by  $\frac{3}{4}$  in. The case is finished in nickel and is provided with rounded corners.

## Long-Distance-Recording System

A system for automatically producing continuous records of pressures, liquid levels, temperatures, mechanical motion, etc., at long distances has recently been developed by the Bristol Company, Waterbury, Conn. In the accompanying illustration is shown the transmitting indicator, which is installed at the point where the pressure or temperature is measured, and the receiving recorder, which is installed at the remote point where it is desired to have the records produced. Three wires are connected to each instrument, one of which is connected to an alternating-current circuit.



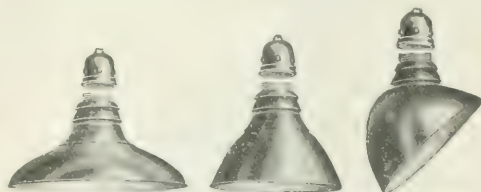
RECORDING AND TRANSMITTING INSTRUMENTS

The complete apparatus consists of two pairs of mechanically balanced solenoids, which swing horizontally back and forth over the ends of soft-iron cores and are connected in parallel to an alternating-current circuit. One pair of the solenoids is used for the transmitting instrument and the other pair for the receiving instrument. When the solenoids of the transmitter and receiver are connected in parallel to an alternating-

current circuit and the transmitter coils are held in a certain position by the operating mechanism the relative amount of current in the solenoid will depend on the position of the iron core due to the inductive effect of the current. At the receiving instrument the other pair of solenoids is mechanically balanced, and it is free to take an angular position which will be the same as that of the transmitter. Hence the current will be the same in the solenoids of the receiver as in those of the transmitter. In the transmitter the operating mechanism is linked directly to the balanced solenoids by means of an arm; in the receiver the recording pen or the indicating pointer is connected to a similar arm, and whenever the arm attached to the operating mechanism moves, the arm fastened to the recording pen is moved a proportionate amount.

## Steel Reflectors for High-Candle-Power Incandescent Lamps

Porcelain-enameled steel reflectors designed for use with nitrogen-filled lamps ranging in rating from 200 watts to 1000 watts have recently been placed on the market by the Wheeler Reflector Company, 156 Pearl



FIGS. 1, 2 AND 3—STEEL REFLECTORS FOR NITROGEN-FILLED LAMPS

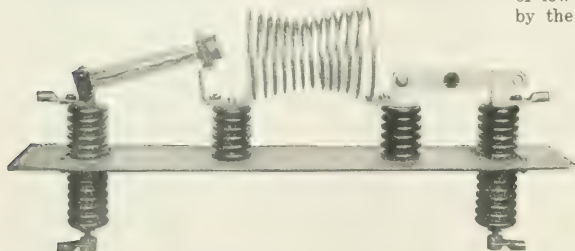
Street, Boston, Mass. Three types of reflectors are being made, and they are placed by the manufacturers in groups designated as W, P and N. One of each group is shown in the accompanying illustrations. The reflectors are equipped with canopies having a copper screw ring which engages the threaded collar on the reflector made for it.

The sockets are fastened to nozzles with hexagonal shoulders which fit into hexagonal holes in the canopies to prevent turning. The nozzles are threaded outside for 1.5 in. conduit couplings and inside for  $\frac{3}{8}$  in. iron pipe. The canopies are well ventilated by means of ventilating ports which are expanded in the canopies before enameling. The large-sized reflectors are fitted with ventilated collars having skirts over the ventilating holes to protect the lamps from driving rain and to prevent light radiating through the opening. In Fig. 1 is shown a reflector large enough to give a light distribution within a zone 75 deg. from the vertical. The reflector shown in Fig. 2 is of a smaller diameter, and it concentrates the light within limited areas. With this reflector the light is confined to a zone 60 deg. from the vertical. With the reflector shown in Fig. 3 the skirt is tilted to project the light in a certain direction.



### High-Tension Line Unit

The demand for lower cost, compact and easily installed units for high-tension feeders, it is declared, has been met by a self-contained line unit, similar to that illustrated herewith, which comprises a switch, fuse and choke-coil. The unit may be connected to the incoming or outgoing feeder circuits. The switch is of the disconnecting form and is operated by an insulated hook stick. The unit is designed for pressures up to 33,000 volts and is built in various combinations of front-connected and back-connected types. The steel base is arranged for mounting on either flat surfaces or pipe framework, and can be grounded, thus affording

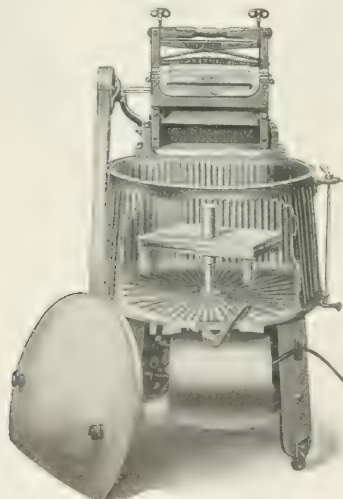


HIGH-TENSION LINE UNIT FOR INDOOR SERVICE

safety to the operator. The equipment is being manufactured by the Delta-Star Electric Company, of Chicago.

### Copper Electric Dolly-Type Washer

A motor-driven washing machine brought out by the Hurley Machine Company, 27½ South Clinton Street, Chicago, is equipped with a corrugated copper body having its interior tin-lined. All corrugations in the bottom of the tub are arranged so that they slope toward



DOLLY-TYPE ELECTRIC WASHER

a metal drain pipe. The tub measures 22 in. in diameter at the top, 24 in. in diameter at the bottom, and is 13 in. deep.

The entire machine occupies a floor space of 27.5 in. by 28 in., and it weighs 168 lb. It is declared to be the first dolly-type machine to be equipped with a 11-in.

safety reversible wringer, and also is said to be the first machine of its kind upon which cut gears have been employed.

The electrical equipment of this washer is quite similar to that used on former machines brought out by the same manufacturer. A 1/6-hp motor drives both the moving parts of the washing machine and the wringer.

### Toy Transformers

Two types of toy transformers equipped with a control lever and a small low-voltage fuse in the secondary or low-voltage winding are being placed on the market by the Dongan Electric Manufacturing Company, 741



TRANSFORMER FOR USE WITH ELECTRIC TOYS

Franklin Street, Detroit, Mich. In case of a short-circuit the fuse will be blown, thus protecting both the transformer coils and the house fuses. The fuse is of the 6-volt automobile type and can readily be replaced. These transformers are designated as the "F" and "master" models.

### Reactive Factor Meters

Although instructed to keep the power-factor of the circuits over which they have control as near unity as possible, switchboard attendants often think that a power-factor of 1 or 2 per cent less than unity is good enough and do not try to improve it. If instead of the power-factor meter use be made on the circuit of a reactive-factor meter, a condition of 98.5 per cent power-factor is indicated as 17.5 per cent reactive factor, and the attendant will be more apt to improve it.

A reactive-factor meter which has recently been introduced by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., operates on the rotating-field principle in a manner similar to that of a power-factor meter placed on the market by the same company. A rotating field is produced in angularly placed coils connected in shunt with the metered cir-



REACTIVE FACTOR METER

cuits, one being used for each phase of the system in the case of polyphase meters. A movable iron vane or armature is placed in the field and is magnetized by a stationary coil the current in which is proportional to and in phase with that of the line current in one phase of the circuit. As the iron vane is attracted or repelled

by the rotating field of the angularly placed coils, it takes up a position in which the zero of the rotating field is indicated at the same instant as zero of its own field. Thus its position gives the phase angle between the voltage and the current of the circuit.

The reactive-factor meter is calibrated to read the sine of the angle indicated, while the power-factor meter is calibrated to read the cosine. In the three-phase meter the rotating field is produced by three coils spaced 60 deg. apart and in the two-phase meter by two coils 90 deg. apart. In the single-phase meter the rotating field is produced by means of a split-phase winding connected to the "voltage" circuit. The meters are inclosed in round dust-proof cases and are built in two sizes, the diameter of one of which is 7 in. and of the other 9 in.

### Long-Range Flashlamp

A flashlamp equipped with two lenses for projecting a beam of light a considerable distance is being placed on the market by the Hipwell Manufacturing Company,

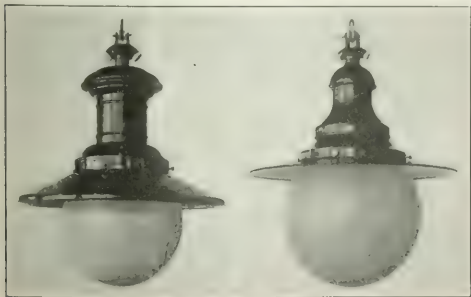


FLASHLAMP WITH TWO LENSES

Pittsburgh, Pa. This "Hipscope" lamp, as it is called, is 10.5 in. long and 1.5 in. in diameter and is provided with a vulcanized-fiber case with nickel trimmings. The weight of the device, including the battery, is 18 ounces. The manufacturers declare that the lamp will throw a light for a distance of over 200 ft.

### Fixtures for High-Candle-Power Incandescent Lamps

Lighting fixtures equipped with heavy copper casings and designed for large-sized nitrogen-filled lamps are shown in the accompanying illustrations. Instead of being riveted or soldered the casings are fastened together with brass screws. The unit shown in Fig. 1 is designed



FIXTURES FOR NITROGEN-FILLED LAMPS

for outdoor installations and for large interiors and is 23.5 in. high and 22.75 in. wide. It is equipped with a cast-iron canopy, an insulated ring for suspension from ceiling or outrigger, a 9-in. by 13-in. Alba globe and a 22-in. bathtub-enamel reflector. The fixture shown in Fig. 2 is for both indoor and outdoor use and is 21.625

in. high and 20 in. wide. The units are being placed on the market by the Electric Operations Company, Bush Terminal, Brooklyn, N. Y.

### Electrical Freight-Handling System for Terminals

An automatic electric system for handling freight in terminals, which is being promoted by the New Transport Company, Ltd., London, England, was described before a recent meeting of the Chicago Real Estate Board. On each floor of the specially constructed freight houses it is proposed to have many continually moving electrically operated transfer cars. Traveling in a closed cycle of movement, each of these cars carries its freight until, coming alongside an empty car passing in the desired direction, it automatically transfers its burden to its neighbor on the adjoining track. Wheels counter-sunk in the flat transfer-car bodies on axes parallel to the direction of travel revolve to move the freight from one car to the other, being set in motion automatically when the proper car to receive the freight comes alongside the loaded car. Switching is thus avoided. Human labor would be needed only to load the freight onto the transfer cars and to operate the electrical push-button system directing the freight to the desired destination on some loading platform in a distant part of the freight house.

### Electric Washer with Swinging Wringer

An electric washer equipped with a wringer which swings around in a circle is being made by the Altorfer Brothers Company, Roanoke, Ill. A dolly is provided to agitate the water and force it through the clothes.



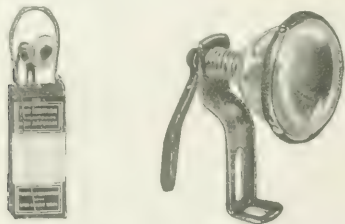
ELECTRIC WASHER WITH ADJUSTABLE-HEIGHT FRAME

The mechanism for operating the machine is underneath the tub. The tub is made of Southern cypress and is very large. The washer is equipped with a steel frame the height of which can be adjusted to suit the operator. The wringer is 11 in. long and is of the two-roll reversible type.



### Electric Hand Lamp

A small lamp designed to be attached to any standard round or square dry cell, making a handy lantern ready for use in house, cellar or stable, is shown in the accompanying illustrations. A small contact is provided for closing the circuit. A standard dry cell will give



FIGS. 1 AND 2—HAND LAMP ATTACHED TO DRY CELL

twenty hours of continuous service and from forty hours to fifty hours of intermittent service. The device is being placed on the market by Fred Rall, 19 Park Place, New York.

### 1915 Model Electric Four-Chair Brougham

The four-chair brougham described in the *Electrical World* of Nov. 15, 1913, and designated as the Waverley 1914 model, has been improved and is now called the 1915 model. In the later model the rear corners of the body have been rounded, the window spaces have been enlarged, and small oval windows have been added in each of the rear corners. Frameless glass is used throughout. The roof is of aluminum and is well padded with felt and canvas to eliminate noise. In this car each passenger occupies a separate chair. In the rear group of three chairs the middle seat is placed slightly behind the other two, while the fourth passenger is accommodated on a folding cosy-corner seat in the right front corner.

A series-wound motor operating at a speed of 1500 r.p.m. is used to drive the car. The transmission system is of the parallel-shaft-drive type and is connected to the motor through double helical or so-called "herring-bone" gears. The controller is of the knife-blade type and is so designed that the car cannot be started on

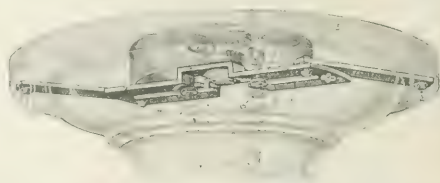


ELECTRIC BROUGHAM OF THE 1915 TYPE

any speed but the first or lowest one. The brougham is made by the Waverley Company, Indianapolis, Ind. The above company is also making a front-and-rear-drive brougham, which permits of four different seating arrangements with two separate positions for the driver. In other respects this car is similar to the four-passenger brougham described above.

### Adjustable Steel Bridge for Ceiling Lamps

An adjustable bridge designed for use with outlet boxes employed with ceiling lamps is being placed on the market by the Metal Arts & Crafts Company, 617 Jackson Boulevard, Chicago, Ill. The bridge is of 3/32-in. pressed steel. The center offset may be turned either side up to fit deep or shallow boxes and is punched out to fit both 3/8-in. and 1/2-in. studs. Two 1/4-in. round

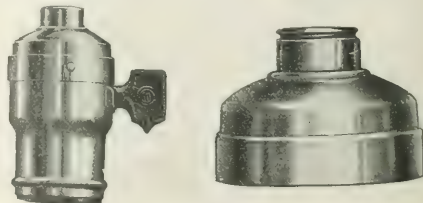


STEEL BRIDGE FOR USE WITH CEILING LAMPS

nuts slide in long slots which permit the use of lug screws when the outlet box is not equipped with a fixture stud. The two end extensions are provided with 1/4-in. holes for securing screws through the edge of the lighting fixture. The extensions can be pulled out or pushed together to fit the upper edge of spinings, varying in diameter from 5 in. to 10 in. In the illustration is shown a steel bridge over a 4-in. outlet box with a 3/8-in. iron fixture stud and a porcelain receptacle fastened to the sliding nuts.

### Sockets Equipped with Screw Shell Embedded in Porcelain

The socket illustrated in Fig. 1 is equipped with a key having a pointer on one end. When the pointer is turned downward the circuit is closed and when turned upward it is open. The screw shell is embedded in porcelain instead of being held by screws, thus obviating the possibility, to a considerable extent, of the screw thread being ripped from the socket when the lamp or attachment plug is twisted. The top part of the cap is undercut so that when the cap is screwed inside of the husk the undercut portion gradually collapses after it reaches a certain point on the threaded nipple of the fixture. The socket key can therefore be located at any point in alignment with the keyhole in the husk and the cap can be held firmly against the fixture without the need of a set screw. The socket can also be located by means of two screw protruding riveted studs which can be easily seen, so that the positive lock may be located



FIGS. 1 AND 2—KEY SOCKET AND CAP

without the necessity of listening for the click when the lock is concealed. The rating of the socket at 250 volts is 660 watts.

The key socket described and a keyless socket of a similar design are being made by the Connecticut Electric Manufacturing Company, whose factory is in Bridgeport, Conn.

# Jobber, Dealer and Contractor

## Illinois Electrical Contractors' Association

The next meeting of the Electrical Contractors' Association of Illinois is to be held at Chicago during January. Mr. W. J. Ball, Moline, Ill., is president of the association, and Mr. E. J. Burns, Electric Building, Rock Island, Ill., is secretary-treasurer.

## Relation of Jobber to Contractor

At the recent convention of the Rhode Island Electrical Contractors' Association at Providence Mr. A. M. Moody, Wetmore-Savage Company, Boston, Mass., pointed out that ideal distribution in the electrical business depends on a direct route from the manufacturer to the jobber, and thence to the contractor and consumer. A channel of this sort can be dug only by absolute co-operation and united support, on the basis of a fair margin of profit for merchandise and work of standard value at standard prices. The speaker said that true competition should be between rival articles rather than between rival dealers. Effective co-operation depends upon first placing prices on a firm foundation, backing these prices with goods of unquestioned quality, and eliminating in every possible way price cutters and "business anarchists."

## Jobber's Suggestions for Dealer's Window Display

To assist its agents in selling electrical appliances the Western Electric Company, 463 West Street, New York City, not only furnishes them with advertising material but with suggestions for decorating their show windows. In the display illustrated herewith attention is called to the low cost of operating the devices. The appliances are arranged gracefully on the show-window platform and on pedestals draped with folds of richly colored basket-weave fabrics. Three placards suspended at the center of the rear wall are connected by ribbons with cards beside each device so as to inform observers



DISPLAY IN THE INTEREST OF ECONOMY

what can be done with each appliance on one cent's worth of electricity. For instance, the cards point out that with one cent's worth of electricity at 10 cents per kw-hr. a toaster will crisp bread for five persons, a grill will broil one sirloin steak or four chops, an iron will do one-quarter of a small family's weekly ironing, a percolator will brew coffee for four persons, a hot-

plate will poach or fry twelve eggs, a heater will warm milk for a baby four times or heat water for shaving three times, a curling-iron heater will heat an iron for curling the heaviest head of hair twenty times, a heating pad will keep warm for two hours, and a chafing dish will prepare a Welsh rabbit for six persons.

Among the principles carried out in this display which should be observed in decorating all windows are the elimination of flat displays, the provision of an opaque background to confine attention to the articles exhibited, and the display of text calling attention to the usefulness and economical operation of each device in the window.

## Christmas Campaign in Louisville

The expenses of the holiday campaign which is being conducted in Louisville, Ky., by the Louisville Gas & Electric Company to increase sales of electrical appliances as Christmas gifts are borne by the five exclusively electrical houses in the city. The company, which will profit only through increased sales of electricity, is giving over the use of its showroom, printing a number of coupons and lending the list of its electrical subscribers. To each subscriber a coupon has been mailed good for a discount of \$1 on each electric iron or toaster usually sold for \$3.50 at any of the five houses mentioned, and other literature is also being distributed, the dealers paying the cost of mailing and addressing.

In addition, the dealers will arrange exhibits of electrical appliances in the showroom of the company, these to include a large Christmas tree, suitably decorated and lighted and hung with various electrical appliances appropriate for Christmas gifts. A demonstration will be carried on also, up to Christmas time, of electric toasters. It is believed that the electric iron and other electrical appliances are sufficiently well appreciated in Louisville to make further special demonstrations unnecessary. The electric toaster is not, however, very generally used, so in a model dining room a good-looking girl will preside at an electric toaster and serve hot buttered toast to all comers.

## Stimulating Christmas Appliance Sales at Boston

Mr. W. Graydon Stetson, superintendent of the appliance department of the Boston Edison company, has addressed a letter to every employee suggesting the desirability of purchasing electric appliances as Christmas gifts and calling attention to the convenience of shopping in the company's own stores and the benefits of utilizing the employee's own knowledge of the business in making such purchases. The letter, which is bordered with holly, points out that any employee can buy electrical appliances through the company at cost for his or her own use and can make easy monthly payments. An effort is being made to break all records this year in Christmas sales, and every employee is urged to send in the name of every person heard making inquiry about electric lights or appliances. A "flying squadron" of several solicitors under Mr. Stetson's direction is visiting towns in the company's territory, demonstrating electric appliances and paying special attention to the opportunities of the holiday trade. In an attractive folder the company is offering its customers a complete electric outfit for light housekeeping at a bargain price of \$17.50, on the basis of \$2.50 down and \$2.50 per month, without interest, the articles consisting of a coffee percolator, a 6-lb. electric flatiron, a disk stove and an electric grill. The regular total price of these appliances before the Christmas campaign was \$29.



# Industrial and Financial News

## Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

**Ornamental Poles for Bridgeport, Conn.**—The Ornamental Lighting Pole Company, 114 Liberty Street, New York, has received a contract for 100 poles from the city of Bridgeport, Conn. These poles are of the ornamental type and are to be equipped with General Electric luminous-arc lamps.

**Inclosed Fuses of the Refillable Type.**—The Kirkman Engineering Corporation, 173 Lafayette Street, New York, is manufacturing both standard and special fuses of the inclosed refillable type. The fuses are refilled only at the factory of the above company. The indicator on the fuses is separate from the label and consists of a white spot,  $\frac{1}{8}$  in. in diameter, which turns black when the fuse blows.

**Green-Plated Glassware.**—The business of the Phoenix Glass Company, Pittsburgh, Pa., in green-plated globes is good. These units are sold wholesale to the fixture manufacturers. The company has been able to reduce its prices in this class of glassware, and on account of the curtailment of importations from Europe it is expected that there will be considerable demand for glass fixtures of the green-plated type.

**Electrical Equipment for Traction Company.**—The West Penn Traction Company, Pittsburgh, Pa., has just placed in operation a 19,000-kva, 6600-volt, three-phase, sixty-cycle turbo-generator built by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. This unit is said to be one of the largest machines in this district and will materially increase the rating of the Connelville power house, in which it is placed. The Monongahela Valley Traction Company is also installing three 1500-kva, 22,000-volt, sixty-cycle, water-cooled high-tension Westinghouse transformers and a remote-control switchboard in its power house near Fairmont, W. Va.

**Porcelain Knob.**—A reversible square knob has recently been developed by the Illinois Electric Porcelain Company, Macomb, Ill. This knob differs from other reversible square knobs in that a curved wireway is provided which is said to draw the wires tighter than ordinary wireways do. The knob is equipped with a heavy shoulder which gives it strength at the weakest point. The above company is also making a porcelain knob which has been designed by the Snyder Hunt Company, of Belle Plaine, Ia. This knob will carry rubber-covered wire in sizes up to and including No. 8. With this knob a whole line can be run through a building and the wire pulled through the hole and drawn tight afterward.

**Switching Apparatus Mounted on Trucks.**—Alternating-current switchboards mounted on trucks have been developed by the British Thompson-Houston Company, Ltd., Rugby, England. The equipment is completely inclosed in an iron structure and is arranged so that it can be mounted against a wall, access to all parts of the switch gear being obtained from the front. The whole of the apparatus excepting the busbars and cable bells is mounted on the truck. On withdrawing the truck access is obtained on three sides, thus exposing every part of the structure. The truck carries contact jaws mounted on porcelain insulators which engage with contact blades fastened to the fixed part of the apparatus. These contact blades are sunk into the porcelain insulators so as to obviate danger of shock or short-circuits when the truck is being moved.

**Electric Company Prepares for Doubling Business Next Year.**—Indications so pronounced and so insistent have been pointing to increased prosperity next year that the Duncan Electric Manufacturing Company, Lafayette, Ind., believes its 1915 business will be double what it was in 1914. Accordingly plans are well under way to provide for the increased building facilities which will be necessary. "Just

now," according to Mr. Thomas Duncan, president, "things could not look much better. In our business the three months just past—September, October and November—have been banner months." When questioned as to whether it was the sale of meters or transformers that was "booming," Mr. Duncan replied that no one line of the company's business was pulling up the total but that the company's product as a whole seemed to be in great demand.

**Large-Sized Washing Machine.**—The Henrici Laundry Machinery Company, Boston, Mass., is making a large-sized electric washer designed for use in laundries, large hospitals, hotels, etc. Some of the institutions in which this machine has been installed are as follows: The Presbyterian Hospital, New York; Hotel Breslin, New York; Superior Laundry Company, Springfield, Mass.; Massachusetts General Hospital, Boston, Mass.; Chinese Imperial Hospitals, Tientsin, China; New York Hospital, New York; Globe Laundry, Chicago, Ill.; U.S.S. *Texas*; Hotel Statler, Buffalo, N. Y.; Peter Bent Brigham Hospital, Brookline, Mass., and Winchester Laundry Company, Winchester, Mass. The machine is equipped with two compartments which are 42 in. in diameter, the total contents being 56.9 cu. ft. The total weight of the machine is 4000 lb. It will take 350 lb. of dry wash, it is declared, the time necessary for a complete operation including six rinsings being twenty minutes.

**Brisk Demand for Electrical Gift Devices.**—That more electrical devices will be given as Christmas presents this year than ever before is evidenced by the large sale of such appliances reported during the first weeks of December by central stations, contractors and dealers in many parts of the country. In some cases the early demand has amounted to two or three times the sales made during the same weeks of 1913. While part of this increased business has probably been due to the "Do Your Christmas Shopping Early" campaigns carried out by the newspapers all over the country, there can be no doubt that the largest proportion of the gain represents increased Christmas-season purchases on the part of the general public, and that an unusually large sale of gift devices will have been effected before Santa Claus pays his last call on the morning of Dec. 25. A marked tendency has been noted this year toward the purchase of utility appliances such as flatirons and toasters, but the offerings of electrical gifts range all the way from five-passenger electric coupés to motor-driven toys operated from low-voltage transformers.

**Piping Systems for Generating Stations.**—The Best Manufacturing Company, Pittsburgh, Pa., is making and installing piping systems for generating stations. The company obtains its pipes from the pipe mills and performs the various operations such as bending, welding and making of flanges, etc. The company also manufactures various types of valves, flange fittings and flanges and other accessories. The piping in the 201st Street station of the United Electric Light & Power Company, New York, and in the Union Station of the Kansas City Terminal Railway Company were furnished and installed by the Best Manufacturing Company. The Best Company specializes in piping for power plants and does not take contracts for heating, plumbing or fire-extinguishing piping, although it furnishes some material to contractors for these classes of work. The business of the company is chiefly with steel mills and public-service companies, and on account of the stagnation in the steel market and the general discontinuance of new-construction work in the public-service field there has been a depression for several months. There are many indications, however, of a resumption of activities, and within a few months the above company is expecting to do more work than it has ever done before.

## Corporate and Financial

**Ohio Company Buys Plant.**—The Sidney (Ohio) Electric Company has been authorized by the Public Utilities Commission of Ohio to purchase the property of the Sidney Electric Light Company for \$85,000.

**Potomac Electric Power Company Bonds.**—The Public Utilities Commission of Washington, D. C., has authorized the Potomac Electric Power Company to sell \$271,000 bonds at 99 and interest. The proceeds are to be used for expenditures and other capital expenditures.

**Ohio Light & Power Files Mortgage.**—A mortgage for \$30,000,000 has been filed at Fremont, Ohio, by the Ohio Light & Power Company in favor of the Guaranty Trust Company of New York, covering properties of the company at Fremont, Tiffin, Fostoria, Newark, Lancaster, Mount Vernon and other Ohio towns, which have recently been consolidated.

**Sonoma Valley Company to Pledge Bonds.**—The Railroad Commission of California has issued a supplemental order authorizing the Sonoma Valley Water, Light & Power Company to pledge not exceeding \$30,000 bonds as collateral for a \$15,000 loan at not to exceed 8 per cent interest and for a period not exceeding six months. The commission has extended the time in which this company may issue \$30,000 of 6 per cent bonds from Oct. 1 to Dec. 31, 1914.

**Public Utility Securities as an Investment.**—The bond department of Henry L. Doherty & Company, New York, says in a letter: "Public utility bonds and notes offer the most attractive form of investment because of the demonstrated stability of the earning power of this character of enterprise, due to the fact that the revenue is based on the universal and ever-present demand for the public necessities, light, heat and power, which exists at all times, irrespective of business conditions."

**Consolidated Gas Convertible Debentures.**—The Consolidated Gas Company of New York has given to stockholders the privilege of subscribing up to Jan. 8, 1915, for the 6 per cent convertible debentures authorized recently at par to the extent of 25 per cent of their holdings of stock on Dec. 19. The \$25,000,000 debentures, as authorized by the public service commission, will be dated Feb. 1, 1915, and will be payable on Feb. 1, 1920, unless sooner converted into stock. While the bonds will not be issued in denominations of less than \$500, holders of less than twenty shares of stock may sell to a broker their right to subscribe or purchase rights representing the difference between their holdings and twenty shares, and thereupon subscribe for a five-hundred-dollar debenture. They also have the privilege of subscribing for and receiving debenture scrip equal to 25 per cent of their holdings which they may sell, or they may purchase enough additional scrip to make up \$500 of scrip, which may be exchanged for a debenture of like denomination.

**Cities Service Sells St. Joseph Trust Certificates.**—The Cities Service Company has sold to E. W. Clark & Company \$1,118,000 of 6 per cent sinking fund gold stock trust certificates of St. Joseph Railway, Light, Heat & Power Company, dated Dec. 1, 1914, and due on or before May 30, 1917. The proceeds from the sale will enable the Cities Service Company to pay holders of the certificates of deposit of St. Joseph common stock the balance of \$35 a share due on the purchase price of the stock. The stock was purchased at \$60 a share, \$25 a share having already been paid to depositing stockholders. The certificates are issued by the Guaranty Trust Company under an agreement between the Cities Service Company and trustee which provides for the deposit with the trustee of 31,948 shares out of a total of 35,000 shares of outstanding common stock of the St. Joseph company. A sinking fund has been provided which will retire all certificates before maturity, payments to be made monthly at not exceeding par and accrued interest.

**To Exchange Miami Bonds for Dayton Bonds.**—The Public Utilities Commission of Ohio has authorized the Dayton Power & Light Company to issue \$159,000 par value first mortgage 5 per cent gold bonds, due 1941, to pay for an equal amount of bonds of the Miami Light, Heat & Power Company of Piqua, Ohio. Mr. F. M. Tait, president of the

Dayton Power & Light Company, made the following statement concerning the properties: "All of the capital stock, except five shares, of the Miami Light, Heat & Power Company has for the past two years been owned by the Dayton Power & Light Company, and the above arrangement is the final step needed to consummate the proposition whereby the owners of the Miami Light, Heat & Power Company bonds, having expressed the desire, may exchange them for the Dayton Power & Light Company bonds. This order of the Public Utilities Commission and the purchasing of the physical property and business of the Miami Light, Heat & Power Company in the manner indicated will enable us to consolidate the Miami Light, Heat & Power Company with the Dayton Power & Light Company and at the same time meet the wishes of our friends in Piqua and others who own Piqua bonds and wish to exchange them for Dayton Power & Light Company bonds."

**Federal Light & Traction Company Defers Preferred Dividends.**—At the meeting of directors of the Federal Light & Traction Company of New York on Nov. 30, 1914, it was decided to defer the payment of dividends on the preferred stock. Mr. E. M. Sanderson, the president, issued the following statement: "During the twelve-month period beginning September, 1913, the total net income of all companies was adversely affected by the disastrous fire at Hot Springs, Ark., the serious strike in the Trinidad (Col.) coal fields, the losses in net revenue at Tucson, Ariz., and Springfield, Mo., resulting from drastic rate schedules made effective by order of the public utility commissions of those States, and expenses incident thereto. In the opinion of the board, the turning point in the affairs of the company has been passed, and it is expected that from now on the company will enjoy increases in both gross and net earnings, due to a partial restoration of normal conditions and to earnings from new business resulting from substantial capital expenditures made during the present year. Confidence in the future is based on the fact that during the past twelve months the gross earnings have shown an increase over the corresponding previous period, and that the net earnings only have suffered substantially from adverse conditions. As a result of negotiations, favorable modifications in the rates at Tucson have been secured. The adverse conditions above referred to caused a falling off in the total net income until July, 1914, when it reached its lowest stage; since then its earnings have been constantly improving, so that during the three-month period ended Oct. 31, 1914, the dividend on the preferred stock was more than earned."

**Standard Gas & Electric Dividend in Scrip.**—The Standard Gas & Electric Company, Chicago, Ill., declared Dec. 3, 1914, a dividend on the preferred stock of 1 per cent, payable Dec. 15, 1914, in scrip to shareholders of record Nov. 30. This dividend bears 6 per cent interest and matures on Sept. 1, 1923, but is redeemable at any prior date at the option of the company. In connection with the dividend declaration Mr. H. M. Bylesby, president, stated: "For the twelve months ended Oct. 31, 1914, net income of the Standard Gas & Electric Company, after payment of all charges, has been equivalent to 5.3 per cent upon its preferred stock. There is reason to believe that unless there are further abnormal increases in taxation of the subsidiary companies and increases in the unit cost of labor to them, or further lowering of the rates by state commissions and regulatory bodies, net earnings of the company for the ensuing twelve months will be in excess of those for the twelve months now closed. In the aggregate the subsidiary companies show a growth in business since Dec. 31, 1913, and the properties are in excellent physical condition. It has been impossible, owing to the depressed financial conditions, to complete a form of permanent financing which was in hand immediately prior to the European war. This plan in general provided for retirement of the remaining balance of \$2,250,000 collateral trust 6 per cent serial notes and other bills and accounts payable which, less current assets, as of Dec. 1, 1914, amounted to \$232,112, and means for further advances to the subsidiaries, pending suitable market conditions, for selling their permanent securities. It is hoped there may be sufficient improvement in general conditions during the coming year to enable such a plan to be made effective, and when made effective the company will distribute its dividends in cash."



## TRADE OPPORTUNITIES IN SOUTH AMERICA

### Prospects for Electrical Manufacturers Discussed by Men of Experience

The *Electrical World* publishes below interviews with three men who have had experience in different South American countries:

#### Salesmen Should Be Sent

Mr. A. H. Keleher, who represents several electrical manufacturers of this country in South America, is in New York. On the trip from which he has just returned he visited Brazil, Argentina, Chile and Uruguay. He represented Pass & Seymour, Inc.; the P. R. Manufacturing Company, of Detroit, Mich.; the Benjamin Electric Manufacturing Company and other concerns.

Mr. Keleher told the *Electrical World* that the European war made financial conditions in South America worse, but that as a matter of fact a commercial crisis had been developing slowly for two years. Acute financial conditions were caused by over-speculation, poor crops and also by the difficulties of the governments in getting loans from Europe. "The United States," said Mr. Keleher, "will undoubtedly receive more South American business when financial conditions improve. At present the depression is so great that it is figured by some people that from two to five years will be required for permanent improvement.

"Consistent efforts by United States manufacturers will undoubtedly be rewarded by orders. It is low price rather than quality on which European manufacturers have developed their large business. Manufacturers of this country can market goods because of superior quality. It is, of course, necessary to use intelligent methods. The salesman can do a certain amount of business even if he does not speak the languages, but of course he can do more if he can use Spanish and Portuguese.

"Although for the time being large purchases have been stopped in South America, they may be started at any time. No one can tell when the situation will begin to improve. Dealers have not bought much for two years. They have bought only from hand to mouth and their stocks are low. Notwithstanding the temporary cessation of buying, I look forward to a large increase in business, which may commence in the Argentine in February or March if nothing happens to offset present favorable crop conditions. Brazil will come along more slowly.

"If manufacturers send men to South America now, they should not expect to have good orders, although some might be received. I believe, however, that it will pay to send men now, even under present conditions, to establish connections for the future. Competition has been very keen between manufacturers of the European countries. I do not believe that European manufacturers can make electrical supplies of as good quality, dollar for dollar, as United States manufacturers. During the next few years consumers will have to buy here certain articles that under normal conditions they would have received from Europe. Our goods are better than those that come from Europe, and we shall have the benefit of a trial now that would have been difficult to get before. We hope that after this trial South American buyers will not again return to the cheaper class of goods."

#### Possibilities in Argentina

Mr. J. Camprubi, who was formerly connected with the office of the General Electric Company at Buenos Aires, Argentina, as assistant manager and for the last year as acting manager, is in New York. Notwithstanding the acuteness of financial conditions in Argentina as a result of the war, Mr. Camprubi thinks that improvement will follow and that a wonderful market will be found there. In talking with a representative of the *Electrical World* he said:

"Until more capital can be secured and a supply is available freely for commercial purposes there will be a partial paralysis of extension work. On account of the nature of its products, I think that Argentina will be the first country in South America to recover from the depression. Under most conditions it is almost sure of a ready and good market for its products. Present conditions in South America

will not affect manufacturers of strictly electrical supplies doing business there as much as it will affect manufacturers of electrical apparatus. For the successful exploitation of the supply business in Argentina it is necessary to have a stock made up of a complete line. The completeness of the line will be one of the strongest determining factors in success or failure. The man selected to order this stock must have a thorough knowledge of the market requirements, for the ordering of stock by an incompetent person means absolute failure. A good seller in the market here may be unsalable there, and vice versa. The Spanish language is absolutely as necessary there as English is here. You should be conservative but not cowardly. It is most important to distinguish between these two attributes in selecting a person to manage a business at such an enormous distance. It is useless to send anybody unless, besides being a gentleman, he is extremely energetic and untiringly persistent and has your absolute confidence. You cannot direct a man 7000 miles away; he must have such qualifications that you are willing to give him a free hand. One large European manufacturer of electrical machinery and supplies has in the neighborhood of \$1,500,000 of stock, while another carries about \$1,000,000 of stock.

"In doing business with South American buyers it is absolutely necessary to give longer credit than would be customary in this country. If a manufacturer here gives a buyer in South America six months from the date of shipment from the factory, he is not giving more time in reality than the average jobber in this country receives when you consider the time expired before the merchandise reaches the Argentine merchant's storehouse. Six months from date of invoice is the standard credit requirement in South America, although where a central station is constructed more time is frequently given. For instance, German manufacturers will give as long as a year and a half or two years when a public lighting plant is offered as security, and regard the transaction as providing good interest on capital and ample protection. From stock a good deal of business can be done demanding payment in from thirty to ninety days. However, to obtain the business of some of the larger organizations you are usually forced to give five months. Credits should be given, there are plenty of firms worthy of it, but here again success or failure rests on the discriminating capacity of the representative in deciding the amount of credit and the length of time to be given to each customer.

"The above remarks apply to the supply business in general and such articles as fans, heating devices, etc. In order to get the lion's share in power house and street railway apparatus it will be necessary for American capital to find its way to Argentina. Public utilities are not regulated there as much as here, and they yield handsome returns on the invested capital. Europeans have been quick to grasp the situation and not only receive good interest on money invested but make handsome profits on apparatus sold to the companies they control.

"Finally, it is most important to draw attention to the lack of meaning in the term South America. The name is used frequently here as one would speak of Canada, the United States, Mexico, Cuba. This is as misleading as if you talked about North America, meaning all of the above-mentioned nations. Do not forget that Buenos Aires is the third city in all America, North and South, outstripped only by New York and Chicago."

#### Electrical Materials Needed

Mr. Harold H. Heinrich, who was formerly connected with the office of the Siemens-Schuckertwerke company in Buenos Aires, Argentine Republic, is in New York. He may return to Buenos Aires to represent United States electrical manufacturers. In speaking to a representative of the *Electrical World* about conditions in Argentina, Mr. Heinrich said:

"Imports of the Argentine Republic in 1912 amounted to \$384,853,469, including \$9,308,785 of electrical material. Of the total imports the United States furnished 14.9 per cent, as compared with 8.7 per cent by Italy, 10.2 per cent by France, 16.5 per cent by Germany and 30.5 per cent by Great Britain. The proportion of the United States is much less in regard to electrical material. Mistakes have

been made by many American exporters who have tried to do business with Latin America and started in an over-enthusiastic way, dumping their goods into the southern republics without first investigating business conditions. There are other things looked upon by those in the United States as of little importance, but of great value if carried out in the proper way, such as printed matter, correspondence and catalogs sent in English instead of in Spanish, insistence on cash with order, failure to send goods exactly as ordered, poor or different packing of the same goods in different shipments. Considerable improvement has been made in the last few years, and this apparently indicates that Americans are paying closer attention to the necessity of meeting South American requirements.

"Personal acquaintance of the salesman with consumers is of great importance. The packing is now probably as good as that of the average exporter to South America, and a better acquaintance with the trade has led to credit extensions, for a period, however, in most cases much shorter than that allowed by any European concern. The first important step to overcome the last-mentioned facts has been taken by the National City Bank, of New York, in opening branches in Rio de Janeiro and Buenos Aires. The absence of branch banks used to be a great handicap to European houses of commerce, as it is an absolute necessity for foreign firms to continue to withhold credit until the standing of the proposed customer can be investigated; but this is becoming easier. In Argentina the facilities for obtaining reports of this nature are nearly as good as those in the United States, while the increasing number of American firms with personal representation in South America makes investigation easier.

"It is of great importance to know that the ordinary credit terms of ninety days are usually insisted on, and it does not seem to be very unusual to have this period extended to six months. Credit of ninety days is usually looked upon as natural and is often used by houses that do not need it, as they regard it as an act of honor, and a refusal of the usual terms would be taken as a reflection on their integrity. Branch banks will lead to close connections with other banks down there, will facilitate in many ways the collection of accounts, settlements of claims, ease in transaction of business, etc., and will keep American exporting and financial interests in closer touch with the fluctuating financial conditions of South America.

"American manufacturers surely would be received with open arms, as there are over seventy-five power stations producing electrical energy every day; consequently electrical material of any description has become a necessity there. Most of the public lighting is done by arc lamps, and carbons are used by the thousands every day. The small stock the houses in the Argentine had before they were cut off from Europe will surely be used up very soon, and to receive material from Europe is practically out of the question for some time. The materials mostly needed are carbons for arc lamps, ordinary installation material, meters, incandescent and metallic-filament lamps, small direct-current and alternating-current motors, etc."

## ELECTRICAL EXPORT TRADE REVIEW

### Europe Generally Takes More of Our Electrical Goods—North and South America Falling Off

During 1912 the United States exported approximately \$20,000,000 worth of electrical goods. In 1913 this figure had increased to almost \$27,000,000, while the value of 1914 was roughly \$25,000,000. The decrease in 1914 was owing principally to the great decrease in the Canadian demand for electrical goods of American manufacture. This lessened demand on the part of Canada meant a loss of approximately \$2,000,000 to our export trade, which figure is roughly the difference between the 1914 and 1913 total trade to the world. The South American trade was roughly \$750,000 behind last year, as was also the trade to Central America. Great Britain and Ireland showed a slight increase, as did also Germany, Russia, Belgium and Turkey. The decrease in the French demand was so slight as to make the demand practically constant.

A more minute analysis of the South American trade reveals the fact that Argentina took approximately \$150,000 more electrical goods in 1914 than 1913; Bolivia took approximately \$20,000 more; Brazil fell behind by approximately \$700,000, and Peru fell behind by roughly \$125,000. The value of the exports to Mexico was cut almost in half, the loss being roughly \$900,000. The trade to Cuba made a gain of roughly \$140,000, the others remaining practically constant. Table III shows a large gain in that part of

TABLE I—VALUE OF AMERICAN ELECTRICAL EXPORTS TO COUNTRIES AT WAR

	1912	1913	1914
Germany	\$1,200,000	\$1,533,983	\$1,700,000
France	1,100,000	215,356	210,887
Austria-Hungary	98,866	23,813	12,170
Japan	1,000,000	2,365,839	2,301,412
Spain	—	—	150
France....	200,000	381,975	377,505
Russia	48,121	69,917	120,703
Belgium	155,116	153,327	257,429
Portugal	Unknown	3,583	24,171
Total	\$2,563,005	\$4,797,800	\$5,148,095

Europe which is not at war. This gain was almost entirely in the trade to Spain, which took \$675,000 more electrical goods in 1914 than 1913.

The loss of trade in Mexico can undoubtedly be accounted for by the period of revolution, in which the demand was necessarily slackened for all kinds of machinery. On the other hand, the losses in Canada show the result of numerous Canadian branches of American manufacturing com-

TABLE II—VALUE OF AMERICAN ELECTRICAL EXPORTS TO COLONIAL TERRITORY OF COUNTRIES AT WAR

	1912	1913	1914
English	\$7,068,023	\$11,111,851	\$9,164,699
German	683*	683	927
Japanese	Unknown	24,076	52,639
French....	8,965	13,104	6,739
Total	\$7,077,673	\$11,149,716	\$9,225,001

\*Assumed the same as in 1912.

panies, together with new Canadian electrical manufacturing, so that there is a lessened demand there for electrical goods of purely American manufacture. The reports show that the Canadian demand for American electrical goods has lessened in every line. What has been lost in South America can easily be gained with the present opportunity. These southern republics are constantly making inquiries

TABLE III—VALUE OF AMERICAN ELECTRICAL EXPORTS TO NEUTRAL TERRITORY

	1912	1913	1914
Europe	\$213,072	\$676,550	\$1,523,996
South America	4,559,693	4,720,934	1,008,886
Central America	3,259,423	4,761,189	1,004,821
Assorted Areas	2,197,233*	924,418	1,000,045
Total	\$10,229,411	\$11,083,091	\$10,647,745

\*Included in the total for Europe.

concerning goods of American electrical manufacture. The figures and the accompanying tables are based on official reports which cover periods from June 30 of one year to July 1 of the next year, the year 1914 being the year ended July 1, 1914.



## MIDDLE WEST UTILITIES

Companies Register a 7.8 Per Cent Growth in Income and a 9.5 Per Cent Growth in Output

The September operations of the electric utility companies in the Central States, according to the returns

TABLE I—COMPARATIVE FIGURES SHOWING THE OPERATIONS OF 70 PER CENT OF THE CENTRAL-STATION INDUSTRY OF THE EAST NORTH CENTRAL STATES (ILLINOIS EXCLUDED)

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
May	\$1,695,130	\$1,713,766	10.6	93,815,971	86,001,868	9.1
June	1,776,809	1,592,880	11.5	90,248,607	81,626,045	10.6
July	1,821,029	1,699,163	7.3	94,192,229	85,167,825	10.6
August	1,997,575	1,814,775	10.0	107,904,474	97,665,027	10.6
September	1,990,136	1,825,327	9.1	104,379,599	95,262,339	9.7

received by the *Electrical World*, were far in advance of the September operations of the previous year. While many companies reported a slight decrease in their September

TABLE II—COMPARATIVE FIGURES SHOWING THE OPERATIONS OF 80 PER CENT OF THE CENTRAL-STATION INDUSTRY OF THE WEST NORTH CENTRAL STATES

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
May	\$778,029	\$633,432	23.0	76,302,296	55,015,511	38.7
June	754,935	610,224	23.6	71,864,644	53,909,090	33.3
July	749,597	676,788	10.9	75,463,726	66,525,278	13.4
August	755,420	738,123	2.3	76,451,635	73,560,807	2.5
September	803,145	789,249	1.8	78,555,476	74,237,579	5.8

operations, the increases from the other companies were sufficient to register a gain over the entire section. The companies which experienced decreases were, for the most

TABLE III—RETURNS FROM THE CENTRAL-STATION COMPANIES IN THE EAST SOUTH CENTRAL STATES

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
June (50 per cent of industry)	\$246,876	\$245,469	5.0	10,893,631	10,191,363	7.0
July (75 per cent of industry)	278,880	245,676	13.7	15,601,528	13,095,744	19.2
August (50 per cent of industry)	362,754	351,414	3.2	17,575,372	15,814,846	11.1
September (83 per cent of industry)	385,618	372,681	3.5	17,654,399	16,466,512	7.5

part, the larger ones. While the smaller companies did not show as large gains as in the previous months, nevertheless for the most part they experienced an increase over Sep-

tember of last year. The greatest growth of the Central States in September was in the South Central section. The effects of the war generally have been very slight in that section of the country. Incompleteness of returns from Illinois necessitated leaving that State out of our compilations. It will be noted by a close examination of the accompanying tables that while the percentage growths were not

TABLE IV—RETURNS FROM CENTRAL-STATION COMPANIES IN THE WEST SOUTH CENTRAL STATES

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
June (66 per cent of industry)	\$574,410	\$490,007	13.0	19,843,957	14,246,882	39.3
July (66 per cent of industry)	591,572	518,169	14.2	20,952,906	15,784,865	32.8
August (72 per cent of industry)	695,941	629,340	10.6	22,988,356	18,102,013	27.1
September (72 per cent of industry)	718,322	646,374	11.1	23,394,749	18,676,189	25.2

as large as those of previous months the decline in the percentage rate of growth was far greater between July and August than between August and September. It would therefore seem that the companies have stood the test exceedingly well.

As the month began some manufacturers on seeing an

TABLE V—RETURNS FROM THE CENTRAL-STATION COMPANIES IN THE CENTRAL STATES (ILLINOIS EXCLUDED)

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
May (56 per cent of industry)	\$3,200,553	\$2,841,685	12.7	202,611,026	162,363,929	24.8
June (66 per cent of industry)	3,914,836	3,459,497	13.2	217,920,183	182,406,207	19.4
July (68 per cent of industry)	3,802,126	3,307,719	15.0	217,928,950	188,569,581	15.6
August (75 per cent of industry)	4,389,696	4,051,678	8.4	247,501,400	226,276,638	9.4
September (75 per cent of industry)	4,703,780	4,368,251	7.9	260,705,339	237,832,934	9.7

improvement in trade conditions, resumed their operations. There was fair activity in most commodities and the general expectation was for a brisk fall trade.

## Business Notes

The Detroit Fuse & Manufacturing Company, Detroit, Mich., has removed its Canadian office from Windsor to Walkerville, Canada.

The E. T. Chapin Company.—The sales office of the E. T. Chapin Company has been moved from Bovill, Idaho, to the Columbia Building, Spokane, Wash.

The Industrial Controller Company, Milwaukee, Wis., is the name of the concern formerly known as the Independent Electric Manufacturing Company.

**The Baruch Electric Controller Corporation**, San Francisco, Cal., has changed its address from 51 Grant Street to 105 Kearny Street.

**The Fort Wayne Engineering & Manufacturing Company.**—O. L. Rimoldi has been appointed general sales agent for the Fort Wayne Engineering & Manufacturing Company, Fort Wayne, Ind.

**The Killark Electric Manufacturing Company**, St. Louis, Mo., has appointed W. D. Wooley its general sales representative in Chicago. Mr. Wooley's office is at 30 North Michigan Boulevard.

**The C & C Electric & Manufacturing Company**, Garwood, N. J., has moved its Cincinnati office from the Greenwood Building to 217 West Second Street. F. A. Saylor is in charge of this office.

**The Thompson Electric Company**, Tampa, Fla., will open up in the near future an electrical contracting and supply house and a motor repair shop. S. B. Thompson is the president of this company.

**The Goulds Manufacturing Company.**—F. L. Bunton, formerly with the Allis-Chalmers Company and the Heine Boiler Company, has been appointed manager of the Chicago office of the Goulds Manufacturing Company, Seneca Falls, New York. The Chicago office of the Goulds Company is at 3801 South Ashland Avenue.

## New Industrial Companies

**Standard Telephone Appliances** has filed articles of incorporation with a capital stock of \$50,000 for the purpose of manufacturing telephones and other electric appliances, etc. The incorporators are G. B. Coddington, A. E. Tucker and S. Vinton, of New York, N. Y.

**The Magneto Parts Company**, of New York, N. Y., has been incorporated with a capital stock of \$30,000 by E. W. Lowy, L. L. Lowy and A. S. Hecht, of the Bronx. The company purposes to manufacture ignition products, auto accessories, fixtures, etc.

**The Moulton Engineering Corporation**, of Portland, Maine, has been incorporated with a capital stock of \$50,000 to do business as a general electrical, hydroelectrical and hydraulic engineering company. E. W. Freeman, of Portland, Maine, is president and treasurer.

**The Lloyds Engineering Company**, of New York, N. Y., has been chartered with a capital stock of \$10,000 to do a general contracting and engineering business, also to deal in electrical supplies and to handle building materials, etc. The incorporators are H. L. Blanchard and J. W. Koch. T. J. Meehan, 2 Rector Street, New York, is attorney.

## Trade Publications

**Cable Clamps.**—"Automatic Cable Clamps" is the subject of a leaflet sent out by M. C. Austin, 700 Jackson Boulevard, Chicago, Ill.

**Motor-Driven Tool.**—Electric drills and grinders are described in a folder issued by the Independent Pneumatic Tool Company, Chicago, Ill.

**Flashlamp.**—A long-range flashlamp is described and illustrated in a folder recently issued by the Hipwell Manufacturing Company, Pittsburgh, Pa.

**Electric Percolator.**—The Hotpoint Electric Heating Company, Ontario, Cal., has issued a folder describing an "El Perco" percolator of new design.

**Vacuum Cleaner.**—The Pittsburgh Electric Specialties Company, Pittsburgh, Pa., has issued several circulars describing a light-weight vacuum cleaner.

**Electric Mine Lamp.**—A "Wico safety" electric mine lamp is described and illustrated in a bulletin issued by the Witherbee Igniter Company, Springfield, Mass.

**Electrical Devices.**—The Chelton Electric Company, Philadelphia, Pa., has recently issued a thirty-nine-page illustrated catalog entitled "Electrical Specialties."

**Electrically Illuminated Barber Poles.**—The Theo. A. Kochs Company, Chicago, Ill., has issued a leaflet describing a revolving barber pole equipped with electric lamps.

**Magnetic Chucks.**—Several types of magnetic chucks and auxiliary apparatus are described in Circular No. 204, published by the D. & W. Fuse Company, Providence, R. I.

**Incandescent-Lamp Fixtures.**—Fixtures for high-candle-power incandescent lamps are the subject of a folder issued by the Electric Operations Company, Bush Terminal, New York.

**Lighting Fixtures.**—The General Electric Company, Ltd., 67 Queen Victoria Street, London, Eng., has recently issued the fourteenth edition of its "Electric Light Fixtures" catalog.

**Distribution Devices.**—The G & W Electric Specialty Company, 6308 Blackstone Avenue, Chicago, Ill., is sending out a folder which describes several types of distribution devices.

**Electrical House Apparatus.**—Edwards & Company, 140th Street and Exterior Street, New York, have issued Catalog No. 6, which describes various electrical house devices.

**Battery-Operated Motor.**—The Menominee Electric Manufacturing Company, Menominee, Mich., has issued a leaflet describing and illustrating several types of battery-operated motors.

**Dolly-Type Electric Washer.**—An electric washer equipped with a white-cedar tub and a hard-wood dolly is described in a circular issued by the Richmond Cedar Works, Richmond, Va.

**Boiler Graphite.**—The Joseph Dixon Crucible Company, Jersey City, N. J., is sending out a mailing card in the shape of a barrel which describes a graphite compound for cleaning boilers.

**Automobile Searchlamp.**—A light-weight adjustable searchlamp for automobiles is described in a leaflet published by the Pittsburgh Electric Specialties Company, Pittsburgh, Pa.

**Workman's Time Recorder.**—The Gisholt Machine Company, Madison, Wis., has published two bulletins which give information on and various methods of using a time-recording device for workmen.

**Lighting Fixtures.**—The National X-Ray Reflector Company, Chicago, Ill., has sent out twelve sheets describing various types of lighting fixtures which are to be added to binders previously provided.

**Steel Reflectors.**—Bulletin R published by the Wheeler Reflector Company contains information on steel reflectors for so-called type "C" and type "D" lamps manufactured by the General Electric Company.

**Resistance Units.**—The Ward Leonard Electric Company, Bronxville, N. Y., has issued a new set of bulletins designated as G8, G9, G10, G11 and G12, which contain descriptions of enameled resistance units.

**Apparatus for Operating Planers.**—Bulletin No. 1089, published by the Allis-Chalmers Manufacturing Company, Milwaukee, Wis., contains information on electrical equipment for operating a reversible planer.

**Iron-Clad Truck-Type Switching Apparatus.**—In Bulletin No. 3311, issued by the British Thomson-Houston Company, Rugby, England, are described and illustrated several kinds of truck-type iron-clad switch apparatus.

**Small Switches.**—"Lektirk Lighting Connections" is the title of an illustrated booklet issued by A. P. Lundberg & Sons, 477 Liverpool Road, London N., England, which contains information on small switches and accessories.

**Flashlamps and House lamps.**—The American Ever Ready Works, 304 Hudson Street, New York, have recently issued a leaflet describing their vest-pocket-size flashlamp, a tubular flashlamp equipped with nickel-plated case, a small houselamp and a toy lantern.

**Cables and Wire.**—The Belden Manufacturing Company, Twenty-third Street and Western Avenue, Chicago, Ill., has issued a cloth-bound 181-page illustrated catalog designated as No. 6 which contains information on various kinds of electrical wires, cables and cordage.

**Varnishes.**—Bulletin No. 9 issued by the Dielectric Manufacturing Company, St. Louis, Mo., contains information on black spirit finishing varnish, and Bulletin No. 10 published by the same company contains a description of a low-priced varnish called "versatile" varnish.



## Personal Mention

Mr. J. G. Jackson has been appointed local manager of the Hydro-Electric system in Chatham, Ont.

Mr. W. G. Busby, State Senator of Missouri, has succeeded Mr. E. J. Bean as attorney for the Public Service Commission of Missouri.

Mr. F. W. Harvey, Jr., Chicago, has been appointed secretary and advertising manager of the Technical World Magazine Company, Chicago.

Mr. J. Shields, consulting electrical contractor, has been appointed city inspector of wiring installations by the Toronto Hydro-Electric Commission.

Mr. E. K. Hall, vice-president of the New England Telephone & Telegraph Company, has been elected first vice-president of the Boston (Mass.) Chamber of Commerce.

Mr. Frank Martin has been appointed chief engineer of the power station of the Trenton & Mercer County Traction Corporation, Trenton, N. J., to succeed Mr. De Witt Smith.

Mr. N. M. Argabrite has left the Muncie (Ind.) Electric Light Company, of which he was assistant manager, to do appraisal work among other properties of the American Gas & Electric Company.

Mr. Frederick D. Nims, electrical engineer and general superintendent of the Western Canada Power Company, Ltd., Vancouver, B. C., has resigned to accept an engineering position with the Olympic Power Company, of Port Angeles, Wash.

Mr. H. S. Sladen, formerly general superintendent of the Kansas Gas & Electric Company with headquarters at Wichita, is now assistant general manager of the company and also local manager for the company's property at Wichita.

Mr. J. Showalter, chief engineer salesman of the meter department of the Ferranto Electrical Company of Canada, Ltd., Toronto, Ont., has been appointed to succeed Mr. J. G. Monahan as manager of that company's Winnipeg (Manitoba) branch.

Mr. E. A. Humphrey has been appointed electrical engineer of the Great Northern Railroad to succeed Mr. C. L. Daugherty, who, as previously noted in the *Electrical World*, has been appointed assistant general manager of the St. Petersburg (Fla.) Light & Power Company.

Mr. M. G. Gould has been elected president of the Lima-Honeoye Light & Railroad Company, Lima, N. Y., to succeed Mr. D. M. Lewis, who continues with the company as secretary, general manager and purchasing agent. Mr. Gould also acts as chief engineer of the company.

Mr. W. S. Henning was recently appointed general manager of the Southwestern Traction & Power Company, New Iberia, La. Mr. Henning was formerly chief engineer of the company and from 1906 to 1912 was engaged in construction work for the Southern Pacific Company in Louisiana.

Mr. C. R. Hunt has resigned from the Chicago sales staff of the General Electric Company to take charge of the exhibit which the Robbins & Myers Company, Springfield, Ohio, will make at the San Francisco Exposition. After the close of the exposition Mr. Hunt will represent the latter company on the Pacific Coast.

Mr. Roy E. Schaulin, who for the past year has been connected with the Chicago office of the *Electrical World*, has been transferred and has been appointed assistant Eastern manager, with headquarters at New York. Mr. Schaulin was for a number of years associated with various sales departments of the Westinghouse organization.

Mr. George B. Wheeler, who recently resigned as general manager of the Chippewa Valley Railway, Light & Power Company, Eau Claire, Wis., after twenty-three years' active management of the electric properties in that city, has just been elected president of the Union National Bank of Eau Claire. Mr. Wheeler is a past-president of the Wisconsin Electrical Association.

Mr. E. G. Hines, for the past three years with Federal Utilities, Inc., and Harrison Williams' organization in New York, has been appointed Eastern manager of the *Electrical World*, succeeding Mr. Frank E. Watts, resigned. Prior

to his connection with the above-mentioned utility-financing organizations, Mr. Hines was in the sales department of the power-plant, road-making and crushing-machinery business.

Mr. T. C. Ringgold has resigned as sales manager of the Central Electric Company, Chicago, after a connection of four years with the company. Prior to that time he was a member of the General Electric Company sales staff. Mr. Ringgold's resignation becomes effective Dec. 31. He has made no definite plans for the future, but mail may be addressed to him in care of 1570 Old Colony Building, Chicago.

Mr. A. E. Peirce, who was recently appointed vice-president of the Wisconsin-Minnesota Light & Power Company, which took over the properties of the Chippewa Valley Railway, Light & Power Company of Eau Claire, Wis., will also have supervision over the properties of the Red Wing (Minn.) Gas, Light & Power Company, the Winona (Minn.) Gas, Light and Coke Company and the Minnesota-Wisconsin Power Corporation, serving Lake City and Wabasha, Minn., all of which have been merged with the first-named company. Mr. Peirce will continue to have his headquarters at Eau Claire.

Mr. Edward N. Hurley, president of the Hurley Machine Company, Chicago, who was installed as president of the Illinois Manufacturers' Association Dec. 8, has been a leader in the work of the association and in its efforts to bring American manufacturers into touch with the buyers of South America. At that time vice-president of the association and chairman of its foreign-trade committee, Mr. Hurley headed the movement which in February resulted in a cruise of American business men to South America, and himself accompanied the expedition. In addition to the company which bears his name, Mr. Hurley has interests in the Independent Pneumatic Tool Company and the Aurora Automatic Machine Company. He is president of the First National Bank of Wheaton, Ill., and is a director of the Chicago & Great Western Railroad.

Mr. L. A. Magraw, who was recently appointed general manager of the Macon (Ga.) Railway & Light Company, was born in Springfield, Mass., May 7, 1883. He attended the public schools at Waterbury, Conn., and was graduated from the Worcester Polytechnic Institute in 1905. He then entered the test department of the Crocker-Wheeler Company, with which he remained two years. During part of this time Mr. Magraw was instructor at Sibley College, Cornell University. In 1907 he entered the employ of the Westinghouse Electric & Manufacturing Company as erecting engineer at Philadelphia, and during his connection with the company at that place he supervised the installation of many steam turbine plants throughout Pennsylvania. In 1909 Mr. Magraw was transferred to the engineering department of the Westinghouse Electric & Manufacturing Company, and as resident engineer at Charlotte, N. C., he was active in the development of high-tension apparatus and supervised the installation of one of the first outdoor substations carrying 110,000 volts. Mr. Magraw was appointed chief engineer of the Central Georgia Power Company in 1911, and in January of the following year he became chief engineer of the Central Georgia Transmission Company and had charge of the construction of a number of substations, distributing lines and high-tension lines in north central Georgia. The following March he was appointed chief engineer of the Macon Railway & Light Company and began the reconstruction of the distribution lines and feeders in the city of Macon. In January, 1913, he was appointed general manager of the Central Georgia Power Company and of the Central Georgia Transmission Company, and last October he was appointed general manager of the Macon Railway & Light Company.

## Obituary

Mr. I. E. Storey, a pioneer in the production of the inclosed motor, died at Los Angeles, Cal., on Nov. 15. He was the inventor of the "Storey" motor, a wholly inclosed direct-current motor designed for polishing and buffing purposes. He was associated with the Storey Motor & Tool Company, later with Thomas H. Dallett & Company, and subsequently with the Northern Electrical Manufacturing Company, Madison, Wis.

## Construction

### New England

**MANCHESTER, N. H.**—The Manchester Trac. Co. & Pwr. Co. has been awarded a permit to erect a one-story power house at Kelley's Falls.

**PORTSMOUTH, N. H.**—The Public Service Commission has granted the Portsmouth Electric Light & Pwr. Co. a franchise for a 12-mile line in North Hampton, Hampton, Seabrook, Falls and Seabrook.

**MONTAGUE CITY, MASS.**—Contracts have been awarded to the Amherst Pwr. Co., controlled by the Cabot interests, of Boston, for the construction of a 45,000-hp hydroelectric power plant at Montague City, Mass., on which will be begun immediately. Energy generated at the station will be supplied to the network of transmission lines of the company in the central Connecticut Valley, including lines connecting the generating station with the system of the United El. Lt. Co. of Springfield, Mass.

**WESTFIELD, MASS.**—The electric light commissioners have authorized T. T. Logie, manager of the municipal electric-light plant, to investigate the cost of installing an ice factory in connection with the municipal lighting plant. The cost of the proposed plant is estimated at from \$40,000 to \$50,000.

**WEST NEWBURY, MASS.**—The installation of an electric-lighting system in West Newbury is under consideration.

**WORCESTER, MASS.**—The Worcester El. Lt. Co. has closed a contract to furnish Denholm & McKay Co. with energy for lighting and power service. The lighting company will also supply electricity to the customers who have been supplied by Denholm & McKay Co., extending from Pleasant Street to Church Street. The power plant in Chase Court will be closed down.

**MERIDEN, CONN.**—The city of Meriden has purchased for \$15,000 the property known as Hough's Mills, adjoining the Bridge Street, on which it intends to erect an electrically operated pumping station.

### Middle Atlantic

**ALBANY, N. Y.**—Bids will be received by the Division of Public Buildings, Executive Chamber, Albany, until Dec. 16, for electric wiring for book stacks and reflectors for the New York State Education Building, Albany. Drawings and specifications and blank form for proposal may be obtained at the Department of Architecture upon deposit of \$10, which will be refunded upon return of same. Lewis F. Pilcher is state architect.

**LANCASTER, N. Y.**—The Public Service Commission has granted the Depew & Lancaster Lt. Pwr. & Conduit Co., of Lancaster, permission to extend its electric transmission lines and gas main through the town of West Seneca outside of the present limits of the city of Lackawanna.

**MALONE, N. Y.**—The Malone Lt. & Pwr. Co. has submitted a new proposal to the Board of Village Trustees for lighting the streets of the village, including ornamental lamps for Main Street, which the board now has under consideration. The company offers to erect and maintain new ornamental incandescent lamps on Main Street, from Washington Street, to include not less than 32 standards, with single globes, using either 250-wp or 100-wp lamps. The company also agrees to replace the present ornamental lamps in the residential district of the village, of which there are 70, with 250-wp incandescent lamps. The 102 incandescent lamps of 60 cp will be maintained on the street lamps as the present contract.

**MECHANICVILLE, N. Y.**—The Mechanicville El. Lt. & Gas Co. has applied to the Public Service Commission for permission to exercise a franchise in the village of South Brook.

**NEW YORK, N. Y.**—Bids will be received at the office of the Mayor, City Hall, borough of Manhattan, until Dec. 16, as follows: (1) Electrical equipment for First Battalion, Naval Military Armory, foot of Ninety-seventh Street, Manhattan; (5) electric wiring new Eighth Coast Defense Command, Jerome Avenue and Kingsbridge Avenue, borough of the Bronx. A separate proposal must be submitted for each item. Blank forms and further information may be obtained at the office of the Army Board, Hall of Records, Manhattan.

**SILVER CREEK, N. Y.**—Application has been made to the Board of Trustees by John Kimmel, manager of the Wayland El. Lt. & Pwr. Co., of Wayland, for a franchise to operate an electric-light and power

plant in Silver Creek for a period of 24 years.

**WATERTOWN, N. Y.**—The Town Boards of Wino and Diana are contemplating establishing a lighting district, which includes the village of Natural Bridge and surrounding territory, and to enter into a contract with the Watertown El. Lt. & Pwr. Co. for lighting the streets, roads, etc., and also for commercial and residential lighting.

**ALLENSTOWN, PA.**—The City Council has entered into an agreement with the Consolidated Tel. Co. to construct and operate an underground conduit system in Allentown, the city reserving the right to buy the system at cost whenever it chooses to build a municipal conduit system. The Bell Tel. Co. is given the privilege to extend its system under the same terms.

**ALLENSTOWN, PA.**—Included in the financial budget prepared by the City Commissioners for the coming year is an appropriation of \$12,500 for the purchase and installation of an electrically operated pump for the waterworks system, also for the appropriation of \$3,500 for underground cable, and if this is decided upon finally, the underground fire-alarm system, with the installation of a hundred feet of cable, from the half streets to points where fire-alarm boxes are located, will be completed.

**GILBERTSVILLE, PA.**—A company is being organized to develop a copper field, located near Gilbertsville. Electrical machinery will be installed. O. R. Dangler, H. Soffer and C. Minire, of Beshler, Pa., are the lessees.

**HARRISBURG, PA.**—Plans are being considered for the construction of an addition to the water works in the city of Harrisburg, involving an expenditure of about \$2,100,000. Samuel B. Rambo is superintendent of public buildings and grounds.

**KANE, PA.**—The property of the Kane El. Lt. & Pwr. Co. has been purchased by the Interstate Public Utilities Corp., of Rochester, N. Y., which recently purchased the plants at Johnsbury and Ridgeway for the purpose of the plant at St. Marys. The generating capacity of the local plant will be doubled for the purpose of supplying electricity to the towns between Kane and St. Marys. The latter town, it is reported, also contemplates the construction of an electric railway between this city and St. Marys.

**PAOLI, PA.**—Plans are being prepared by William W. Wokman, architect, Broad Street, Philadelphia, Pa., for the erection of a power house (brick and concrete) at Paoli, for the Pennsylvania Railroad.

**PHILADELPHIA, PA.**—The Citizens' Lt. & Pwr. Co., recently incorporated, has filed an application to issue bonds to the amount of \$500,000.

**PASSAIC, N. J.**—The contract for electric work in School No. 12, in the Fourth Ward, has been awarded to the Beaver Engineering Co., Newark, at \$5,344.

**NEW CASTLE, DEL.**—A permit has been granted for the erection of a power plant and shop building for the Bethlehem Steel Works. C. Leih, of Bethlehem, Pa., is engineer.

**WILMINGTON, DEL.**—The Wilmington & Philadelphia Trac. Co. has been granted permission by the Levy Court to take over the poles and lines of the Du Pont Powder Co., adjoining the Hagley Yard along the Brandywine. The Du Pont company has decided to abandon its power house and purchase electricity from the traction company.

**WALKERSVILLE, MD.**—The Hagerstown & Frederick Ry. Co., of Hagerstown, Md., is extending its electric transmission line to Walkersville to supply electricity for lamps and motors here.

**HUNTINGTON, W. VA.**—The City Commission is reported to be contemplating the installation of an electric generating plant in the basement of the municipal building to supply electricity for lighting the city hall and fire station and for the fire-alarm system and the Gamewell police-call system.

**CLARKSVILLE, VA.**—Bids, it is reported, will be received by J. W. Maxey, clerk, for the erection of an electric-lighting plant and street-lighting system, for which \$6,000 in bonds was recently voted.

**WASHTON, D. C.**—The Public Utilities Commission has authorized the Potomac El. Pwr. Co. to sell \$271,000 in bonds, the proceeds to be used for capital expenses, improvements and extensions to its service.

**WASHINGTON, D. C.**—A consul in British Columbia wishes to contract with American manufacturers of tungsten lamps, flashlamps and batteries for same. The company formerly purchased its supplies from the Electric Light Co. of America. Information address No. 14,640, Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., or branch offices.

**WASHINGTON, D. C.**—A consul reports that a firm in his district is anxious to be placed in communication with American manufacturers of arc-lamp carbons. The concern in question is a large buyer of this class of goods as well as other electrical accessories. For further information, address No. 14,604, Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., or branch offices.

**WASHINGTON, D. C.**—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Dec. 22, for the purchase of various navy yards and naval stations the following supplies: Brooklyn, N. Y., Schedule 7635—miscellaneous arc-lamp carbons, 540 incandescent bridge-type lamps; Schedule 7671—10,700 lb. sheet lead in rolls; Schedule 7673—263,730 lb. steel boiler plates (class C), 45,000 lb. steel shapes (class C); Charleston, S. C., Schedule 7665—300 Southern black cross-tees and two sets of switches, two stiff rods and two split switches; Washington, D. C., Schedule 7664—furnishing and installing miscellaneous motor and lighting equipment; Mass., Schedule 7680—3000 lb. galvanized soft-steel wire; Schedule 7683—miscellaneous soft steel brass, 2100 lb. rod copper, miscellaneous sheet brass, 1000 lb. sheet lead; Schedule 7677—12,450 lb. sheet lead. Bids will also be received until Dec. 29, as follows: Boston, Mass., Schedule 7684—17,500 lb. brass pipe (1 in. to 6 in.), miscellaneous seamless brass copper pipe, 3000 lb. brass tubing; Portsmouth, N. H., Schedule 7684—2500 lb. seamless copper pipe. Applications for proposals should give the schedule desired by number.

### North Central

**BANGOR, MICH.**—The village of Bangor expects to purchase within the next three months a new electric plant for two return-volt boilers. F. M. Gross is superintendent.

**DUNDEE, MICH.**—Within the next eight months the Dundee Hydraulic Pwr. Co. expects to erect a new electric plant on a transmission line. H. G. Grey is superintendent.

**GRAND RAPIDS, MICH.**—The Wisconsin Railroad Commission has granted the Wisconsin-Minnesota Lt. & Pwr. Corp., a subsidiary of the American Public Utilities Co., permission to issue \$611,000 in capital stock, of which \$500,000 will be for the purpose of acquiring the properties of the Winona Gas Lt. & Coke Co., of Winona, Wis.; the Red Wing Gas Lt. & Pwr. Co., of Red Wing, Minn.; the Minnesota-Wisconsin Pwr. Corp., of Wabasha, Minn.; the Eau Claire Gas Lt. Co., of Eau Claire, Wis., and \$17,000 to acquire all the property of the Neillsville El. Co., of Neillsville, Wis. The company also authorized to issue \$94,000 in capital stock for improvements and extensions.

**BUTLER, OHIO.**—The municipal electric-light plant and water-works system has been purchased by the Hicksville El. Co. for \$10,372. Electricity to operate the local system will be supplied by the Hicksville plant.

**CINCINNATI, OHIO.**—Plans are being considered by the Central Vine Street Business Association for the installation of an ornamental lighting system on Vine Street between the canal and McMicken Avenue. It is proposed to use new nitrogen tungsten lamps.

**CINCINNATI, OHIO.**—The Union Lt. Ht. & Pwr. Co., which supplies electrical service in Covington, Newport and other cities in Kentucky, is planning to strengthen its lines near the Kentucky River, by the installation of heavier poles carrying high-tension cables to transmit energy from the Cincinnati plant to the Kentucky side.

**COLUMBUS, OHIO.**—The City Council has again taken up the consideration of the proposal to issue \$265,000 in bonds for extensions and improvements to the municipal electric-light plant.

**HAMILTON, OHIO.**—The extension of the ornamental lighting system on Main Street from the High Street Bridge to D Street is under consideration.

**KINGSTON, OHIO.**—The Village Council of this city has been authorized to purchase to construct and operate an electric-light plant in Kingston for a period of 25 years.

**LOVELAND, OHIO.**—The Loveland Citizens' El. Co. has been granted permission by the Commissioners of Hamilton County to furnish energy in the village of Twilight.

**MILFORD, OHIO.**—The Commissioners of Hamilton County have granted the Cincinnati, Milford & Loveland Trac. Co., of Milford, permission to erect transmission



lines to supply electricity to the residents of Indian Hill Avenue, the Wooster Pike and the McClelland Road.

**OXFORD, OHIO.**—The Village Council of Oxford, Ohio, is authorized to take over the municipal electric-light plant for 10 years. Mr. Reenhart proposes to take over the plant and install new equipment at his own expense and sell the plant back to the city at the end of 10 years at 5 per cent discount.

**SEVEN MILE, OHIO.**—A franchise has been granted to N. B. Yingling to install and operate an electric-lighting plant in Seven Mile.

**TOLEDO, OHIO.**—The Willys-Overland Co. is replacing the oil annealing and tempering ovens with electric furnaces in its Toledo plant. Electricity for operating the plant is furnished by the Toledo Rys. & Lt. Co. Arrangements are being made by the power company to supply the Willys-Overland plant with much additional energy to operate the large building. It is expected that steps will be taken by the Toledo Rys. & Lt. Co. to enlarge its generating plants to meet the increasing demand for power.

**YOUNGSTOWN, OHIO.**—An appropriation of \$1,000 has been made by the Ohio State Tel. Co. for improvements to its Youngstown plant, which will include the erection of a new building, new underground cable, extensions to the existing cable lines and the installation of a new automatic system.

**CARLISLE, KY.**—Within the next six months the Carlisle Electric Pwr. Co. expects to install an ice factory, to be operated in connection with the electric-light plant. W. J. Richardson is superintendent.

**LANCASTER, KY.**—Plans are being considered for changing the system of the municipal electric-light plant from direct current to alternating current, to be completed by July, 1915. If the change is made, two 125-kw generators and engine to drive the same will be required. The town will have to be rewired. For further information address G. C. Rose, P. O. Box 176, Lancaster, Ky.

**LAWRENCEBURG, KY.**—The Kentucky River Stone & Sand Co. is contemplating installing additional electric motor-driven machinery.

**LOUISVILLE, KY.**—The New York Laundry is contemplating building an addition to its plant, which will be equipped with electric motor-driven machinery.

**OWENSBORO, KY.**—Preparations are being made, it is reported, for the installation of a 250-hp boiler in the municipal electric-light plant, bids for which have been asked for.

**PRINCETON, KY.**—Owing to the City Council and the Princeton Lt. & Pwr. Co. being unable to come to an agreement over the rates for service the city is without street-lighting at present.

**JEFFERSONVILLE, IND.**—The officials of the State Reformatory have asked for an appropriation of \$16,000 for the installation of two additional boilers at the reformatory in Jeffersonville and \$1,000 for installing a conduit wiring system.

**JEFFERSONVILLE, IND.**—Negotiations are under way between the City Council and the United Gas & El. Co. of New Albany, relative to a new contract for lighting the streets of the city. Upon the expiration of the old contract (some time ago) the city contracted with Owen B. Carr to supply the service, but the courts held the contract invalid. The United Gas & El. Co. has been furnishing the service. The light and gas committee of the Council is contemplating replacing the old arc lamps with tungsten incandescents. Chester E. Wilson, of Indianapolis, is president of the company.

**ONTARIO, IND.**—Within the next six months C. F. Cain, owner of the local electric-light plant, expects to purchase an oil engine with a rating of from 100 hp to 125 hp.

**DU QUOIN, ILL.**—The Du Quoin Utility Co. expects to purchase within the next few months a 300-hp boiler to be used in the company has recently installed a 250-kva mixed-pressure turbine and has purchased material, including poles, transformers, wire, etc., for extension of its distribution system. J. Naumer is superintendent.

**FISHER, ILL.**—Within the next few months the managers of the municipal electric-light plant may possibly purchase a few meters and a small amount of wire and wiring supplies. A. L. Baker is engineer.

**LA HARPE, ILL.**—Within the next four months the La Harpe El. Lt. & Pwr. Co. expects to purchase two crude-oil engines, one of 120 hp and the other of 40 hp.

**MINIER, ILL.**—The village of Minier expects to purchase within the next six months about 300 poles and cross-arms to

rebuild the distributing system. Henry J. Blome is village clerk.

**PEORIA, ILL.**—A resolution has been introduced in the City Council providing for the appointment of a committee of five aldermen to investigate the feasibility of establishing a municipal electric-light plant in Peoria.

**VICTORIA, ILL.**—The local electric-light plant has been purchased by E. L. Brown, president of the Galva El. Lt. Co. of Galva. Electricity to operate the local system will be supplied from the plant of the Galva El. Lt. Co. 12 miles distant. The plant will be extended 5 miles to supply the service.

**WASHBURN, ILL.**—Within the next six months the Washburn El. Lt. & Pwr. Co. expects to erect 13 miles of three-phase transmission line and also to purchase a 4-kva street-lighting equipment. W. E. Lyan is general manager.

**ASHLAND, WIS.**—A movement has been started among the business men to install a general lighting system on Second Street, to cost about \$4,000.

**FOX LAKE, WIS.**—The Fox Lake Lt. & Pwr. Co., a subsidiary of the Beaver Dam Lt. & Pwr. Co. of Beaver Dam, is planning to install a general lighting system in Fox Lake. The proposed work will consist of two outdoor substations of 50-kw rating, the erection of 10 miles of overhead wire, the installation of 6 bars of copper wire to be used and 42 tungsten incandescent street lamps. Nothing will be done until next year. D. C. West is president of the company.

**JANESVILLE, WIS.**—The Janesville El. Co. has been granted permission to increase its capital stock from \$100,000 to \$300,000.

**MINERAL POINT, WIS.**—The Wisconsin Commission has authorized the Mineral Point Sewer Co. to issue \$200,000 in bonds the proceeds to be used for paying outstanding indebtedness and for various extensions and improvements to its property.

**PRAIRIE DU SAC, WIS.**—The installation of a municipal electric-light plant in Prairie du Sac is under consideration.

**AURORA, MINN.**—The Village Council has awarded the contract for building for the power plant to the Boston Electric Contracting Co. of St. Paul, for \$13,561. The cost of the plant complete is estimated at \$27,000. Contracts have already been placed for machinery.

**BIGFLO, MINN.**—The installation of a municipal electric-lighting system is under consideration by the City Council. Electricity for operating the system will probably be obtained from the plant in Lake.

**REDWOOD FALLS, MINN.**—Within the next three months the Wherland El. Co. of Redwood Falls, expects to purchase one 150-hp boiler, one 125-hp engine and one 75-kw, 2200-volt, three-phase generator. R. F. Wierlinski is secretary.

**TOWER, MINN.**—Plans, it is reported, are being prepared for the installation of an isolated electric-light plant in the Vermilion Lake School.

**WINDOM, MINN.**—The Village Council has engaged Earl Jackson, consulting engineer, Capital Bank Building, St. Paul, to prepare plans and specifications for extensions and improvements to the municipal electric-light plant.

**GRINNELL, IA.**—The Grinnell El. & Htg. Co. has applied to the County Commissioners of Jasper County for permission to erect an electric transmission line from Grinnell to Kellogg.

**SCHLESWIG, IA.**—A petition has been presented to the Town Council asking that an election be called to submit the proposal to issue bonds for the installation of a municipal electric-light plant to the voters.

**SPENCER, IA.**—The city of Spencer expects to install within the next six months a new generator and condensing system and also to compound the present engine in the municipal electric-light plant. E. G. Gay is superintendent of public works.

**CLARENCE, MO.**—The electric light commissioners expect to purchase within the next six months a 200-hp generating unit, consisting of a Corliss engine directly connected with an alternator and belted exciter. Don McIntire is superintendent.

**JOPLIN, MO.**—Charles A. Patterson, commissioner of public utilities, recommends increasing the output of the municipal electric-light plant to meet the increasing demand for street lighting and commercial service. The cost is estimated at \$150,000, and it is understood that a bond issue will be asked.

**TRENT, S. D.**—The installation of an electric-light plant in Trent is under consideration. It is proposed to grant a fran-

chise to a private company, the village having decided not to install a municipal plant.

**NEHAUKA, NEB.**—Plans are being considered, it is reported, by E. M. Pollard, owner of the local electric-light plant, for extension of the distributing lines throughout the town.

**PRAGUE, NEB.**—The village of Prague expects to construct a new power house within the next seven months. Anton Kasper is village clerk.

**COLBY, NEB.**—At an election held recently the proposal to issue bonds for the installation of a municipal electric-light plant was carried.

**LEAVENWORTH, KAN.**—The contract for the standards for the ornamental street-lighting system has been awarded to the Great Western Mfg. Co., for \$5,384, and for the installation of the lamps, wires, etc., to Tholen Bros., at \$7,990.

**LEAVENWORTH, KAN.**—The installation of an ornamental lighting system to extend from Fort Leavenworth to the Soldiers' Home at Lansing next year is under consideration by the Leavenworth Chamber of Commerce and Colonel Green, commander of Fort Leavenworth, and the officials of the Soldiers' Home have promised their support. It is proposed to use arc lamps.

**PAWNEE ROCK, KAN.**—T. J. Stinson, of Spearville, is reported to have purchased the local electric-light plant. Improvements, it is understood, will be made to the plant, including the installation of an engine and generator.

**WELLINGTON, KAN.**—Bids will be received by the city of Wellington until Dec. 17 for engines, generators, pumps, boilers, heater, switchboard and miscellaneous electrical apparatus for the proposed water and electric-light plant in the city of Wellington and substation at Mayfield Wells. Alternate bids will be taken on steam turbines and cross compound Corliss engines. Specifications may be obtained at the office of the city clerk, Wellington, and from the Benham Engineering Co., consulting engineer, 435 American National Bank Building, Oklahoma City, Okla.

## Southern States

**FARMVILLE, N. C.**—The city of Farmville is contemplating improvements to the municipal electric-light plant next year, including the installation of an engine and generator. H. L. James is manager.

**HAZLEWOOD, N. C.**—At an election held recently bonds to the amount of \$15,000 were voted for the installation of an electric-light, water-works and sewer systems in Hazlewood.

**FLORENCE, S. C.**—The Carolina El. Co. recently organized and has acquired and consolidated the following companies: The Florence El. & Utility Co., of Florence; the Marion Wtr. & El. Co., of Marion; and the Tarlington Wtr. & El. Co., of Darlington. The new company is capitalized at \$800,000 and has an authorized bond issue of \$2,000,000, of which \$1,500,000 is reserved for improvements, extensions and purchase of new properties. The officers of the company are D. T. McKethen, of Darlington, president; J. W. McCown, of Florence, vice-president; and George E. Dargan, secretary and treasurer.

**WESTMINSTER, S. C.**—D. B. Traxler, of Greenville, it is reported, is contemplating the construction of a hydroelectric power plant within 3 miles of Westminster. It will develop about 1700 hp, 120 ft head, 9 miles, and to Seneca, 12 miles distant.

**BUNNELL, FLA.**—The local electric-light plant, which was taken over by Edward Bunnell on Sept. 20, 1914, is being rebuilt. A 3-ton ice plant will be installed in the spring. A company has been organized under the name of the Bunnell Ice, Lt. & Wtr. Co. to operate the system.

**FORBES, FLA.**—Arrangements have been made, it is reported, whereby the Pinellas El. Lt. & Pwr. Co. will extend its transmission lines through New Port Richey, to a point near that point, and furnish electricity there. A movement has been started to extend the interurban railway of the St. Petersburg-Tarpon Springs Co. to New Port Richey.

**TARFON SPINGS, FLA.**—Application has been made to the City Council, it is reported, by James H. Murphy, for a franchise to light the streets of the city.

**BRISTOL, TENN.**—The Edmondson El. Co., of Meadowview, Va., has applied to the City Council for a franchise to supply electricity in Bristol. The company is constructing a dam on the Middle Fork of the Holston River near Meadowview.

**CHATTANOOGA, TENN.**—The Southern Ry. Co. has begun the installation of about 30 miles additional of automatic electrical block signal system, containing the same in use from Chattanooga to Citico, and from Atlanta to Howell. Power stations are being erected at Sevier, Brainerd, Howell and Austell.

**GAYLESVILLE, ALA.**—The Walker El. Co. of Rome, is reported to have submitted a proposal to the city council to install electric-light plant, water-works system and ice factory in Gaylesville.

**WEST BLOCTON, ALA.**—Plans are being considered by the Hills Creek Mining Co. for the installation of electric generating machinery in connection with its steam power plant to supply electricity for its own use and for lighting the town.

**MANSFIELD, LA.**—The Mansfield El. Co. is in the market for a gas engine directly connected to a 100-kw, 2300-volt, three-phase generator, with exciter. For details see proposal columns.

**FAIRLAND, OKLA.**—Within the next few months the Fairland Lt. & Pwr. Co. expects to install a 2-hp. and one 1-hp. boiler, new switchboard and instruments; also to purchase one 4-kw, 110-volt direct-current exciter, five transformers, two lighting fixtures and two meters. Floyd Roberts is superintendent.

**MUSKOGEE, OKLA.**—The City Commissioners, it is reported, are contemplating installing electric generators in the engine room of the municipal water-pumping station to supply electricity for the proposed street-lighting system.

**EL CAMPO, TEX.**—The Central Service Co., controlled by Henry L. Doherty & Co., of New York, it is reported, will take over the property of the El Campo Wtr. & Lt. Co. The owners, it is understood, contemplate improvements to the water and light plant, involving an expenditure of about \$50,000.

**MART, TEX.**—Plans are being considered by the City Council for improving the municipal electric-lighting system.

**PANHANDLE, TEX.**—A company, it is reported, is being organized to establish an electric-lighting plant in Panhandle, to cost about \$3,500.

**WACO, TEX.**—The Texas Pwr. & Lt. Co. is planning to erect a system of transmission lines to a number of towns in Central Texas from its new power plant in Waco. Energy for operating the system of inter-urban railways of the Southern Trac. Co. will be supplied by the new station.

**YORKTOWN, TEX.**—The property of the Southern Utility Co., consisting of an electric-light plant, has been purchased by the Southern El. Co., which will take over the property Feb. 1, 1915. E. A. Clousnitzer is manager of the Southern Utility Co.

## Pacific States

**SEATTLE, WASH.**—The Lake Burien & Southwest Improvement Club will petition the City Council for an extension of the municipal electric-lighting service into that section of the city. Sufficient contracts, it is said, have been signed to warrant the extension.

**TACOMA, WASH.**—An ordinance providing for the installation of a lighting system on D Street, between South Seventh and South Seventeenth Streets, has been passed by the City Council. The cost of the work is estimated at about \$17,000. Bids for installation of the system, it is understood, will be asked for about the first of the year.

**BAKER, ORE.**—The proposal to issue \$57,776 in bonds for the construction of a

municipal electric-light plant in or near Baker and for the installation of a distributing system will soon be submitted to the voters. Preliminary surveys and estimates have recently been made by L. R. Stock, city engineer.

**HELIX, ORE.**—The installation of a small electric-light plant, consisting of a 22-hp crude-oil engine and generator, equipped with storage battery, is being promoted by Freuler & Dyer, engineers, of Walla Walla.

**LEBANON, ORE.**—Application has been made to the city of Lebanon by Scroggin & Washburn for a franchise to install and operate an electric-light plant.

**YAQUINA, ORE.**—The Yaquina Bay El. Co. has increased its capital stock from \$20,000 to \$40,000, the proceeds to be used for improvements and extensions to its system. The headquarters of the company are in Vancouver, Wash.

**LOS ANGELES, CAL.**—An ordinance has been passed by the City Council requiring all wires placed underground on Los Angeles Street between Alameda Street and the southerly limit of Plaza Street.

**OKADALE, CAL.**—Plans are being prepared, it is reported, for the construction of an electric railway (50 miles long) by the city of San Francisco to connect by rail direct with the Hetch Hetchy Valley. Power for operating the proposed railway will be developed from the water falls.

**PASADENA, CAL.**—A movement has been started among the property owners on North Fair Oaks Avenue, between Hammond Street and Washington Street, for the installation of ornamental lamps.

**SAN FRANCISCO, CAL.**—Arrangements have been made for lighting Fourth Street whereby the property owners are to furnish the electrolators and the city maintain the lamps. The present plans provide for 48 lamps.

**SAN FRANCISCO, CAL.**—Recommendation has been made to the Board of Supervisors for the installation of a new lighting system on Van Ness Avenue, to cost about \$25,000. It is proposed to attach the lamps to the street railway trolley poles.

**SAN FRANCISCO, CAL.**—The Board of Supervisors has authorized Mayor Rolph to enter into an agreement with the Panama-Pacific Exposition Co. whereby permission is granted the Exposition officials to use a lot at Grove and Polk Streets in the Civic Center property as a site for a temporary power house for a period not to exceed 12 months. The building will be used to supply power to the municipal auditorium.

**CALDWELL, IDAHO.**—Arrangements have been made whereby the citizens of Wilder and Greenleaf have agreed to take the bonds of the Caldwell Trac. Co. for the purpose of providing funds for equipping the Wilder branch of the Oregon Short Line for electrical operation.

**BEAVER, UTAH.**—Owing to increased demand for electrical service by the various mining companies operating in Beaver, Millard, Sevier and Piut Counties, the Beaver River Pwr. Co. is contemplating the construction of an additional power plant on the Beaver River, about 5 miles below the present plant. The erection of several miles of transmission lines is also under consideration.

**SALT LAKE CITY, UTAH.**—Energy generated at the plant of the Granite County Power Co. will be transmitted to the property of the Royal Basin Mining & Milling Co., at Royal Basin, Mont., a distance of 6 miles, which will be used to operate the machinery and equipment at the mine. Several small towns in the vicinity of the mine will be supplied with electricity and the line may eventually be extended to

Drummond, Mont. John D. Fields is manager of the Royal Basin company.

**BOZEMAN, MONT.**—The installation of a new street-lighting system is under consideration by the Retail Merchants' Association of Bozeman. For further information address the city clerk.

**SANTA FE, N. M.**—James A. French, state engineer, has approved the application of John Borradaile, of Santa Fe, representing the White Rock Hydro-Electric Co., asking permission to develop water-power in White Rock Canyon, 15 miles from Santa Fe. Electricity generated at the proposed plant will be transmitted to Santa Fe, Albuquerque, Las Vegas and Socorro.

## Canada

**VICTORIA, B. C.**—The Vanderhoof Pwr. Co. has applied for permission to take 100 second-ft. of water from Stoney Creek and store it for power purposes.

**PILOT MOUND, MAN.**—The Town Board has endorsed a proposal to establish an electric-light plant. The board will be asked to grant a 20-year franchise for installing the plant free from taxation.

**MONCTON, N. B.**—Arrangements are being made by the Moncton Tramways, El. & Gas Co., it is reported, for lighting the streets of the villages of Lewisville, Sunny Brae and Humphries. The question of extending the street railway to these villages is also under consideration. E. B. Resor is general manager of the Moncton Tramways, El. & Gas Co.

**BRAMPTON, ONT.**—The Chinguacousy Township Council has authorized the town of Brampton to take charge of the installation and operation of its electric-light and power system.

**LAMBETH, ONT.**—The ratepayers have voted to appropriate \$4,000 for the purpose of securing a hydro-electric service from the Hydro-Electric Power Commission.

**LANDSOWNE, ONT.**—The village of Landsowne has decided to ask the Hydro-Electric Power Commission to extend its transmission lines to Landsowne and furnish electricity here.

**MOUNT FOREST, ONT.**—A by-law will be submitted to the ratepayers on Jan. 1 authorizing the Town Council to negotiate with the Hydro-Electric Power Commission for a supply of hydro-electric power.

**MONTREAL, QUE.**—Provision is made in the budget of the lighting department of the City Council for an expenditure of \$50,000 for improving the lighting system on St. Catherine and Huron Streets. An expenditure of \$2,000 for the installation of a new police-alarm signal system, designed by A. Parent, city lighting department, is also proposed.

**QUEBEC, QUE.**—The city of Quebec will petition the next Legislature for power to enable it to take over the plant of the Dorchester El. Co., of Quebec, to be owned and operated by the municipality.

## New Incorporations

**UPPER SAUCON, PA.**—The Upper Sauccon El. Co. has been chartered with a capital stock of \$10,000 for the purpose of installing electric lighting in Upper Sauccon Township. The company is a subsidiary of the Lehigh Navigation El. Co. Upper Sauccon has not a post office.

# Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED  
DEC. 1, 1914.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York, N. Y.]

- 1,118,925. HARMONIC RINGER; J. Erickson, Chicago, Ill. App. filed Nov. 30, 1908. For use on gun; series; special knife edge pivot for armature.
- 1,118,926. TELEPHONE SYSTEM RECEIVER; J. Erickson, Chicago, Ill. App. filed March 1, 1910. Magnet of the receiver has a laminated core.
- 1,118,928. DYNAMO-ELECTRIC MACHINE; V. A. Fynn, London, Eng. App. filed June

- 19, 1911. Generator for charging storage batteries.
- 1,118,929. SYSTEM OF ELECTRIC CONTROL; A. Fynn, St. Louis, Mo. App. filed Feb. 26, 1912. For electric vehicles.
- 1,118,935. STATIC FREQUENCY TRANSFORMER; M. Joly, Bourg la Reine, France. App. filed March 29, 1911. Employs transformers of variable and constant permeability.
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- 1,118,941. IGNITION APPARATUS; H. Lyon, Gloucester City, N. J. App. filed June

- 11, 1910. For gas lamps; special form of ignition chamber.
- 1,118,942. IGNITION DEVICE; H. Lyon, Gloucester City, N. J. App. filed Oct. 7, 1910. Has helically formed ignition element.
- 1,118,943. GAS IGNITION APPARATUS; H. Lyon, Gloucester City, N. J. App. filed Dec. 20, 1910. Catalytic lighting means situated in the zone of the pilot.
- 1,118,953. ATTACHMENT CONDUCTOR FOR ELECTRICAL INSTRUMENTS; G. J. Schneider, Detroit, Mich. App. filed Jan. 16, 1911. Protective helix is non-relatively attached to the plugs at the ends of the conductor.





# Electrical World

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## Public Telegraph and Telephone

The Postmaster-General steps into the limelight with another recommendation for the public ownership and operation of telephone and telegraph lines. His failure to have his plans carried out a year ago does not keep him from taking full advantage of the second opportunity offered by his annual report. This time he speaks to reiterate "the firm conviction of the department that telegraph and telephone service is inevitably monopolistic and when operated under private control does not render the maximum of public service at the minimum cost to the whole people." Why did he not consult the Department of Justice so as to be historically correct in his conviction? With much ado the Department of Justice worked out a very careful legal separation of telegraph and telephone service in the Western Union-American Telephone & Telegraph case. They are two services, not one. The contention of the Department of Justice is that they are not inevitably monopolistic. Does the Post-Office Department fail to appreciate the settlement of the long-standing telephone litigation, which President Wilson praised so earnestly? The conclusion forces itself upon us that the Postmaster-General still speaks for himself and for his already convinced department and not for the administration. "Maximum service at minimum cost" is a fine ideal, but "the whole people" do not use the telephone and telegraph. Greater efficiency is found in private operation than in public operation. Better service and lower operating costs come from private operation under adequate regulation than from public operation.

## Safety Rules of Standards Bureau

The increasing scope and activities of the Bureau of Standards are set forth in the report of Secretary of Commerce Redfield, which is mentioned elsewhere in this issue. Regarding one result of these activities, Dr. Stratton, director of the bureau, has written to the *Electrical World* an article which is published on another page. There may be some difference of opinion as to whether or not the bureau is following the logical lines of its development in taking up a matter that affects so many varied interests as do the proposed rules of safety. Since, however, the work has gone so far as to receive an initial publication, it is of the highest importance that, as nearly as possible, it shall meet the requirements of the interests concerned. Dr. Stratton speaks of the publication of the bureau as preliminary and emphasizes the desire that criticisms shall be made. The most important suggestion that he offers bearing on the subject of a general consideration of the

proposed rules by the various interests affected is that a conference be held later for an exchange of views. It is highly desirable that the request for study and criticism shall not pass unnoticed by the state commissions and engineering societies. Without effective co-operation between the interests directly involved in matters of this kind the best means necessary for the adoption of reasonable, satisfactory and workable rules cannot be determined with any degree of finality.

## Public Lighting at Private Expense

Cities have so long imposed on the generosity of their citizens in the matter of public lighting that their officials overlook the fact that that which is paid for out of the public coffers is as nothing compared to that contributed by other sources. It is a reflection on any city when its merchants have to build "white ways" to light the chief thoroughfares properly, themselves shouldering the expense. It is a worse reflection when officials attempt to profit by this private lighting in reducing appropriations for public lighting. But when an official in a city like New York discovers that the metropolis of the Western Hemisphere, which minus its private lighting would be enshrouded in Cimmerian darkness, is over-lighted, we pause for breath. Crime and light have never had anything in common, and no one ever heard of a city that had too much light and too little crime. What all large cities lack is light, and we hope that some day city fathers will look upon appropriations for light as they do upon appropriations for public instruction—as necessary for public good and public defense.

## The Three-Wire Generator

When first introduced as a substitution for the two-wire system, the three-wire system greatly reduced the amount of copper required to be installed in a given distribution network under any assigned set of conditions. It had the disadvantage, however, of requiring two generators to be used at the central station where one was used before. At a later date this objection was overcome either by using a relatively small balancer at the station, to the middle of which the neutral conductor was attached, or by employing a so-called three-wire generator, consisting usually of a full-voltage direct-current generator with an auto-transformer coil connected across taps in the armature winding 180 electrical deg. apart, the neutral conductor being then attached to the middle point of the auto-transformer. In an article which we print this week Prof. O. J.



Ferguson discusses in detail the actions which occur between armature and auto-transformer when the generator is at work. If the load is perfectly balanced, then of course the neutral conductor carries no current and a simple alternating current flows through the auto-transformer, just sufficient to excite it as the primary coil of a transformer without load. When, however, an unbalance occurs on the three-wire system, load current comes on the auto-transformer, which begins to take working alternating currents from the armature. The conditions are somewhat complex, but the author has succeeded in analyzing them in particular cases with the aid of oscillographic records.

### The Electric Vehicle in Europe

From our viewpoint no great enterprise has yet been shown in Europe in exploiting the electrical vehicle, but there is an extremely intelligent interest in it which should count for much in the future. From the records brought forward by Mr. H. Beckmann in a recent issue of the *Elektrotechnische Zeitschrift*, there are not more than 4000 electric automobiles in the whole of Europe, the merest fraction of those which have been put into service in this country. Nevertheless, in some cities there has been real activity in developing the electric-vehicle business. The vehicle-charging stations in Berlin have a yearly output of about 10,000,000 kw-hr., and the larger German cities have already begun to show considerable activity in this particular line. Eastern Europe has been much less progressive and in fact has a very much less automobile traffic of any kind than has the West. The great variations in the price of gasoline on the Continent and the probability of still greater changes have encouraged the use of electric vehicles of late so that more rapid progress is being made than formerly. Of course, at the present moment, when Europe as a whole is at war, there will be lessened activity, but we are inclined to think that the electric vehicle will tend to come to the front since it is about the only kind of automobile which is not being used by the soldiers, and hence is unlikely to be permanently taken over by the governments. Even in the earlier stages of the war gasoline could be obtained only at an enhanced price, and now very little is to be had by anybody except for strictly military uses.

The effect of the automobile charging load on central-station service is found to be exceedingly good as respects the load-factor of the stations, and the aggregate amount of energy used has already shown large possibilities. The Berlin experience has developed some useful figures on the consumption of electrical energy in practice by vehicles of different sorts, running from about 0.2 kw-hr. per km for small passenger vehicles up to 1 kw-hr. per km for 5-ton electric trucks. These figures are, of course, rather exceptionally favorable, being derived from experience with good and level roads. The electric-vehicle business on the Continent and abroad generally is evidently very much in its infancy, yet the data thus placed at our disposal show that

the central stations in the larger Continental cities are thoroughly alive to the needs of the situation, and if the war continues to prevent gasoline from being used for private motor vehicles a considerable extension of the electric service should be manifest. Abroad as here the secret of success is the provision of numerous charging stations where they can be conveniently reached so as to make the supply of motive power very simple even for the private owner of a small vehicle. The provision of charging sets which can be attached almost anywhere and left to do their work of replenishment will relieve the situation very much as regards passenger vehicles. It does not in the least obviate the necessity of convenient supply for the thousands of electric trucks which are in use here and are rapidly coming into use on the Continent. Electrical energy must be rendered as readily obtainable as gasoline before the electric vehicle will fairly come into its own.

### Efficiency of the Gas-Filled Lamp

There is a notable tendency as time goes on toward the rating of the gas-filled tungsten-filament lamps at a lower and lower specific consumption. A consumption of 0.8 watt per candle seemed low in the beginning, but 0.6 or 0.5 is now the order of the day, with broad hints of 0.4 or even 0.3 in the near future. These lamps have been in use for too short a time to show what useful life corresponds to the various specific consumptions, and the most serious question of the immediate future is just what the relation between life and consumption will be. It is an old problem, this balancing of the specific consumption against the life. It was encountered first in the days of the old carbon lamp, again when the excellent metalized filament came into use, and once more for a brief period in the career of the tantalum lamp. There was much discussion nearly twenty years ago as to whether it would not be desirable to operate the carbon filament at a much higher efficiency than usual and allow the lamp to burn out in a correspondingly shorter time, and the same argument may very properly be made about the gas-filled lamp or any other new incandescent unit. The ultimate consumer naturally looks with cheer toward extremely high efficiency. The central station views the subject with some misgiving and the engineer wonders what the situation really is.

On the whole, there is some doubt as to the desirability of increasing the efficiency too much and too rapidly, not because high efficiency is not in principle good but because it may bring with it some rather undesirable qualities from a practical standpoint. For instance, the extreme brilliancy of the filament of an incandescent lamp of very low specific consumption involves the illuminating engineer in some considerable difficulties. The diffusing shades and globes entirely adequate for the ordinary tungsten lamp prove to be too small or too thin, or both, when used with the more brilliant and powerful gas-filled units. A word of caution should be given on this account since it is extremely easy with the new lamp to force a diffusing shade to a brilliancy far

too great for comfortable use. In other words, as the absolute and specific intensity of the source rises more and more an increasing amount of light must be sacrificed in keeping down the intrinsic brilliancy of the visible source. This situation is specially striking in indoors lighting, but it is also not without its effect in street illumination. An unscreened tungsten lamp of the older type can be used in the smaller sizes without unpleasant effect. A concentrated filament lamp of even the same candle-power possesses a brilliancy that many people find disagreeable and is altogether pleasanter when used with a frosted bulb or other means of diffusion. In short, the coming introduction of the gas-filled lamp will create an increased need for diffusing shades of one sort or another. The new lamp possesses many valuable qualities and has come to stay. The main problem is how best to utilize it.

### Wireless in Time of War

The extensive use of wireless telegraphy over distances so long as to pass far beyond national boundaries and over the high seas raised some very serious international questions which have confronted the United States government during recent months. International law, in so far as it is a tangible and codified matter, has not had the opportunity yet to touch seriously on the rights of belligerents with respect to wireless service. It has been necessary to judge the new situation in the light of general principles and of such old precedents as may be fairly applicable. In case of war neutral countries have very wide options in adjusting their relations. Under the Hague conventions they are not even compelled to prevent the exploitation of actual contraband, much less to stop the use of ordinary means of communicating information which may be considered as conditional contraband. On the other hand, while the exportation of military supplies for the benefit of one or another belligerent is not in itself considered a *casus belli*, it is regarded as decidedly "bad form" in international society openly or covertly to help on belligerents, particularly if the neutral country in question is on friendly terms with both sides, as is certainly the case in the present instance. A proclamation of neutrality is generally in terms which make it evident that citizens of the neutral country are expected to keep clear of any acts which tend to destroy the balance of neutrality. President Wilson wisely added to the formal declaration a warning to the people of the United States to abstain not only from overt acts tending to favor one or another belligerent, but also from intemperate or abusive speech tending to disturb the amicable relations which, in this terrific crisis, the country has been trying to preserve with all the nations concerned.

It is the clear duty of any country righteously intending to be neutral to prevent its territory being used as the basis of warlike operations by any belligerent upon any pretext whatsoever. If, for example, a cruiser of one of the belligerents should chase a ship of another

into a fortified harbor of the United States and endeavor to destroy her, the attempt would very probably and properly be met by gunfire from the forts. In other words, a neutral says openly to the belligerents: "Fight in your own territory or on the high seas if you must, but intrude your armed quarrel on my territory at your peril." It is solely on this general principle that the attitude of the United States toward wireless communications has been based. There is no objection to the use of wireless telegraphy except in so far as it may be for the deliberate purpose of directing belligerents in hostile acts.

An attitude of repression of belligerent wireless messages was very promptly taken by the United States and has been held consistently. The chief difficulty has been, not in determining a perfectly fair and definite policy, but in carrying it out so that it would not work hardship in reaching its end. As it happened, estopping the use of transatlantic wireless bore hard upon the embassy of one friendly nation which chanced to be cut off from the ordinary channels of communication. This embargo was promptly lifted as a proper act of courtesy far enough to permit cipher messages between the embassy and its government to be transmitted. Thus the main question regarding wireless communication seems to have been settled in a perfectly straightforward manner. Cables stand in a different category, for the reason that they cannot be used for the purpose of directing hostilities upon the high seas. Messages sent by them, even if bearing concealed information, must be repeated to the belligerent's fleet at its own risk.

### Central-Station Development in Germany

The natural restrictions imposed in Europe by the unusual war conditions upon building and upon the real-estate situation in general are necessarily felt in electrical service. In spite of the most systematic efforts to relieve the business situation, activity in almost every line which concerns the electrical industries has fallen off, especially in those countries most directly and immediately affected by the war. It is peculiarly hard on the electrical contractor and therefore bears seriously upon the manufacturer of electrical supplies. Nevertheless, the electricity works in Germany seem to have risen to the occasion and to have set about carrying out wiring campaigns so arranged as to bear as lightly as possible on the consumer; and hence construction work is still going on and the central-station business is showing much less loss than one would naturally expect. Some of the large municipal plants—for example, that in Frankfurt—are entering actively into the installation business and are accordingly acquiring loads in places previously untouched. The shortage in petroleum products due to their being now held as contraband is also beginning to have its effect so that there will be a stronger tendency toward the further use of electricity on account of the difficulty of obtaining gasoline and kerosene. Altogether the German central stations seem to be showing determination and resourcefulness.



# The News of the Week

## Activities and Events in the Electrical Field— Reports of Meetings—Commission Findings, Etc.

### Illuminating Engineering Society Activities

At a meeting of the council of the Illuminating Engineering Society, Dec. 10, 1914, an extensive report of the status of illuminating engineering education in the colleges of this country was received from the 1914 committee on education, of which Mr. Preston S. Millar was the chairman. The report included: (1) A summary showing the extent of instruction in laboratory work in illuminating engineering at thirty-nine colleges; (2) a complete curriculum for a four-year undergraduate course leading to an illuminating engineering degree; (3) a one-year undergraduate adjunct course; (4) a one-year post-graduate course; (5) a classified list of books in English pertaining to illuminating engineering.

The following resolution was received from the committee on nomenclature and standards, of which Dr. A. E. Kennelly is the chairman:

"Resolved, that it is the opinion of this committee: (a) That the output of all illuminants should be expressed in lumens; (b) that illuminants should be rated upon a lumen basis instead of a candle-power basis; (c) that the specific output of electric lamps should be stated in lumens per watt and the specific output of illuminants dependent upon combustion should be stated in lumens per British thermal unit per hour."

The exhibition booth committee (electric), of which Mr. Ward Harrison is the chairman, submitted a report outlining the conditions under which the society's series of booths, which were designed to present in an attractive way the fundamental principles of good lighting, may be obtained for display in showrooms of central-station companies, at conventions, expositions, etc.

Dr. E. B. Rosa was appointed chairman of the research committee, and Mr. G. H. Stickney chairman of the committee on the time and place for holding the 1915 convention.

The Drexel Institute, Philadelphia, was elected a sustaining member of the society.

### Meeting of Empire State Association

The first of the midyear meetings of the Empire State Gas and Electric Association was held in the Hotel Ten Eyck, Albany, on Dec. 10 and 11.

Mr. J. C. DeLong, the president, called the session to order at 2 p. m. on Dec. 10. The chief subject for discussion was the handling of bill and service complaints. The opening remarks were made by Mr. C. G. M. Thomas, who outlined the practices of his company. Mr. Thomas took up such questions as testing of meters, the adjustment of bills on account of fast and defective meters and the method of notifying the customer, as well as a number of other closely related points. Some of the members outlined their methods and the general discussion consumed the entire afternoon session. At 7 o'clock the delegates dined together at the hotel. There was no evening session.

The meeting reconvened at 10 a. m. on Dec. 11, when a further discussion took place in reference to the complaint question. It had been announced in advance

that one session should be open for the discussion of any subject the members cared to present. A number of interesting points were brought up in this open session, which lasted until 4 p. m.

The secretary, Mr. C. H. B. Chapin, was instructed to send a telegram to Mr. Thomas A. Edison expressing the regret and sympathy of the association in the loss and inconvenience occasioned to him by the fire in his plant. A suggestion was made to the executive committee that uniform practice in the adjustment of bills in the case of wrong meters was desirable and that a tentative scheme might be prepared and distributed among members for their criticism with beneficial results. One of the subjects which received considerable attention was that of consumers' deposits. A plan was proposed for the exchange of information in regard to customers who moved from one locality to another. The executive committee was also asked to take up this question.

### Electrical Energy Exported from Canada

Of the hydro-electric energy generated along the international boundary in Canada more is exported to the United States than is used in Canada, according to a report issued by the Dominion government. The total production of electrical energy in 1913 by Canadian companies with transmission lines extending into the United States was 1,543,464,097 kw-hr., of which 772,597,049 kw-hr. was exported and 770,867,048 kw-hr. was used in Canada. The totals by companies are shown in the accompanying table.

#### KILOWATT-HOURS OF HYDRO-ELECTRIC ENERGY EXPORTED FROM CANADA OR USED IN CANADA

	Exported from Canada	Used in Canada
Canadian Niagara Power Company.....	400,214,908	11,420,020
Ontario Power Company.....	282,123,004	412,597,896
Electrical Development Company.....	42,154,000	191,885,670
Western Canada Power Company.....	23,213,891	39,339,239
Ontario & Minnesota Power Company..	21,649,327	868,856

In addition, a large amount of hydro-electric energy is generated by Canadian companies in the vicinity of Montreal, Toronto, Quebec and Winnipeg. This is not included in these figures, as none of it is exported.

### Opposition to Overhead Wiring Rules of Idaho Public Utility Commission

Lighting men of Idaho are very much exercised over the proposed rules to be adopted by the Public Utilities Commission to govern all overhead-line construction work by lighting, telephone, telegraph and railroad companies. The proposed rules were discussed at Boise, Idaho, on Dec. 4 and 5, at a meeting of the executive committee of the Idaho Power & Light Association, together with engineers of some of the larger companies, lawyers, and others especially interested. The lighting men insisted that the rules proposed by the telephone

companies were so drastic in many of their provisions that the lighting companies could not reach out into the rural communities owing to the excessive cost of construction for transmission and distribution lines. It was also felt that the effect of the new rules would be to drive the lighting companies from the streets and highways in many places and compel them to purchase private rights-of-way. Owing to the differences existing, the Public Utilities Commission postponed action on the matter until Jan. 11. The lighting men insist that if the rules proposed by the telephone and railway companies are adopted and made the law of the State by the Public Utilities Commission the lighting industry will be crippled in several important particulars. The companies realize that safety to human life is the first and most important consideration in all these matters, yet they feel that the rules for line construction can be made so liberal that the electric companies of the Northwest can be utilized in the development of the resources of the country.

To add greatly to the cost of constructing transmission lines and to establish rules that will make it practically impossible to build lines through many of the narrow canyons of the Northwest is, in the judgment of many lighting men, harmful to the mining industry. The lighting men expressed their willingness to cooperate with the commission and with all other interests to the end that the employees of the companies and the public shall have every possible protection. They object, however, to rules which will hamper them in their business, which will not add to the safety of the general public, and which will deprive rural communities of electric service that the companies are ready to give. In reaching out into sparsely settled districts it would be out of the question to employ the same character of construction that would be used in congested districts and cities. In order to make rural circuits feasible the cheapest construction consistent with safety must be followed. Recourse is often had to iron wire circuits strung on poles with twice the ordinary separation. The Northwest Electric Light & Power Association is also deeply concerned with the proposed rules, inasmuch as its activity extends over the States of Montana, Idaho, Washington and Oregon.

### Boston Street-Lighting Contract Signed

The municipal authorities of Boston, Mass., and the Edison Electric Illuminating Company came to an agreement upon a ten-year street-lighting contract at a meeting of the City Council on Dec. 7. Mayor Curley promptly signed the contract, which covers about 4500 6.6-amp magnetite-arc lamps and a considerable number of incandescent lamps of various sizes, ranging from 40 cp to 200 cp, besides a few 1600-cp, 500-watt Thoran flaming-arc lamps used in the illumination of prominent squares.

To attain this price a temporary agreement has been reached on a rate of \$87.53 per 6.6-amp, 500-watt direct-current magnetite-arc lamp per year, compared with \$103.54 under the previous contract. According to the company's schedule, this rate corresponds to a fixed cost per lamp per year of \$36 and to a running cost of 1.6 cents per lamp-hour, with a 10 per cent discount for the ten-year contract. The candle-powers specified refer to mean horizontal values in incandescent lamps and to mean lower hemispherical values in the case of arc lamps. Under the terms of the contract the parties in interest agree jointly to request the Massachusetts Gas and Electric Light Commission to determine whether the prices named (ranging from \$10.80 per lamp per year plus 0.25 cent per lamp-hour running

cost gross for 40-cp incandescent to \$42 per lamp-year plus 3.2 cents per lamp-hour for 1600-cp flaming-arc lamps) are as a whole fair, taking into account length of term, discount and all other pertinent matters. If the board determines that the fair price for the entire service is less than the schedule names, the rates may be reduced by the commission and substituted for the tentative rates above named.

Lamps of any type may be substituted and resubstituted for lamps of any type if the city pays the total net expense to the company of making the changes (credit being allowed the city for the then market value of the displaced property) and if the comparative candle-power (mean lower hemispherical, with lamps equipped for use) is not substantially less than that of those displaced. The fixed-cost price of such substituted lamps is to be the same as that of the lamps displaced, and the running cost prices are to be determined by agreement between the Commissioner of Public Works and the company, subject to arbitration in case of disagreement. To meet possible improvements in incandescent lamps of the gas-filled or other type which may permit such lamps to be operated without increase of watts on circuits supplying energy to 500-watt magnetite-arc lamps, the company will, if maintenance cost is not increased, upon demand of the city and without charge for making the change, substitute such an incandescent lamp for any magnetite lamp at the price established by the Gas and Electric Light Commission. Other provisions are for an eight-hour day for employees on street-lighting work and the release of the city from liability for the unexpired term in case of purchase of the whole or a part of the company's plant. Sixty days' written notice is required to terminate the contract after the expiration of the ten-year period. The prices named in the contract are to date from July 1, 1914, which yields a refund to the city of \$32,652 on the basis of the new rates.

### N. E. L. A. Committee on House Wiring

Twenty persons, representing central stations, manufacturers, contractors, inspectors and other branches of the industry, attended the meeting of the N. E. L. A. committee on the wiring of existing buildings held at Cleveland, Ohio, on Dec. 10. Chairman R. S. Hale, of Boston, Mass., was delayed several hours by a train wreck, and as the opening of the session was belated, time was somewhat limited for discussion of the many topics presented for the committee's consideration. The important report of the sub-committee on the standardization of plugs and receptacles, which had been prepared at an earlier meeting in New York City, was accepted without discussion.

#### Unit Prices for Wiring

Although presented with a quantity of data and reports on unit prices for wiring, the committee felt that the figures obtainable were not in dependable form for comparison. Mr. A. J. Hixon and Mr. Hugo Eisenmenger were accordingly appointed to draw up specifications of buildings of representative types, and to secure estimates of the cost of wiring these in various localities under differing conditions of material and labor prices.

Instead of compiling a special handbook on house-wiring methods, the committee recommended the adoption by the N. E. L. A. of the Cushing manual, adding, if necessary, chapters especially suitable to the needs of the association.

The recommendation that the National Electrical Code be changed to make permissible the omission of the



neutral fuse on grounded three-wire systems was referred to the association's insurance expert, Mr. W. H. Blood, Jr.

#### "Bare Concentric Wire" for Single Circuits and Extensions

Mr. H. R. Sargent reported that the special committee appointed to consider the new "bare concentric wire" (described on page 1134 of the *Electrical World* of Dec. 12) has held several meetings and has prepared an appendix to the Code covering the use of this wire. It is proposed to permit the use of the concentric wire in small buildings requiring only a single (660-watt) circuit and for making extensions in fireproof structures. Mr. W. H. Blood, Jr., is chairman of the committee, and with him are associated Messrs. G. S. Lawler, Washington Devereaux, J. C. Forsyth, A. M. Paddon and Dana Pierce.

A proposal to designate plug and cartridge fuse sizes by different colors, and to have each fuse block marked, upon inspection, with a paster of the proper color, was referred to a sub-committee consisting of Messrs. Hale, G. B. Griffin and J. E. Latta. A proposed change in the Code to allow the use of several large lamps, as, for example, 500-watt units, without separate branch circuits for each, was referred to a committee composed of Messrs. H. R. Sargent and W. Slack.

The next meeting of the committee on house wiring will probably be held in Boston during February.

#### Meeting of Westinghouse Agent-Jobbers

The midwinter meeting of the Westinghouse agent-jobbers was held at French Lick Springs, Ind., Dec. 3, 4 and 5. Matters of mutual interest were discussed and the following officers elected: President, Mr. N. G. Harvey, Chicago, Ill.; vice-president, Mr. S. L. Nicholson, Pittsburgh, Pa.; secretary, Mr. Max McGraw, Sioux City, Ia.; assistant secretary, Mr. H. T. Pritchard, Pittsburgh, Pa., and treasurer, Mr. J. E. McClernon, New York.

The object of the association is to promote close relations between the manufacturer and the agent-jobbers, with a view to providing more efficient avenues for distribution of electric appliances, and to popularize the use of electrical apparatus and supplies, to the end that the purchase of such articles may be made easy and convenient for the ultimate user.

#### C., M. & St. P. Railway High-Voltage Direct-Current System

In connection with the electrification of the Puget Sound division of the Chicago, Milwaukee & St. Paul Railway, mentioned in the Nov. 21 issue of the *Electrical World*, arrangements have been made to obtain a continuous reliable supply of 3000-volt direct-current energy and distribute it to the trains with a minimum investment in substations and feeders. While contracts have been closed for equipment for only 113 miles of the system, it is reported that the railroad company may provide for electrical train operation from Harlowton, Mont., to the Pacific Coast, a distance of 850 miles, if the operating results of the 113-mile section prove as satisfactory as anticipated.

Two No. 4/0 trolley wires suspended side by side from the same catenary at 25 ft. above the rails will be employed to deliver energy to the pantographs on the electric locomotives. Twin conductors have been adopted to reduce the current density at the collector contacts. Although both trolley wires will be suspended from the same messenger, they will be attached thereto

at alternate points by independent hangers. With this construction flashing will be practically eliminated even at speeds of 60 miles per hour, which will probably be attained by the passenger trains. The catenaries will be supported by brackets attached to wooden poles wherever track alignment will permit. On sharp curves and in yards the trolley wires will be attached to cross-span wires. Steel supports will be used in yards where the number of tracks to be spanned is too great for wooden-pole construction.

Perhaps the most interesting part of the locomotive equipment is the control which is arranged to allow regenerative electric braking on down grades. This is a valuable feature, for, in addition to providing the greatest safety in operation, it also returns a considerable amount of energy to the substations and transmission systems for other trains demanding energy. The regenerative braking will be sufficient to limit the speed of the train without applying air brakes except in emergencies or when stopping the train. As the method of electric braking which will be used does not require the pressure of brake-shoes on the rims of the driving wheels, considerable wear on the wheels and tracks will be eliminated. As electric locomotives require inspection only after a run of approximately 2000 miles, they can be employed on longer runs than steam locomotives, which have to be stopped periodically to take on water or coal, dump ashes, clean boilers or undergo petty roundhouse repairs.

It is declared that the locomotives, which will weigh approximately 260 tons, will be more powerful than any steam or electric locomotive yet built. The drawbar pull available for starting trains will be approximately 120,000 lb., assuming a coefficient of adhesion of 30 per cent. The locomotives for both freight and passenger service will be similar in all respects except that the passenger locomotives will be provided with a gear ratio permitting the operation of an 800-ton trailing train at approximately 60 miles per hour. The freight locomotives are designed to pull a trailing load of 2500 tons up a 1 per cent grade at 16 miles per hour.

Each locomotive will be equipped with eight main axles driven by their individual 1500-volt motors. Each motor has one-hour rating of 430 hp or a continuous rating of 375 hp. The motors are twin-g geared to their respective driving axles by pinions mounted on each end of the armature shaft. Sparkless commutation is afforded by equipping the motors with commutating poles and the windings are cooled by forced ventilation.

The electrification of the Puget Sound division of the Chicago, Milwaukee & St. Paul Railway is under the direction of Mr. C. A. Goodnow, assistant to the president, in charge of construction, and the field work is under the supervision of Mr. R. Beeuwkes, electrical engineer for the railway company. All of the electrical equipment is being furnished by the General Electric Company, Schenectady, N. Y. The initial electrification of 113 miles between Three Forks and Deer Lodge will be ready for operation, it is expected, by Jan. 1, 1916, while the rest of the section from Harlowton to Avery will be in operation about Jan. 1, 1918.

#### Developments in Cleveland

At the meeting of the City Council on Dec. 14 the vote of a week previous, refusing the application of the Cleveland Electric Illuminating Company to lay steam-heating mains in the business section, was reconsidered and the application was granted.

The council appropriated \$200,000 for the purpose of constructing a new lighting system in the business section of the city. It is probable that new standards will

be used and an attempt will be made to secure a more artistic display.

The Cleveland Electric Illuminating Company has notified the city of its desire to terminate its contract for furnishing energy to the new high-pressure pumping station, as the municipal plant has erected a substation adjoining the pumping plant. Director of Public Service Benesch has appealed to the company not to terminate its contract and remove the equipment. The municipal plant, he says, is not in position to furnish the needed energy.

### Transportation Plans for N. E. L. A. Convention

A meeting of the transportation committee of the National Electric Light Association was held at the association headquarters in New York on Dec. 15 and 16. Plans for transportation to the convention to be held in San Francisco on June 7 to 11, 1915, were discussed. The following members were present: Messrs. George W. Elliott, chairman; J. C. McQuiston, A. H. Manwaring, H. N. Sibbald, E. C. Bennett, C. H. Hodkinson and G. A. Freeman. Mr. John A. Britton, vice-president and general manager of the Pacific Gas & Electric Company, met with the committee to discuss the plans.

Arrangements have been practically completed for four distinct tours for Eastern delegates to the convention. Three of these will make complete journeys from the East to the convention and return. The fourth tour will comprise only the going journey, leaving delegates free to make their own selection of return routes. The circular tours will go over southern and midtranscontinental lines because the points of scenic interest on the northern lines are not open until after June 15. A new feature is a plan to make scheduled stops at various hydroelectric plants and transmission lines at points throughout the country traversed. The first of the tours will leave the East as early as May 24.

### N. E. L. A. Commercial Section

About a score of members and guests of the executive committee of the Commercial Section of the N. E. L. A. met in Boston on Dec. 14 to discuss the work of the section in the coming year. Chairman E. L. Callahan, of Chicago, presided. Through the courtesy of the Edison Electric Illuminating Company an electrically cooked luncheon was served at 1 p. m. in the large restaurant on the Service Building grounds and a tour of these structures was added to the interest of the day.

The budget for 1915, which was approved with reference to the executive committee of the association, provides for an even broader scope of activity than the section has hitherto undertaken. It was announced that the issue of 125,000 Christmas booklets, "Gifts That Please," had been oversold.

Mr. R. S. Hale, chairman of the N. E. L. A. committee on the wiring of existing buildings, outlined the work which is being done to standardize plugs and receptacles and to stimulate wiring. Mr. R. R. Young, chairman of the committee on merchandising and the recent development of energy-consuming devices, outlined the work under way in this field and stated that the reports bearing on this subject will be ready to submit to the midwinter meeting of the Commercial Section executive committee in New York. Mr. H. C. Cushing, editor of the "Cushing Handbook of Electric Wiring," touched upon the features of the forthcoming edition. The publication committee of the section has underwritten 1500 copies of the manual, which will be sold generally to members of the association.

### Public Utilities Work of the Bureau of Standards

In the annual report of Secretary of Commerce Redfield, covering the year ended June 30, 1914, a section relates to the work of the Bureau of Standards. This section refers to the activities relating to public utilities.

During the year an appropriation was made by Congress to conduct work in connection with public utilities. With the rapid growth of public utility regulation by state and municipal commissions a great number of technical questions have arisen which involve standards of regulation and control. The success of public utility regulation depends upon the carefulness with which it is based upon ascertained measures and standards.

An ideal regulation would involve standards for many details of the service and include the more complex subjects of quality, efficiency, distribution, process and control. This is an extension of the idea of units and standards of measurement of the simpler forms. Practically all divisions of the bureau, the report says, have been at times called upon to meet the demands for information and advice on these subjects.

The bureau has also been requested by state and city governments and public service commissions to assist in research designed to secure more efficient regulation of particular utilities. It is gratifying that the national government has available the laboratory facilities for submitting to rigid laboratory experiment the various technical questions connected with this subject. The bureau during the year has continued its advanced work and field investigation of methods of electrolysis mitigation. The results have been very gratifying.

In connection with electric-light and power service, the principal factors to be prescribed are quality and reliability and the accuracy of meters that measure the current. These may be investigated by experiment and measurement, and the results will be of great value to the public, both the consumer and producer, by making the mutual understanding more definite, thus avoiding suspicion and inefficiency. The bureau serves in a co-operative and advisory capacity as to standards involved. In special cases the bureau experts are asked to visit and study local conditions. The extent to which the regulation of public utilities involves laboratory work, field measurements, and standards is striking, the report declares. For example, the measurement of candle-power involves the plan of testing, the unit of candle-power, the effect of atmospheric conditions, the bases of rating, humidity corrections and corrections for air pressure. All these are measured details affecting the measurement of candle-power.

In the public utilities work the bureau has secured the ready co-operation of engineers, inspectors and local government officials. The bureau thus has available and is accumulating data and experience. It is enabled to tabulate and study such data and draft model regulations which have passed the critical scrutiny of the bureau and the best experts in the country. This enables the utilities commissions to begin upon a technically correct basis. The bureau aims to be in the highest degree helpful to the public, the public utilities companies themselves and the public service commissions which regulate them.

The bureau assists the state legislatures when called upon in connection with the technical details of legislation affecting measurements. These include the units, standards, measuring instruments and methods of measurement of the various public utilities, such as electric light and power service, gas, water and similar utilities, as well as all questions affecting the inspection of trade weights and measures. The various interests concerned, including the public service corpora-



tions themselves, the report adds, have requested the bureau's co-operation in connection with the standardization of these utilities. The bureau is an unbiased institution, ready to serve all concerned, and in general its work is done and its decisions reached only after the fullest consultation with all interested and after consideration of all sides of the subject. In other words, the bureau aims to take up mainly such questions as may be settled by experiment or by direct measurement.

The need for standards of length, mass, capacity, heat, light and electricity is now generally appreciated. Continual care and laborious experimental work is often needed to maintain many of these standards. Specifications for electric energy covering both quality and quantity may often be made even more exact than for materials.

## Work of Bureau of Standard on Safety Rules for Electrical Practice

BY S. W. STRATTON\*

The attention of the Bureau of Standards was drawn several years ago to the need of a thorough investigation of the subject of life hazard in electrical practice. For many years the Underwriters' rules had been in use and had exerted a powerful influence toward securing better electrical construction and reducing the fire hazard, but not sufficient account was taken of the equally important life hazard in these rules. It was evident that the preparation of such rules in a form that would be at once adequate and satisfactory would be no easy task. It was thought, however, that the Bureau of Standards occupied a favorable position for such an undertaking, and the bureau therefore asked Congress two years ago for a special appropriation to enable the work to be done. The appropriation became available July 1, 1913, and the work was begun at once. A few weeks before this, at the request of the secretary of the National Electric Light Association, Dr. Rosa presented to that association a short account of the work we proposed to do, and I quote from his address the outline of the work as then given:

"The general plan to be followed will be the same as that followed in other similar investigations by the Bureau of Standards, namely, to secure the advice and co-operation of those who are best prepared to give valuable assistance and counsel, and then after gathering together a large amount of information and the experience of the managers and employees of electrical operating companies, the manufacturers of electrical apparatus and others, to prepare a comprehensive report on the subject. Following that, or as a part of such report, we shall expect to prepare a statement or a set of rules for the guidance of managers of operating and constructing companies which shall embody what is believed to be the best practice in electrical construction as regards the safeguarding of human life, and a second set of rules or instructions for the guidance of employees for their own protection. In formulating such rules, we shall expect to utilize the best experience and judgment in the electrical industry. It is also hoped to formulate rules in co-operation with state commissions and other representatives of the public in such form that they could be adopted by such commissions or by city councils, to insure, as far as possible, that electrical companies conform to the best practice with respect to the safeguarding of human life."

Dr. Rosa closed his address with these words:

"We shall take up the study in the spirit of investigators, appealing both to experiment and experience, and shall ask you for the results of your extended ex-

perience derived from the various lines of investigation.

"The Bureau of Standards will be very glad indeed to have the official co-operation of this association, as well as the assistance of its individual members, both in planning the work and in carrying it out."

In accordance with the plans as outlined at the N. E. L. A. convention, the investigation has been carried out under Dr. Rosa's direction during the past eighteen months. Mr. W. J. Canada, an electrical engineer who has had ten years' experience in work which has specially qualified him for this investigation, was first appointed, and later two other well-qualified and experienced engineers were appointed to assist in the work.

We began by studying what had been done on the subject to date both in Europe and in America. We collected all the books of rules that have been issued by the operating and manufacturing companies and all the official regulations that have been put into effect anywhere, so far as we could learn of them. We conferred with some of the state commissions, with committees of engineering societies, with the representatives of the National Association of Municipal Electricians, the International Brotherhood of Electrical Workers, the Workmen's Compensation Service Bureau, the National Fire Protection Association, the Underwriters' Laboratories, with manufacturers and with a large number of engineers and superintendents of light and power plants. We studied accident reports and gathered information as to the causes of accidents.

During the first twelve months of the investigation preliminary drafts of four parts of a code of safety rules were prepared, as follows:

- (1) Stations; for generating and substations.
- (2) Lines; for overhead and underground line construction.
- (3) Utilization; apparatus and equipment employed in the utilization of electricity.
- (4) Operation; operating rules for employers and employees, stations and lines.

The operation rules were issued in a preliminary edition as Circular 49 about four months ago and distributed quite widely for criticism and suggestions to be utilized in a revised edition. The bureau has received a great many very favorable comments on these rules as well as many valuable suggestions to be used in the second edition. It is intended to secure the criticism of the three sets of construction rules by a large number of experienced engineers and superintendents as well as workmen and inspectors. Much of this conference work has already been done, and valuable suggestions have been received.

In order that the rules may be made as satisfactory as possible, it is intended to ask the formal co-operation of a considerable number of state commissions and engineering societies as well as the Underwriters' Laboratories, the Workmen's Compensation Service Bureau, the municipalities and the workmen, and it is hoped to hold a conference in Washington to discuss the proposed safety code after it has been brought into such shape that it can be considered approximately satisfactory for a first edition.

These four sets of rules form a code of electrical safety rules which will supplement the Underwriters' rules, and together they will form a complete electrical code. It is proposed that the Bureau of Standards take the chief responsibility in formulating the code of safety rules and subsequently keeping them revised up to date, as the electrical committee of the National Fire Protection Association takes the chief responsibility in formulating and revising the rules for fire hazard. In both cases every important interest affected will be consulted, and suggestions for improvement will be welcome from any source.

\*Director, Bureau of Standards.

It is believed that the Bureau of Standards occupies a peculiarly favorable position to undertake the preparation of such a code. With an able and experienced staff of engineers who will devote their whole time to the work and who can personally keep in touch with the electrical industries all over the country by frequent visits to the manufacturing plants and operating stations, as well as by attending the meetings of engineering societies and their technical committees and conferring with operators, inspectors, workmen and the representatives of state commissions, it is believed that we shall obtain not only full information but also a broad and unbiased view, and that the rules will be better and more acceptable than if prepared by the state commissions acting separately or together, or by the casualty insurance interests, or by the companies, or by the workmen's organizations, or by all of them.

The advantage of a single electrical code prepared from the standpoint of the fire hazard has been abundantly demonstrated. The advantage of a single code of safety rules will be no less real. The Bureau of Standards hopes and expects that the engineering societies concerned will respond to our request for further cooperation as cordially as have most of the state commissions that have taken the matter up, the fire and casualty insurance interests, the manufacturers, the operating companies and the workmen's organizations.

### Hearings on Water-Power Bill

Hearings before the public lands committee of the Senate in Washington on the Adamson water-power bill have continued. Testimony has been presented by Messrs. John A. Britton, vice-president Pacific Gas & Electric Company; W. A. Brackenridge, vice-president Southern California Edison Company; Franklin T. Griffith, president Portland (Ore.) Railway, Light & Power Company; George C. Ward, vice-president Pacific Light & Power Corporation, and others. The testimony of some of the witnesses is indicated in the abstracts published below.

#### Testimony of Mr. Brackenridge

Replying to a question as to whether state regulation in California has been satisfactory, Mr. Brackenridge said that in general he thought it had been so far as his company was concerned. The previous condition, under which rate-making within municipalities was controlled by city authorities, was entirely unsatisfactory. Where there is competition the consumer is the one who must pay in his rate for necessary duplication of property and service. The business of the company increases at the rate of 15 to 16 per cent per annum. The company has over three and one-half years in which to complete the new hydroelectric plant now under construction. It is expected that by the time this plant is completed the demands for power will have increased so that all of the output of the new station will be absorbed. The probability is that the company will have to increase its steam-power facilities also. With some of its most efficient machinery the company has been enabled to get as high as 285 kw-hr. to 290 kw-hr. per barrel of oil.

Mr. Brackenridge said that the company would not proceed with the construction of new plants under the conditions proposed by the bill under consideration. While present conditions are unsatisfactory, he would not give up an unsatisfactory situation for one that was still more unsatisfactory. There is no need of the provision in the bill which would limit the sale of energy to any one concern to 50 per cent of the output generated. That in itself is enough to deter the company

from undertaking to operate under this bill. Mr. Brackenridge suggested that the bill provide for a period of not less than fifty years, although he would be satisfied with a term of fifty years if that was fixed definitely without a condition of recapture.

In the judgment of Mr. Brackenridge as an engineer and operator, if all the systems in California were connected physically and the companies were consolidated financially the whole situation would be very much improved and the consumer would be better served. Citing the experience of the Niagara Falls Power Company, which was justified in proceeding in 1890 with its great development because of the prospect of selling to several large industries without long transmission, the witness said that the condition is not dissimilar in California. The company expects, if it is allowed to develop large powers, to find some one industry to take the entire output from one of the stations. The provision in the bill providing for recapture should be amended so as to make it clear that all of the property belonging to the lessee, whether on or off of government land or in any way affected in the power development, shall be purchased. It should be possible to make contracts for ninety-nine years so as to permit the encouragement of great industries and large investment.

#### Testimony of Mr. Ward

Mr. Ward said that the term should be not less than fifty years, and after the expiration of this period the right should continue until terminated and until compensation has been given for the value of all the property, including transmission lines and contingent properties. Many plants would not have been constructed if there had not been a customer for more than 50 per cent of the energy in the beginning. The bill should provide for acquisition of the property at a fair value and not the depreciated value.

#### Testimony of Mr. Griffith

Mr. Griffith objected to the provision in the bill that no more than 50 per cent of the output should be sold to one customer. That purpose is based upon the theory that monopoly is evil. The old theory of modern regulation is to avoid duplication of investment and by artificial means through the regulatory body to create conditions that were formerly sought to be obtained by actual competition. No public service man in the country to-day who is abreast of the times will raise his voice in protest against regulation.

Mr. Griffith expressed the opinion that further legislation by Congress would be necessary to extend the powers of the Interstate Commerce Commission so as to include the regulation of rates for the transmission of electric energy. It is entirely conceivable that developments may be made where the only possible market at the outset is to sell to a distributing company. If for any reason the company cannot make enough to take care of operating costs and also of obsolescence, these expenses are proper charges against the public because the earnings on the investment are limited by regulation. In most instances, and certainly in the West in the Pacific Coast cities and states, no electric company has earned enough above a reasonable return upon its invested capital to cover the obsolescence and depreciation that has occurred if the company is twenty or twenty-five years old.

Mr. Griffith expressed the belief that it would be unwise on the part of Congress to invade the power of the state to regulate rates and service of electrical energy generated and used within the state. For the proper regulation of interstate companies engaged in the development of water-power there should be co-operation between federal and state governments.



## LIGHTING OF THE HOME

"Art and Science in Home Lighting" Discussed by the New York Section of the Illuminating Engineering Society

At the meeting of the New York Section of the Illuminating Engineering Society held in New York City Dec. 10, Mr. George W. Cassidy presented a paper entitled "Art and Science in Home Lighting." It was pointed out that to illuminate a home properly the lighting must be considered from the esthetic, physiological, psychological and economical viewpoints. To combine the esthetic and scientific ideas properly the architect should co-operate with the illuminating engineer. As every person desires to have his home as beautiful as his means will afford, it is important that the lighting fixtures should be designed to harmonize with the decorations of the respective rooms. From an ocular hygienic standpoint it is important that lamps having high intrinsic brilliancy should be covered by some sort of diffusing medium, or a larger number of low-intensity lamps should be employed. While a lighting system may be ideal from the physiological standpoint it may have an undesirable effect on the occupant of the room. To apply the principles outlined in the foregoing, the author described the manner in which modern suburban or country homes costing from \$5,000 to \$15,000 should be illuminated.

### Discussion

Among those taking part in the discussion were Messrs. A. L. Powell, Norman Macbeth, M. Luckiesh, H. Calvert, L. C. Porter, George Leland Hunter, George H. Stickney and Preston S. Millar.

Mr. Powell pointed out that where large quantities of light are required it is preferable to supply it from a number of sources rather than from a single unit. He questioned the superiority of amber-colored light over other tones, saying that it is advisable to tint fixtures to harmonize with the surrounding decorations.

Mr. Macbeth declared that daylight is far from satisfactory for bringing out the richness of different colors. In homes it is desirable to have soft, warm light rather than the cold, hard light of the noonday sun. He expressed himself as favoring dome fixtures for the dining-room, but declared that it is absurd to arrange the lamps where they can be seen by those seated at the table. A number of stereopticon views were cast on a screen to show the illuminating equipment in several homes. In one room shown candle-type fixtures were installed along the plate rail and mantelpiece to furnish illumination as well as to provide decoration.

Mr. Luckiesh said that there would be a big boom in fixture sales if the manufacturers would combine usefulness with appearance in the fixtures. As many people do not know when their homes are badly lighted, they should be educated to the use of proper illumination.

Mr. Porter suggested methods for converting old fixtures to the more sightly and efficient forms which do not cause eyestrain.

Mr. Hunter pointed out that it is practically useless to depend on any illuminant to produce a certain color effect in a room unless the trimmings and furnishings thereof carry out the same color scheme. The speaker declared that most fixtures are inartistically and improperly designed, and expressed himself as favoring softer light inside. Instead of employing fixtures to illuminate rooms, he advised installing a number of floor-plug receptacles to which portable lamps could be connected.

Mr. Stickney pointed out that if illuminating engineers would get together and compare opinions they could make many suggestions for improving the design of fixtures.

## HIGH-VOLTAGE INSULATION

The Depreciation of Insulators and the Effect of Altitude on Spark-Over Voltage Are Discussed at A. I. E. E. Meeting in New York

Causes of insulator depreciation and the effect of altitude on spark-over voltages were the subjects discussed at a meeting of the American Institute of Electrical Engineers held Dec. 11 at New York City.

### Effect of Altitude on Spark-Over Voltages

In a paper entitled "Effect of Altitude on Spark-Over Voltages of Bushings, Leads and Insulators," by Mr. F. W. Peek, Jr., were given actual test data on the spark-over voltages of various designs of electrical equipment at different air densities and temperatures. Correction factors for different densities were given in order that the spark-over voltage of any piece of apparatus might be computed if its spark-over value at sea level were known. In most cases the correction factors are very nearly equal to the density, assuming it to be 1 at sea level. Cross-sections of the devices to which the curves refer were printed on the curve sheets. Curves were also given showing the relative barometer readings and air densities at different altitudes. Therefore, if it is desired to find the spark-over voltage of a certain type of insulator at a certain temperature and altitude, it is only necessary to refer to one chart to determine the air density relative to that at sea level, then to the data on an insulator of similar design for the correction factor, and finally to the curve sheet to determine the spark-over voltage. The starting point for corona may also be determined in a manner similar to that described for determining spark-over voltage.

### Insulator Depreciation

In a paper entitled "Insulator Depreciation and Its Effect on Operation," by Mr. A. O. Austin, it was pointed out that insulator failures are not attributable so much to fatigue in the material as to depreciation caused by the absorption of water or by the cracking of the dielectric from high internal mechanical stresses set up by uneven temperatures or by the unequal expansions of cement, metal and porcelain. The shape of the insulator parts has a considerable effect on the maximum stresses which will occur. Sulphur fumes in the air appear to attack cement and increase the crystalline growth presumably of calcium sulphate, thereby causing expansion and excessive stresses. Cements may also be forced to expand by the formation of acids caused by static discharge.

In connection with insulator construction the author pointed out that the substitution of a sanded surface for grooves to hold the cement will eliminate high shearing stresses and will be found to furnish equal gripping strengths in every direction. Vibratory stresses, which are most severe in dead-end insulators, may cause a break-down of the dielectric structure. On one of the long-distance transmission systems in this country 1.4 per cent of the insulators out of the 2 per cent shown by a megger to be weak were defective because of lack of vitrification. Apparatus was illustrated which is more sensitive than the megger and therefore preferable for factory tests. Where insulators made up of six or more closely spaced, well-tested sections are employed it is declared that there is little danger of puncture from high-frequency surges.

A formula for operating hazard was also developed giving an idea of the relative economic importance of the number of sections in an insulator, the magnitude of the switching surge and the rate of depreciation as affecting the reliability of the system. A number of curves were shown, one set indicating the advantage of adding enough sections to produce reliability, another

set showing that the operating hazard increases very rapidly with the increase in the rate of depreciation, particularly if the insulating material is designed to withstand pressures only slightly above the surge voltage, and a third set showing how discharge points will improve the factor of safety of insulators having only a few sections but not one containing a long string of units. From these curves it was pointed out that it is more economical to install reactance or resistance in switching circuits than it is to increase the total insulation of the system. As depreciation is likely to reduce the total number of good units in a string, it is advisable to employ discharge points to allow the remaining good sections to flash over rather than puncture.

#### Discussion

Among those taking part in the combined discussion of the two papers were Messrs. H. L. Curtis, D. B. Rushmore, E. D. Eby, P. W. Sothman, Selby Haar, Paul M. Lincoln, Charles P. Steinmetz, E. E. F. Creighton, Farley Osgood and the authors of the papers.

Mr. Curtis showed by curves that the surface leakage over insulators is affected but little by temperature and voltage, but to a great extent by the atmospheric humidity. With hard rubber which has deteriorated from exposure to light the surface leakage may be multiplied by a factor as large as 10". Waxy materials, such as paraffin and beeswax, change very slightly.

Mr. Rushmore expressed the opinion that the depreciation of insulators will be understood only after a scientific study has been made of the cements and porcelains employed in their construction. He called attention to the need of determining the quantitative value of ground wires, as hundreds of thousands of dollars are spent every year to install them and still nobody knows of just how much value they are. The speaker expressed the opinion that surface leakage has to be taken into consideration in determining this value.

Mr. Eby pointed out that, except in very rare instances, the corrections are not worth considering except as an additional margin of safety. Going further the speaker called attention to the large difference between the correction factor and the density when only one unit of a string of insulators is considered. As the factors of safety usually employed in designing electrical equipment would prevent spark-over at sixty cycles even at the maximum elevation, it was suggested that the data compiled by Mr. Peek be corrected to apply to high-frequency disturbances.

Mr. Sothman said that laboratory tests on insulators show that they alone should not be studied to prevent break-down, as the condition of the atmosphere and the characteristics of the circuit affect the break-down value considerably. He advised using a higher factor of safety than is employed at present, to make insulators more immune to break-down than other parts of the transmission or generating system. The speaker called attention to the fact that in three or four years the percentage of failures due to insulator defects has dropped from 48 to 6 or 7, this being due to the improvement in porcelain. He was of the belief that if transmission engineers and porcelain manufacturers would exchange opinions and observations a substantial improvement in insulators could be made soon. Future development of insulators may be seriously handicapped, declared Mr. Sothman, if insulator specifications are adopted without carefully considering all of the phenomena which affect successful operation.

Dr. Steinmetz said the line should be the strongest part of a system as faults can be located and repaired more quickly in a generating station than on the transmission line. He pointed out that normal line voltage and frequency seldom break down insulators; therefore they should be tested with high-frequency and surge

potentials. Attention was called to the fact that when rapid oscillations are caused by electrical resonance an indefinite voltage and a constant current are produced; therefore the break-down of an insulator tested thereby will depend on the power applied to the circuits. The speaker also called attention to the possible future use of some radiant energy to make porcelain transparent for the study of its internal strain by means of a polariscope and polarized light. By increasing the number of units in a string of insulators the reliability is increased considerably more than the margin of safety. Reliability of operation is also improved by eliminating surges, reducing depreciation of the insulators, and weeding out the faulty units. To locate defective insulators it would be preferable to have apparatus for testing them without de-energizing the transmission line.

Dr. Creighton referred to the limitations of the megger and the high-voltage direct-current method mentioned by Mr. Austin. No matter if insulator faults are due to under-fired porous porcelain or whether the units contain minute flaws, high-frequency power will develop the flaws and will rarely harm porcelain.

Mr. Osgood pointed out that an overhead ground wire is of great value in locating defective insulators; therefore, in considering its installation, the expense should not be assumed to be for protective purposes only.

Mr. Peek suggested that users of insulators inspect them carefully and demand of the manufacturers that not more than 2 per cent of the insulators fail as they come from the kilns. If a few per cent more than this amount should fail, the purchasers should be very suspicious of the insulators and perhaps condemn the whole pile. The speaker also pointed out that most insulator failures occur on low-voltage lines, rated between 20,000 volts and 40,000 volts, because the insulators are designed for the operating voltage, whereas they should withstand the lightning voltage which really causes the damage. He also spoke briefly of impulse tests on insulators, the voltage being measured fairly accurately by a sphere gap. The impulses referred to had a maximum value of about 1,000,000 volts and a duration of one one-millionth of a second. With each application the insulator "arcs over" much the same as if it were subjected to a lightning surge. The speaker called attention to the differences in the results which are obtained with high-frequency tests. While the difference between results is large it should not condemn any of these methods but should call attention to the fact that results should be differentiated.

Mr. Austin pointed out that an insulator which is dielectrically weak will have a larger factor of safety at high altitudes than at sea level, because flash-over will occur at a lower voltage. As the cost of line insulation varies as the square or cube of the cost of the station insulation, depending on the protective apparatus employed, it is advisable to use low factors of safety in the station to prevent damage to line equipment. Line surges may be damped to a considerable extent by inserting resistors in the circuits to prevent enormous rushes of current which occur during high-frequency disturbances. With enormous amounts of power back of a system in which the damping is small, it is advisable to remove an arcing ground from the system as soon as possible in order to prevent damage to any of the equipment. The effect of applying a high voltage to an insulator may not be noticed immediately but will probably start faults which are later developed by the operating voltage and mechanical stresses. If insulators are dielectrically weak, considerable protection against lightning will be afforded by employing a ground wire. Insulators are now made, however, which are practically lightning proof.



## PUBLIC SERVICE COMMISSION NEWS

## New York Commissions

Further testimony was taken by the New York Public Service Commission, Second District, on Dec. 9 and 10 in regard to the valuation of the property of the New York Telephone Company. Mr. Martin W. Littleton acted as special counsel for the commission in place of Daniel D. Murphy, who died recently. Among those who testified were Dr. William McClellan, consulting engineer for the commission; Mr. Milton B. Ignatius, Mr. Sergius B. Grace and Mr. Dean Langmuir.

## Missouri Commission

The Missouri commission has ruled that the Pierce City Farmers' Mutual Telephone Company is not entitled to a rehearing of its petition to engage in business. The commission ruled that the Missouri & Kansas Telephone Company was giving satisfactory service at reasonable rates, and that there was not enough business to justify the entrance of another telephone company into that field. The commission suggested that in the very essence of things a local telephone exchange was a monopoly, and the greater the monopoly the better the service, the cheaper, the more convenient, with the least disturbance of streets, etc. Competition, the board said, was to be avoided in telephone service wherever possible.

## Indiana Commission

The commission has taken under advisement the case in which Ingwald Moe and others at Gary, Ind., have petitioned to be allowed to construct a new lighting plant at Gary in competition with the Gary Heat, Light & Water Company, which now obtains its supply of electrical energy from the plant of the Illinois Steel Company.

The city of Indianapolis, through Corporation Counsel W. A. Pickens, has filed with the Public Service Commission a petition asking that the Central Union Telephone Company and the Indianapolis Telephone Company be required to connect their physical plants. According to one member of the commission, the only parties who may petition for physical connection of telephone plants are the utilities directly interested. Other commissioners, however, say that they believe that the question must be passed upon by the courts. The section of the utility law applying to physical connections specified "interested parties" as those who may start such an action.

## District of Columbia Commission

An answer by the District Commissioners and the Public Utilities Commission in the suit instituted by the Potomac Electric Power Company and the Washington Railway & Electric Company to prevent the commission from enforcing corporate separation of the properties has been filed in the District Supreme Court by Corporation Counsel Syme and Assistant Corporation Counsel Stephens. The answer declares that under the public utilities law the commission is empowered to compel the Potomac Electric Power Company so to keep its accounts and records that they will show the cost of manufacture and distribution of electric energy and also losses in distribution. It declares that the exercise of this power is solely in the public interest. It declares that ownership by the Washington Railway & Electric Company of the entire stock of the Potomac Electric Power Company is contrary to law and has been used for the purpose of making the railway company the beneficiary of the property and franchises of the power company as though it had the legal title thereto.

## Current News Notes

**WASHINGTON JOVIANS MEET.**—At the annual meeting of the Jovians of Washington, D. C., the following officers were elected: Statesman, Mr. J. C. McLoughlin; tribune, Mr. Thomas Fisher; secretary, Mr. W. B. Hadley; treasurer, Mr. C. O. Reed.

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**WASHINGTON WANTS ELECTRIC-VEHICLE MEETING.**—The Washington branch of the Electric Vehicle Association, at its meeting on Dec. 10, appointed a committee for the purpose of trying to get the association to hold its next annual convention in Washington.

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**DIFFERENCES OVER CONTRACT IN FRANKFORT, KY.**—Differences have arisen between the city of Frankfort and the Kentucky Public Service Company. The city demands immediate compliance with an alleged contract to furnish it with 2000-cp arc lights. Attorneys for the city claim to have discovered that neither the company nor its subsidiaries ever had franchises.

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**PIONEER SAFETY WORK.**—Mr. J. E. Latta, of the Underwriters' Laboratories, Chicago, addressed the St. Louis League of Electrical Interests, Jovian Chapter, Dec. 15, on the topic of "Pioneer Safety Work." Mr. Latta referred to the national fire waste and the loss of life due to industrial accidents, and spoke in particular of the work done by the Chicago laboratories in making electric service safe.

\* \* \*

**JEWELER ADVERTISES HIS "WIRELESS" CONNECTION.**—Mr. E. L. McDowell, an Arkansas City (Kan.) jeweler, has prepared a halftone reproduction of his store, above which a "wireless" aerial projects very prominently. Using this illustration on letterheads and in advertising, Mr. McDowell makes the claim of being the proprietor of the first jewelry store in the United States to receive time signals daily by wireless.

\* \* \*

**WATERPROOF BINDING COMPOUND.**—Mr. J. E. Warner read a paper entitled "Flexible Compound and Its Uses" before the American Society of Engineers, Architects and Constructors at its regular monthly meeting in New York, Dec. 10. The compound which Mr. Warner described is an oil product and is used to bind pigments in paint and to render the paint moisture-proof. The speaker declared that the product can be applied to anything, from the finest silk to structural iron, and can also be used as an insulating compound.

\* \* \*

**STATISTICS IN BUSINESS.**—Mr. N. C. Kingsbury, vice-president of the American Telephone & Telegraph Company, made an address on "The Special Service of Statistics to Business" at a dinner of the American Statistical Association held at the Yale Club, New York City, on Dec. 11. Other speakers were Messrs. Henry Bruère, chamberlain of the city of New York, on "The Potential Value of Statistics in Shaping Rational Public Opinion"; Mr. Carl M. Hansen, secretary of the Workmen's Compensation Bureau Service, on "The Need for Standardization in Accident Statistics"; Mr. Osmond Phillips, editor of the *New York Times Annalist*, on "Statistics for Public Consumption," and Mr. F. H. Dixon, chief statistician of the Bureau of Railway Economics, on "Statistics of Railroads." To further the development of statistics as a factor in the settlement of current business problems a special committee was appointed. This committee will report at the annual meeting of the association to be held at Princeton, N. J., on Dec. 28 to 31.

## Hydroelectric Development on Bishop Creek, Cal.—X

**Conclusion of the description of the Southern Sierras transmission system—The steam plant at San Bernardino—Typical outdoor substations—Imperial Valley line. By C. O. Poole**

OWING to the long distance from the hydroelectric plants to points of delivery in southern California, it was early seen that an auxiliary steam plant would have to be erected near the lower end of the system to steady the load and insure against shut-downs. San Bernardino was chosen as a good location and accordingly became the terminus for the tower line from the Bishop Creek plants. Enough property in the southwest of the town inside the city limits was secured for the erection of the steam plant with room to make future increases should these become necessary.

From a study of the various prime movers it was decided to use a steam turbine, as the all-day economy by so doing promised to be higher than could be obtained otherwise. Preliminary designs and specifications were drawn up in 1911, and bidders were requested to supply designs and specifications suitable to the apparatus they proposed supplying, with guarantees as to the economy. Messrs. Charles C. Moore & Company, of San Francisco, obtained the contract, which included a 4500-kw Allis-Chalmers steam turbine directly connected to a 5000-kw generator wound for 6600 volts and operating at 1800 r.p.m. under a steam pressure of 180 lb. per square inch at the throttle, four 500-hp Stirling water-tube boilers, and Wheeler surface condensers. All auxiliaries, piping and oil-burning apparatus, a 2500-barrel oil tank, a pump house and a cooling tower were also included in the contract.

Early in 1912, on account of the rapidly increasing load, it was decided to double the maximum output of

the plant by the addition of a 5000-kw General Electric steam turbine directly connected to a 5000-kw generator, three 500-hp Stirling water-tube boilers, making a total of seven, another cooling tower and a duplicate set of auxiliary apparatus. The building is of concrete steel with concrete steel roof, supported by 20-in. steel I-beams in place of the usual steel trusses. Figs. 77 and 78 show interior views and Fig. 76 an exterior view of the station. The boiler fronts toward the turbines, no partition wall being built between the boiler and turbine rooms. Thus the engineer on watch has the entire floor at all times under his supervision. Water for condensing is obtained from a deep well and after being pumped through the condensers is dropped through the cooling towers.

The matter of cooling the water has been a very difficult problem as during the hot weather the temperatures frequently rise for days to 100 deg. Fahr. and over. Some changes are now being made in the towers that will when completed more than double their rating. The value of the steam plant has been demonstrated on several occasions when through accidental or intentional cutting off of the hydro plants the regularity of the service has been maintained.

### Substations

Each of the sectionalizing stations of the tower line is made a substation as well as a switching station.

Four three-pole Bowie switches on 45-ft. towers are placed in each circuit for the purpose of sectionalizing,

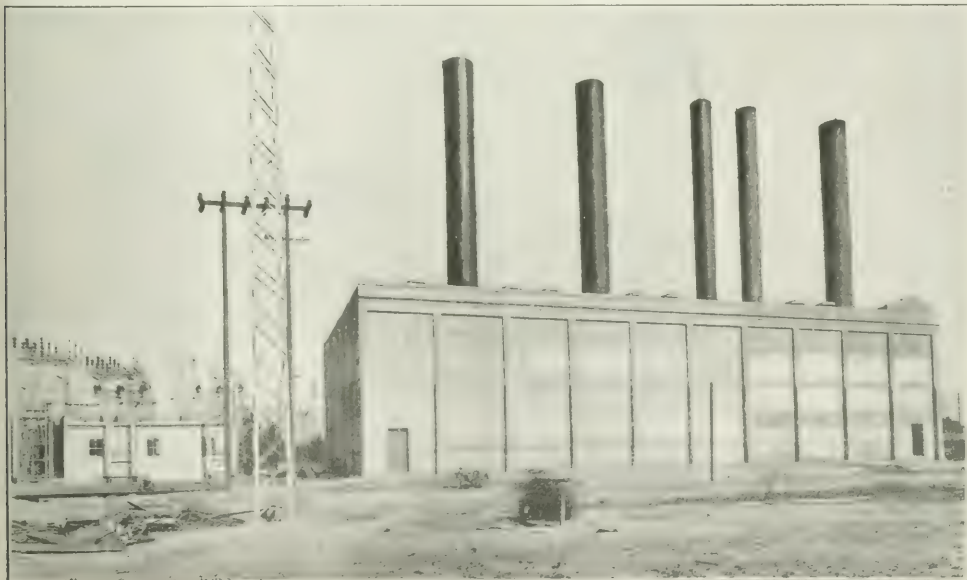


FIG. 76—EXTERIOR OF SAN BERNARDINO STEAM STATION





FIG. 77—TURBINE ROOM IN SAN BERNARDINO STATION

and a paralleling station bus with single-pole disconnecting switches at either end is erected at right angles to the lines and connected to them by vertical jumpers. This cross-bus is divided into two sections by disconnecting switches at the center of the switching plant. The disconnecting switches used in these installations are of special design and are a development of the company. They are mounted on a structure composed of several A-frames supported by diagonal bracing and consist of an angle-iron trussed blade supported at the hinged end by horizontal strings of suspension insulators and a set of jaws supported in a similar manner at a distance of 5 ft. above the lower strings. One of these switches is shown in Fig. 82. By the use of the standard line insulators the cost of the switch has been kept low, and the fact that the insulators are from tower-line material stock makes the replacement of a broken unit very simple and insures repair parts being always on hand. At one end of the station bus is the bank of lowering transformers, and at the other end a set of electrolytic arresters is installed. Each station is strictly of the outdoor type, with all switches and buses supported by structures of galvanized steel.

Three 500-kva water-cooled transformers are installed at these stations.

These transformers are of Allis-Chalmers make and are wound for 87,000/36,000 volts, with a 55,000-volt tap on the high-tension winding and small percentage-reducing taps on both high-tension and low-tension windings. Distribution from the stations is at 33,000 volts, each of the distributing lines being protected by an automatic oil circuit-breaker at the station.

The transformers are mounted on concrete piers, and at right angles to the greater dimension of the piers is a transfer track upon which is a large truck. By the use of smaller trucks under each transformer it is an easy matter to move a transformer from its location if repairs are necessary. At one end of the transfer track a lifting rig is erected over a concrete-lined pit that, with dimensions of 9 ft. by 9 ft. by 16 ft., will accommodate the case of the transformer. The transformer is lowered into the pit by means of a hand-operated winch fastened to one of the legs of the gallows frame structure over the pit.

At the Inyokern station a building is erected above the hoisting arrangement large enough to serve also as a warehouse shop, garage and switchboard room.

Figs. 79, 80 and 81 show typical outdoor stations, these being the Lone Pine, Inyokern and Randsburg plants.

#### San Bernardino Substation

The San Bernardino substation, situated at the southern extremity of the tower line, is in most respects similar to the intermediate substations. The two lines terminate on 140,000-volt Bowie switches, mounted on extra heavy dead-end towers, tying in through them to a station bus. To this bus are connected the station transformers and lightning arresters. Three 4000-kva transformers of Allis-Chalmers make are installed at this station, and provision is made for three more of the same rating. The transformers now installed have three distinct windings—that is, a high-tension winding for 87,000 volts with a 55,000-volt tap, an intermediate winding for 36,000 volts with smaller taps, and a low-tension winding for 6600 volts, the latter be-

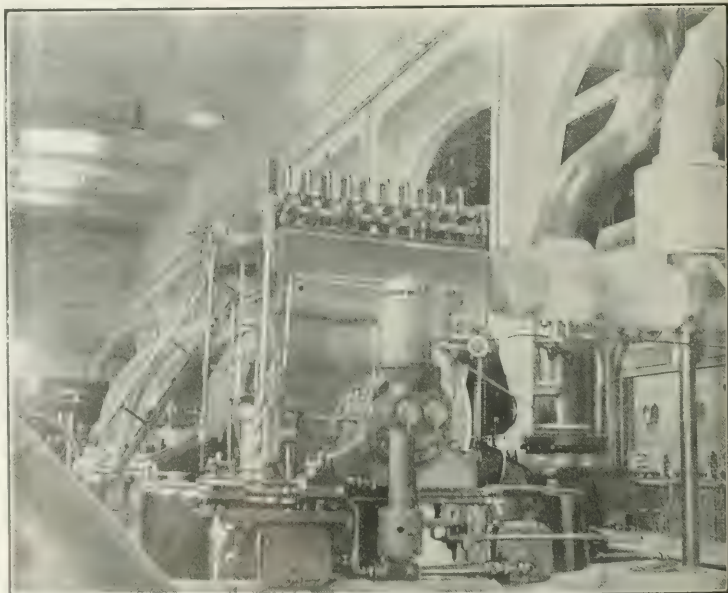


FIG. 78—5000-KW TURBO-GENERATOR IN SAN BERNARDINO STATION

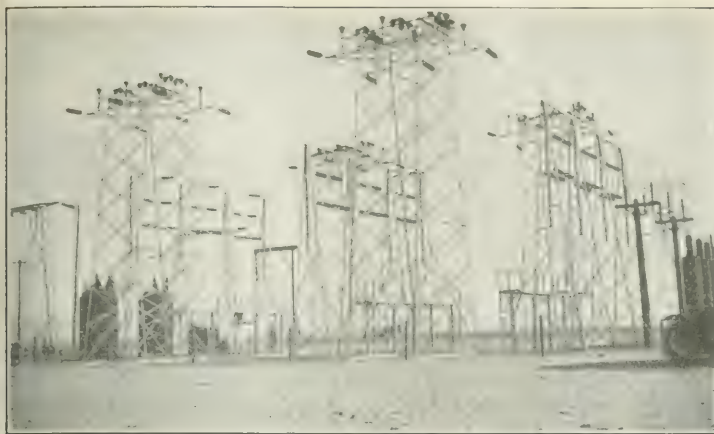


FIG. 79—SUBSTATION AT LONE PINE

ing the generating voltage of the reserve steam station which is situated near the substation. Owing to the proximity of the steam plant, a transfer truck is provided for moving any of the transformers into the station if necessary to repair or overhaul them. After a transformer is taken into the station a 40-ton jib crane is used to lower the transformer into a pit and disassemble it.

At this substation there is a set of shunt inductance coils for artificial loading at times when the synchronous machines in the station are off the line and the load on the 33,000-volt feeders is light. These inductors are of the air-core type and are made up of six units. Three Westinghouse three-pole oil switches are provided for putting the coils in service, the switches being arranged with interlocking mechanism so that the order in which the coils are connected to the line will be such that the least possible disturbance will result. The coils have a combined rating of 1900 kva and are connected to the 33,000-volt bus. Their action has proved quite satisfactory, and at the present operating voltage of 55,000 the inductive reactance of the six coils is sufficient to hold the receiving terminal voltage of one of the 240-mile lines down to about normal value.

#### Imperial Valley Line

The latest addition to the system mileage is the extension from the southern terminal of the tower line of the Southern Sierras Power Company to the Imperial Valley. This wonderfully fertile sec-

tion of the country has been handicapped by the inadequate local supply of electricity, a condition brought about by the phenomenal growth of the towns and industries of the Imperial country.

To supply the needs referred to a line reaching from San Bernardino to El Centro is being constructed. The new line is of wooden-pole construction with No. 000 aluminum conductor, spaced 72 in. in an equilateral triangle, on Locke insulators. The total length of the line is 166 miles, the present voltage of transmission being 55,000.

At Banning, Coachella and Imperial Junction there will be substations of 900 kva rating each, and at El Centro, the southern terminal, three 1250-kva transformers are being installed. The latter are of the General Electric outdoor type with radiator-style cases and three distinct windings for 55,000, 17,000 and 2200 volts respectively. A 2000-kva, 2200-volt synchronous condenser set is installed at El Centro for regulating the voltage at the receiving end of the line. The condenser operates in connection with a Tirrill regulator and will be kept floating on the line at all times.

On account of the extreme heat at El Centro, a canopy covering of corrugated iron is provided for protecting the transformers from the direct rays of the sun. A Kelman oil circuit-breaker protects the El Centro station transformers on the high-tension side, this switch being mounted, as is the one at San Bernardino, on a



FIG. 80—SUBSTATION AT RANDSBURG

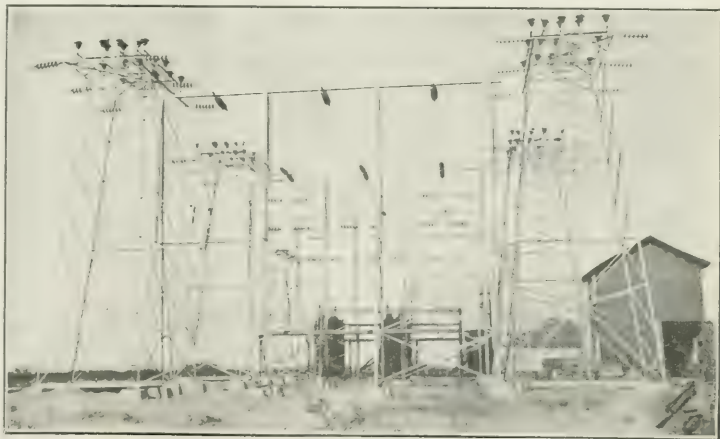


FIG. 81—SUBSTATION AT INYOKERN



30-ft. galvanized-steel tower and fitted with both disconnecting and grounding switches. From the 17,000-volt bus energy is distributed to the neighboring towns of Brawley, Holtville, Calexico and other points. It is intended to change from delta to star connection as soon as the voltage of the system is raised to 87,000.

The foregoing represents a typical hydroelectric system designed to meet the varying and ever-increasing

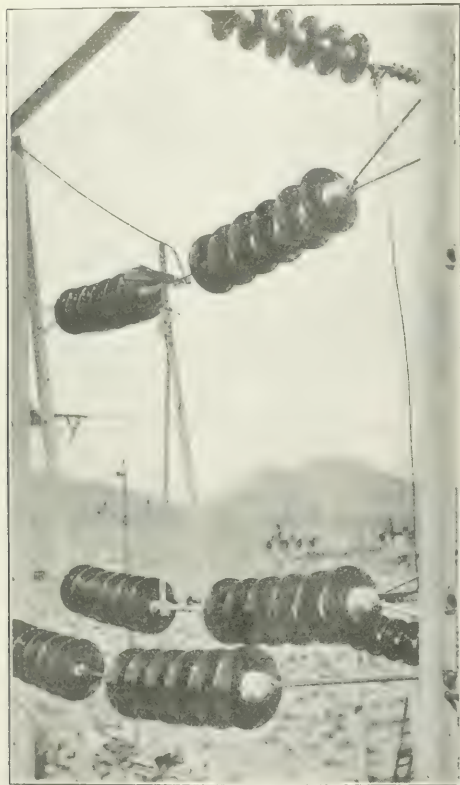


FIG. 82—DISCONNECTING SWITCH USED ON 87,000-VOLT LINES

conditions of service. The author wishes to express his sincere thanks to Mr. R. G. Manifold, engineer, and Mr. R. H. Halpenny, assistant engineer, for assistance rendered in collecting the data and otherwise contributing to the preparation of this article.

### Electricity Versus Steam in Railroad Practice

A New Haven Railroad official is quoted as saying: "Upkeep of electric engines is on the order of 5 cents to 7 cents per locomotive mile per 100 tons of weight. Steam-locomotive maintenance runs anywhere from 8 cents to 25 cents, depending upon nature of the coal and water used—an average figure of 11 cents would not be bad. With regard to pounds of coal burned for electric-engine versus steam-engine haul, a pound of coal burned under the boilers of a central electric station for such traffic will develop twice the drawbar pull that would be developed if the same pound of coal was burned in the firebox of the steam locomotive."

## ELECTRIC AUXILIARIES ON AUTOMOBILES

Three-Unit, Two-Unit and Single-Unit Systems Designed for Lighting, Starting and Ignition Purposes

BY GEORGE T. HANCHETT

THE problems of lighting, starting and ignition on automobiles have created an electrical industry which requires the activities of many large factories, and the larger electrical companies, realizing the extent that the business has attained, have also entered the field.

There is perhaps no more difficult problem to solve satisfactorily than the supply of electricity to gasoline automobiles. Many requirements must be met: First, the apparatus must be reliable; second, it must be light; third, it must conform to limited space conditions and unfavorable surroundings; fourth, it must be cheap, and, fifth, it must comprise both low and high voltage alternating-current and direct-current outputs.

For ignition purposes nothing has proved more reliable than the so-called high-tension magneto. This peculiar machine is a combination generator and transformer. It invariably comprises a shuttle armature revolving in a strong permanent magnetic field in synchronism with the engine that drives it and that it supplies with electricity. A low-voltage coil builds up a current on short-circuit through a breaker opened twice each shaft revolution. The sudden cessation of current within the armature produces an impulse in a high-voltage coil, the output of which is distributed by an appropriate commutator to the spark-plug to be fired. A condenser is usually added to reduce the spark at the breaker and a safety spark-gap is installed to protect the high-voltage circuits. The breaker acts on the crest of the current wave.

So perfectly has this device been developed that the magneto has become one of the most reliable parts of a gasoline automobile. The history of buzz coils, batteries and the like has been so unfortunate that builders have been reluctant to abandon the magneto even when a substantial dynamo and storage battery have become available to provide a practically unailing source of electrical energy. The confidence of many makers is such that they depend on the magneto alone for ignition, discarding the dry battery and spark coil as a dual auxiliary which was popular in the early days of magneto development.

### Systems for Providing Electricity

This merited confidence in the magneto has been a large factor in creating the following systems for providing electrical energy:

- (1) A three-unit system, comprising a magneto, a generator and a starting motor.
- (2) A two-unit system, which may be of two kinds—combined lighting and starting with a magneto, or combined lighting and ignition with a starting motor.
- (3) A single-unit system, in which a single machine as a motor starts the engine and as a generator provides energy for both lighting and ignition.

The single-unit systems are of two kinds—directly connected and geared. The directly connected system comprises a flywheel generator which is quite expensive and usually weighs at least 30 per cent more than the flywheel that it replaces when casing and field magnet are considered. As a motor it is expected to operate at from 90 r.p.m. to 150 r.p.m. As a generator it operates at from 300 r.p.m. to 1500 r.p.m. As a motor it usually consumes from 600 watts to 1000 watts. As a generator it is required to deliver about one-tenth of that power. All of the operations must be substantially the same voltage.

This calls for design conditions which are disadvantageous to the apparatus. The torque conditions are sometimes very severe, especially in new cars that have been shipped a long distance or across the sea, and in cars that have many cylinders or valve sleeves and have had to run for a long time in cold weather. In a test made on a hundred new cars with 35-hp motors, the torque at shipment was measured and found to average 10 lb.-ft.

The maximum torque must be dealt with. The form of the torque curve is of less importance, for, though there is a means of estimating the energy per start, that is very small in view of the short time the starting motor is applied.

Series characteristics are therefore desirable on starting, while for running as a generator the requirements are those of a regulated shunt machine.

The voltage of operation is always low; 6 is a popular standard, but 12 and even 24 have been used, and, as there are no volts to spare if any are to be left to overcome back emf and give speed, the series turns must be bulky and massive.

The writer designed and patented one of the first automobile generators ever built. The object was to store the surplus energy of the engine at times of light load and to feed the energy back automatically when the gasoline engine felt the distress of heavy torques and slowed down in meeting them. The automatic starting feature was incidental, and while recognized as an advantage it was not at that time considered so necessary as it is to-day. The machine performed fully both as generator and motor, and it is not without its advantages, in spite of the drawbacks of weight and cost. It is foolproof and silent, two compelling advantages in automobile work which make the machine popular on high-priced cars. Heavy as it is, it displaces the flywheel and, though it is distinctly heavier than the net than some other types, the difference is not great as at first might be supposed. This generator provides starting and lighting energy in a most satisfactory way, for it is usually coupled with an ample storage battery somewhat larger than required, and the machine, being large in dimensions for its output, must be built into the car and designed with the power plant. A multipolar generator with from six to eight poles is variably used.

For ignition recourse is had to a synchronous make-and-break arrangement, a condenser and a coil, the energy being taken from the storage battery. This system, if well made, is very satisfactory and has but one weakness—the failure of the battery from evaporation and sulphating due to long periods of inattention. This objection has impelled many makers to spend a little more money and install a high-tension magneto, thus providing a two-unit system.

#### Another Form of Single-Unit System

A second form of single-unit system operates on the same electrical principle, but the motor is connected to the engine by chains or gears. The motor speed is higher, and therefore the machine itself lighter and less costly, but it displaces no flywheel weight, and in the net little, if any, gain in weight is had. Being smaller in bulk for the duty, it is easier to design for better efficiency and smaller storage battery. It is, however, more noisy and requires two more bearings and moving parts. Ignition is provided in the same way as in the other unit, and though at first the make-and-break system with coil was used, a separate magneto was eventually installed, so that it may be truly said that genuine single-unit systems are daily becoming rarer.

With one exception, all other automobile electric sys-

tems employ for starting a separate motor which performs no other duty. The duty is so brief that enormous overloads are permissible. Any feasible battery will fail before the motor becomes distressed.

High torque is obtained by a series field and very small clearance. One-sixty-fourth of an inch is used successfully by one maker who grinds his core disks to insure concentricity. Everything can be sacrificed to torque. Sparkless commutation is of secondary consideration. The result is a very light, efficient motor with surprising output, size considered.

The system is complicated by the necessity of mechanically disconnecting the motor after the engine has started, and this requirement often presents formidable difficulties. The small high-speed motor requires a reducing gear often twenty, and seldom less than ten, to one. As a speed of 1000 r.p.m. is not uncommon in automobile engines, it is plain that after the engine starts immediate mechanical disconnection is imperative. The most popular means of connection and disconnection is by clash or sliding gears. This is mechanically barbarous. In transmission work it is bad enough to mesh the gears when the speeds are more nearly alike, but in starter work the speed conditions are either rest for the flywheel gear and an unloaded series motor speed for the meshing gear on starting or extreme tooth speed of both gears at the moment of disengagement.

It is plain that the engaging and disengaging means must be certain and sure or broken gear teeth will result. Needless to say, much sad experience has been gained due to poor design or mismanagement on the part of the user.

One maker has solved the problem by ingenious means. The motor armature slides within the field structure lengthwise with the shaft. It is normally held out of the field structure by a spring. The first action of the series field is to draw the armature into it and slide the pinion into mesh before it is fairly revolving. The revolutions then proceed until the engine takes hold, when the load comes off the motor. The field weakens with the reduced load, and the pinion and armature are retracted promptly and automatically by the spring before the engine has a chance to reach a speed that would endanger the motor. No mechanical levers are needed, only the electric connections. The device has the disadvantage that it must be geared directly to the flywheel, which limits the ratio to nine to one or less, thereby requiring a larger machine. Care must be had to break the electric circuit promptly to avoid series speeding, though a small shunt coil could be advantageously added to prevent a runaway.

Other starting motors of this single-duty type employ double reduction motors. A sliding gear worked with mechanical levers is used and the electric switch is simultaneously closed. The noise of the gears grows in volume as the engine starts until it reaches sufficient magnitude to scare the operator into letting go of the handle, which usually is spring-controlled and retracts the offending pinion automatically.

The makers of these motors have wisely refrained from supplying the mechanical connections. This is left to the automobile designer and his peculiar school of engineering. Necessity and circumstance often cause him to violate successfully all accepted laws of conservative mechanics, yet most of the solutions offered have given a reasonable degree of practical satisfaction.

#### An Offered Solution

An interesting solution of the problem has been offered in the shape of a friction drive on the rim of



the flywheel. This has the doubtful disadvantage of slipping, but when surface velocities are widely different, as they often are, it is a positive blessing. Engagement is instant, and slipping when in engagement can be reduced by the accepted forms of V-groove friction wheels or the employment of composition friction wheels, one of which, made of canvas placed edge on radially under heavy pressure, is notably good.

Still another starting means involves the use of a ball or roller clutch driven by the motor and surrounding the shaft to be started. The engine runs away from the clutch when it speeds. There are no mechanical levers, and only an electric circuit needs to be closed. A shunt coil is of advantage here to prevent series over-speeding when the circuit is held closed too long.

One single-unit system employs sliding gears for starting and switches to a second and more favorable driving ratio for driving the machine as a generator. This effects an economy in the size of the double-duty electric motor but at the expense of some mechanical complication. A coil and breaker in connection with a battery is used for ignition purposes, but the tendency to use a separate magneto is strong and often the customer makes such a substitution.

The next tendency is to obtain energy for ignition and lighting from a single unit, leaving the separate starting motor to do its duty alone. The principle is simple. A generator is synchronously geared to the engine and carries on the end of its shaft a breaker. By the aid of a differential field winding and a small differential cut-out part of the output is used in charging the storage battery without the aid of other regulation in spite of the variable speed at which the unit is driven. Sometimes this regulation is augmented with a potential magnet actuating a vibrator which short-circuits a resistor in connection with the shunt field. A coil in combination with the breaker and battery with a suitable high-tension distributor provides energy for ignition. This system has the advantage of giving a fat ignition spark regardless of speed, but the disadvantage of being wholly dependent on the storage battery, which may suffer owing to the user's neglect.

#### The Three-Unit System

For these reasons the three-unit system has found favor—a generator for generating, a magneto for ignition and a motor for starting, all designed to fit their various duties. The pioneer days scarcely ever found these three things existing separately. The easiest way was to use them. Now the luxuries can become disabled without involving the necessities.

The single duty of the three units permits the best electrical design. The temporary duty of the starting motor permits close clearance and compact structure and very light weight, and the only disadvantage is the complicated and numerous mechanical appliances.

To sum up in tabular form, the following advantages and disadvantages obtain:

Type of System	Advantages	Disadvantages
Single unit directly connected.	Simple, easy to operate, slow speed, reliable, long life.	Weight, cost, ignition on battery; three duties on one machine.
Two units, starting and lighting, directly connected.	As above.	Weight, cost.
Single unit, gears or chains.	Simple, easy to operate, light, compact.	High speed when operating as generator; ignition dependent on battery; three duties on one machine.
Two units, starting and lighting, in one, gears or chains.	As above.	High speed under dynamo operation.
Single unit, gears or chains; two drive ratios.	Light, compact.	Requires skill to operate; apt to be noisy on motor operation; ignition dependent on battery; complicated mechanical connection.

Type of System	Advantages	Disadvantages
Two units, starting and lighting combined; two drive ratios.	As above.	Complicated mechanical connection; requires skill to operate; apt to be noisy on starting.
Two units, ignition and lighting combined; starting separate.	Light, compact.	Complicated mechanical connection; requires skill to operate; noisy on starting; ignition dependent on battery.
Three units.	Light; all machines at best efficiency; non-interference of various duties.	Complicated mechanical connection; needful to operate noisy on starting; difficult to make installation.

It is easy to see that the advantages and disadvantages of all of the systems are so many and varied that it is not surprising that each has many advocates, and as these are often ardent, impelled either by commercial considerations or technical pride, it is well to say in closing that the disadvantages cited are relative and that any of the systems mentioned will give a reasonable degree of satisfaction. The survival of the fittest remains to be determined.

#### Experiments with Crystals of Metallic Selenium

Prof. F. C. Brown, State University of Iowa, Iowa City, in speaking before the American Physical Society on fundamental electro-mechanical, photo-electrical and electrical relations in crystals of metallic selenium, said that his work had shown that light of all portions of the visible spectrum alters the conductivity of crystals of metallic selenium of two systems. Furthermore, when the light is removed the recovery is rapid. If the entire crystal is illuminated, equilibrium is reached in less than 0.2 second. The maximum sensibility for a given amount of energy is in the ultra violet.

Selenium crystals are in equilibrium such that a pressure of 180 atmospheres will increase the conductivity a hundredfold. Specific conductivity of the crystals also increases with the applied voltage. While light action may be transmitted almost undiminished throughout the crystal, pressure effect is not transmitted outside the region affected by the mechanical stress.

The effect of an applied electric potential is not transmitted beyond the region of the electrical stress, nor does it manifest itself except in the direction of the electrical field. The absolute sensibility of the crystals to light increases with mechanical pressure and is proportional to the relative conductivities for corresponding pressures in the dark. If a crystal is partly under pressure, this increased sensibility takes place only at the place where the pressure is applied. But the increase of sensibility holds for the transmitted light action as well as the direct action of light. The action is transmitted in the crystal at a rate greater than 2 cm per second.

#### Internal and External Heating Have Same Effect on Wire

Prof. H. L. Dodge, State University of Iowa, experimenting on the comparative effects of electric heating and external heating upon the elasticity of mild-steel copper and aluminum wire, has found that the effects of internal and external heating are the same. With increases in temperature Young's modulus decreases for all metals, it is declared, with increasing rapidity. Professor Dodge described his experiments before the recent Chicago meeting of the American Physical Society.

# Characteristics of the Three-Wire Generator

Analysis of its behavior when used  
as a balancer in a direct-current  
lighting system. By O. J. Ferguson

THE invention and development of the three-wire distributing system for lighting created a demand for machines or combinations of machines which present, for connection to these three mains, three points—namely, the positive terminal, the negative terminal and also the neutral terminal. With alternating current and the use of the transformer this presents no difficulty. But direct-current circuits preceded alternating-current circuits in commercial application to lighting.

The conditions were successfully met in direct-current practice by numerous devices. Among them may be mentioned the most important as follows:

Two generators were put into series with each other, each one generating the voltage necessary for one incandescent-lamp unit. This is diagrammatically shown in Fig. 1. Equally successful is the combination of a

6. Here the functions of the motor and generator, respectively, change if the load is unbalanced in the opposite sense from that shown. In some cases double-commutator generators are used.

The most successful single-unit system ever devised for this service is called the three-wire generator. Fig. 7 represents one form of this machine. A generator is provided with the ordinary commutator, positive and negative brushes, besides which it has two slip-rings connected at diametrical points of the armature. A compensator is connected across this alternating-current circuit from ring to ring. From the mid-point of this compensator winding a lead is brought out for the neutral connection.

The vector for the alternating-current circuit and the direct-current vector always bisect each other, no matter what the position of the armature (Fig. 8). Hence

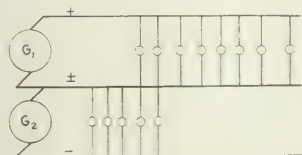


FIG. 1—TWO-GENERATOR SYSTEM

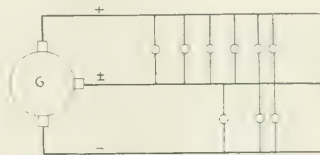


FIG. 3—THREE-BRUSH GENERATOR

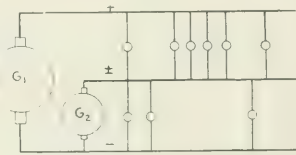


FIG. 5—AUXILIARY GENERATOR

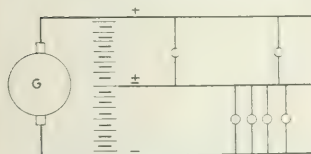


FIG. 2—GENERATOR AND BATTERY SYSTEM

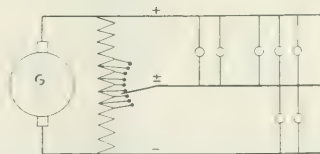


FIG. 4—GENERATOR AND RESISTANCE SYSTEM

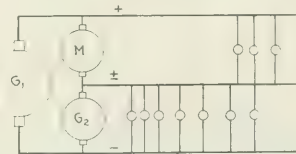


FIG. 6—BALANCER SET FOR THREE-WIRE SYSTEM

single generator with a storage battery thrown across the line, the mid-point of the latter furnishing the neutral lead (Fig. 2). Besides these, various other designs were more or less satisfactory.

Three brushes may be used as in Fig. 3. This has the disadvantage that it places a brush upon the commutator at the most objectionable point—where the coil short-circuited by it is generating a high value of electromotive force. The region in which the auxiliary brush is placed can be made neutral by a suitable design of the generator. This might mean a gap in the pole face.

Resistances may replace the storage battery, as in Fig. 4. It is quite evident that this system must be very evenly balanced or serious losses occur in the resistances. Moreover, the resistances must be high or there will be a heavy current flowing through them even on a balanced load.

An auxiliary generator may be used (Fig. 5), of some capacity smaller than the main generator. A "balancer set" may be thrown across the line as in Fig.

the center point of the compensator winding is always the neutral point of the armature.

If the two points of the armature, A and B (Fig. 7), are not diametrically opposite, the alternating-current vector will revolve tangent to a small circle concentric to the emf circle, as in Fig. 9, and the brush-to-neutral voltage follows a cycle of the form:

$$e = r^2 - a^2 + 2ar \sin \theta.$$

In the circuit of the compensator or reactance coil there will always be flowing an exciting current of such a magnitude as will produce normal flux in the core. This, by design, is kept small.

When the load upon the system is balanced there is no return current in the neutral and, therefore, the only current in the reactance coil is the small exciting current. When the load is unbalanced a current is produced in the neutral, in either one direction or the other, depending upon the direction of the unbalancing.

In order to be explicit, assume an unbalancing, as shown in Fig. 10, where, also, the reactance coil is shown as if connected directly across the armature



permanently and the neutral is brought out from its center point. If this unbalancing amounts to  $2i_0$ , the relation holds that

$$I_1, I_2 = 2i_0.$$

At the connection point  $C$  the current  $2i_0$  divides equally and  $i_0$  is its value in each direction from the cen-

In each section of the armature there flows the current below noted.

$$\text{In } A, \quad i_a = i_2 - i_0 - 0.5I_2 - 0.5i_x.$$

$$B, \quad i_b = i_1 + i_0 + 0.5I_2 - 0.5i_x.$$

$$F, \quad i_f = i_2 - i_0 - 0.5I_2 + 0.5i_x.$$

$$D, \quad i_d = i_1 + i_0 + 0.5I_2 + 0.5i_x.$$

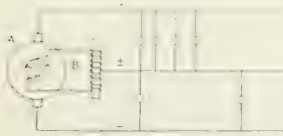


FIG. 7—THREE-WIRE GENERATOR SYSTEM



FIGS. 8 AND 9—VOLTAGE VECTORS, TRUE AND MISPLACED NEUTRALS

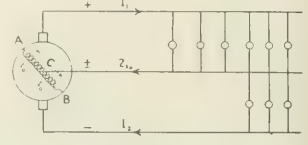
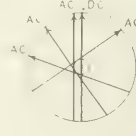


FIG. 10—CURRENT DIVISION IN THE REACTANCE COIL

ter. The relation is most easily seen by referring to the magnetic circuits.

Coil  $AB$  is permanently connected across the armature, and hence has impressed upon it the alternating emf of the machine  $e_x$  (Fig. 12). There flows the exciting current  $i_x$ . A flux  $\phi$  will be set up in the core, lagging slightly behind the current and practically 90 time degrees behind the emf  $e_x$ .

If  $e_x$  is a sine wave, the flux will follow a sine wave of time value also, but  $i_x$  will assume the ordinary excitation current wave of a core where iron is present in the magnetic circuit. The flux will link with both halves of the winding.

If, now, an extra current  $i_0$  is produced in one-half of the winding, in the same direction as  $i_x$ , there will be an increased number of ampere-turns upon that half of the core and the flux will be increased. But the actual total flux must follow the definite cycle shown in the figure. Hence the current in the second half of the winding must be such as will counteract the effect of the extra current in the first half. This means that it must also have an excess current of  $i_0$  in a direction opposed to the exciting current.

When the circuit is followed to the point  $A$  (Fig. 10) another division of current occurs. This partition is not so easily described.

If the circuit at this point be divided and the parts be lettered as in Fig. 13, the current  $i_0$  may be consid-

Of these component parts,  $I_2$  may be made equal to zero by completely unbalancing the load. The exciting current is generally very small and hence only slightly affects the total when that total is anywhere near to normal load. Because of this we may consider without serious error, for a wholly unbalanced load, that currents are:

$$i_a = i_2 - i_0,$$

$$i_b = i_1 + i_0,$$

$$i_f = i_2 - i_0,$$

$$i_d = i_1 + i_0.$$

Moreover,

$$i_0 = i_1 + i_2 = i_3 + i_4.$$

Therefore,

$$i_a = -i_f$$

$$i_0 = i_a + i_b = i_d + i_f.$$

In solving the problems, we may deal either with the component parts,  $i_1, i_2, i_3, i_4$ , or with the real currents,  $i_a, i_b, i_f, i_d$ .

Upon the current distribution in the armature depends the heating, and therefore the rating, of the machine. When no unbalancing occurs the wave-shape of the current in any conductor is rectangular, reversal occurring at each brush. Here the current cycle (Fig. 14) is the same for all conductors.

Dr. E. J. Berg has worked out what the ratings may be when unbalancing occurs, basing his calculations

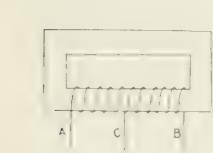


FIG. 11—MAGNETIC RELATION OF TWO PARTS OF REACTANCE COIL

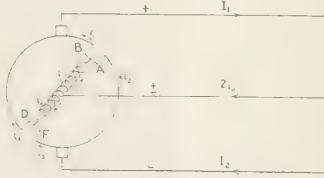


FIG. 13—UNBALANCED-CURRENT DIVISION IN THE ARMATURE



FIG. 12—EXCITING CURRENT IN REACTANCE COIL



FIG. 14—ARMATURE CURRENTS WITH NO UNBALANCING

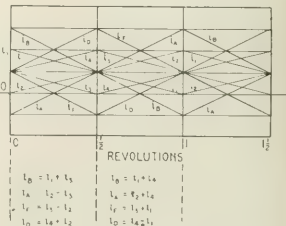


FIG. 15—ARMATURE CURRENTS AND THEIR COMPONENTS, ASSUMING A STRAIGHT-LINE VARIATION OF THE LATTER

ered as equal to the sum of the two components  $i_1$  and  $i_2$ .

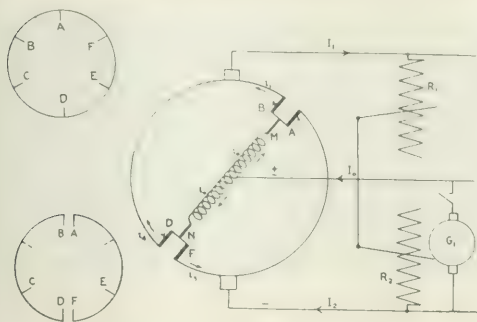
$$i_0 = i_1 + i_2 = i_3 + i_4$$

These currents,  $i_1, i_2, i_3, i_4$ , are not recognizable either by meter or oscillograph, for they do not exist independently.

upon the assumption that the component currents change by the straight-line variation. Such an assumption may be illustrated by Fig. 15. During the first half revolution, counting time from the instant when  $A$  and  $B$  pass the positive brush, we have the conditions already noted:

$$\begin{aligned} i_b &= i_1 - i_1 \\ i_d &= i_2 - i_1 \\ i_f &= i_2 - i_1 \\ i_h &= i_1 - i_1 \end{aligned}$$

When a half revolution has occurred *D* and *F* commute and interchange values, the direction of gradual change remaining the same in each case as it was be-



FIGS. 16, 17 AND 18—NORMAL RING CONNECTIONS OF CONVERTER, SPIRAL RING CONNECTIONS, AND CONVERTER CIRCUITS AS USED IN THE TESTS

fore. That is,  $i_1$  always decreases, except for the commutation change;  $i_2$  always increases, except for the commutation change. At the point of commutation, however, they would interchange values,  $i_1$  becoming large and  $i_2$  becoming zero. The positive brush is now upon the commutator at some point intermediate to *A* and *F*.

Hence, the current relations are:

$$\begin{aligned} i_b &= i_1 - i_1 \\ i_d &= i_2 + i_1 \\ i_f &= i_2 + i_1 \\ i_h &= i_1 - i_1 \end{aligned}$$

If, now, the component currents are straight-line curves, then the actual currents will follow straight lines also. From the assumption that the currents  $i_1$ ,  $i_2$ ,  $i_3$  follow straight lines is necessarily derived the result that the currents  $i_b$ ,  $i_d$ ,  $i_f$ ,  $i_h$  follow straight lines.

Of course, it is quite evident that this statement is not reversible. For if  $i_d$  were known to follow a straight

at 10 kw, 62.5 amp, 160 volts, direct current, was used as a three-wire generator. The rings are normally connected at *A*, *B*, *C*, *D*, *E*, *F*, of Fig. 16. The armature was opened at the diametrical points *A* and *D*. Rings *B* and *F* were detached from their proper position in the winding and connected as shown in Fig. 17. Although readings were not to be taken at *D* and *F*, it was found necessary to open the circuit at this point and insert resistances equal to those at *A* and *B* in order to balance the two halves of the armature against each other.

Fig. 18 shows the development of circuits for this scheme. The heavy lines at *A*, *B*, *M*, *F*, *D*, *N* indicate German-silver resistances inserted as mentioned in the preceding paragraph.

Balanced and various unbalanced loads were put upon the machine. Between the neutral main and the negative main provision was made to balance  $R_1$  by means of  $R_2$ , or to secure any degree of unbalancing. Further-

TABLE I—READINGS FOR LOAD DISTRIBUTION

Fig. No.	21	22	23	24	25	26	27
$I_1$	30.0	30.0	30.0	30.0	30.0	30.0	30.0
$I_2$	30.0	20.0	10.0	0	-10.0	-20.0	-30.0
$I_0$	0	9.0	19.0	29.0	39.1	49.1	59.0
$2E$	120.0	120.0	120.0	118.0	118.0	118.0	120.0
$i_m$	0	6.5	11.0	16.0	20.8	26.5	32.5
$i_0$	0	5.5	10.7	16.2	20.3	24.7	29.8
$i_a$	14.3	12.4	10.4	10.6	11.8	13.4	16.0
$i_b$	14.1	12.3	10.5	10.6	11.7	13.7	16.2
$i_r$	13.8	11.0	10.3	10.2	11.1	12.7	15.4

more, a generator was equalized-in between these two lines, allowing energy to be supplied to this half of the armature.

Readings and curves were taken for the load distribution:

$I_1$	30	30	30	30	30	30	30
$I_2$	30	20	10	0	-10	-20	-30

Oscillograms of currents in *A*, *B* and *M* were taken. These curves are shown in Figs. 19 to 25, inclusive. The readings are given in Table I.

These readings and curves present several noteworthy points.

Within the ordinary range of accuracy, the meter readings indicate that:

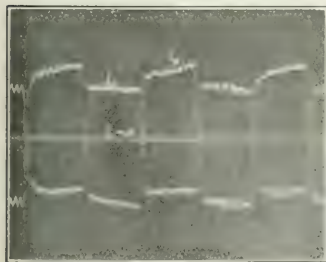


FIG. 19—ARMATURE CURRENTS WHEN  $I_1 = 30$  AND  $I_2 = 30$  (UNBALANCED STATE)



FIG. 20—ARMATURE CURRENTS WHEN  $I_1 = 30$ ,  $I_2 = 20$  (PARTIAL UNBALANCE)

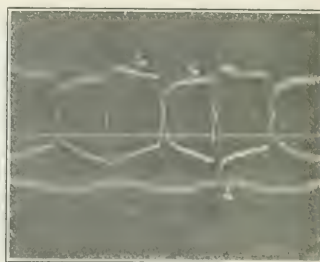


FIG. 21—ARMATURE CURRENTS WHEN  $I_1 = 30$ ,  $I_2 = 10$  (PARTIAL UNBALANCE)

line variation, it might be made up of two components, each differing from a straight line, the one in one direction, the other in the other direction, by like amounts.

In order to secure data upon the current wave, the writer has proceeded as follows:

A four-pole, sixty-cycle synchronous converter, rated

$$\begin{aligned} I_1 &= I_a + I_b \\ i_m &= i_a \\ i_a &= i_b = i_r \end{aligned}$$

Each of the curves is toothed with a much higher frequency than the fundamental. It appears that the number of teeth per cycle upon any curve shown is equal to the number of armature slots for two



poles. We conclude that these higher harmonics are caused by the varying reluctance of the magnetic path as the teeth pass in front of the poles.

The cross-over from one condition to the other at commutation does not occur instantaneously but requires a time about sufficient for the passage of two armature teeth from under the pole face. The self-inductance of

and  $i_1$  (with present conditions), for

$$i_1 = i_2 - i_r,$$

and  $i_2$  is identical with  $i_1$  except that it occurs a half revolution later. Most satisfactory results were obtained by assuming that the final value of  $i_1$  was equal to about  $(3/8)i_r$ , this assumption giving results coinciding fairly well with oscillograms.



FIG. 22—ARMATURE CURRENTS WHEN  $I_1 = 30, I_2 = 0$  (COMPLETE UNBALANCE)



FIG. 23—ARMATURE CURRENTS WHEN  $I_1 = 30, I_2 = -10$  (DIRECT-CURRENT CONVERTER)



FIG. 24—ARMATURE CURRENTS WHEN  $I_1 = 30, I_2 = 20$  (DIRECT-CURRENT CONVERTER)

the coil in which current is being reversed and the width of brush are the cause of this delay. The brush is sufficiently wide, however, to allow a complete reversal of current in the short-circuited coil or even to build up too great a current in the proper direction. This is much a matter of brush shift as well as width of brush.

The reversals are illustrated by special photographic records taken for this purpose and showing the effect of short-circuiting an armature coil by a brush with backward and with forward shifts. (See Fig. 26.) The commutation peaks of the curve (i.e., the peaks occurring due to the short-circuiting of the coil under the brush) are reversed in direction by reversing the brush shift.

From a study of Figs. 19 to 25 it becomes evident that the component currents cannot be straight lines because their combinations are not such lines. These latter are, rather, broken curves whose successive sections resemble exponential curves.

As before noted, the indication that  $i_a$  and  $i_b$  are logarithmic does not require that  $i_1, i_2, i_3, i_4$  be log-

Theoretically derived, the curves appear as in Fig 32, which has been developed as follows:

Current  $i_1$  is assumed as above noted. Then during the first half revolution

$$i_a = i_1 - i_r - (0.5)i_r,$$

$$i_b = i_1 + i_r - (0.5)i_r,$$

while during the second half revolution

$$i_a = i_2 + i_r - (0.5)i_r,$$

$$i_b = i_2 - i_r - (0.5)i_r.$$

Neglecting  $i_r$  will give the smooth curves shown in dotted lines in Fig. 32.

The exciting current is very small compared with the load current. It is distorted and is of the shape always seen in the presence of iron. Combining this with the other curves will give the solid curves named  $i_a$  and  $i_b$ . These derived curves are almost identical with the oscillograms for wholly unbalanced loads. (Fig. 22.)

If resistances  $A, B, M, F, D, N$  are unbalanced, we shall get such curves as are shown by curves 27, 28, 29, 30. These correspond to 19, 20, 21, 22, respectively, with balanced conditions of resistances.

In the mathematical solution of the problem difficulties are encountered which indicate that the present statement of the problem is not sufficient fully to deter-



FIG. 25—ARMATURE CURRENTS WHEN  $I_1 = 30, I_2 = -30$  (DIRECT-CURRENT CONVERTER)

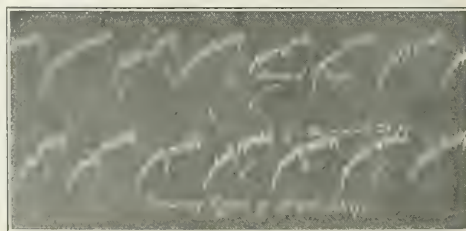


FIG. 26—CURRENT IN ARMATURE COIL, SHOWING EFFECT OF BRUSH SHIFT ON SHORT-CIRCUITED VALUES

arithmic. However, this is a natural supposition, while if we test this hypothesis we get no negative results and everything seems to point toward satisfactory explanations of the observed results.

For example,  $i_1$  may fall off through the entire revolution of the armature along any one of the curves shown in Fig. 31. Assuming curve  $i_1$  would fix  $i_2, i_3$

mine the values of the component currents. This is evidenced by undetermined coefficients in the final expression for the current.

$$\text{Let } \frac{di}{dt} = p$$

$e$  = voltage reading between positive brush and  $M$  (Fig. 18).

$e_o$  = voltage generated between the same two points.  
 $r$  = resistance of one coil.  
 $L$  = self-inductance of one coil.  
 $N$  = total number of coils upon the armature.  
 $\omega$  = displacement of  $M$  from positive brush.

$$-L\left(\frac{N}{2}-\frac{N_{\omega}}{2\pi}\right)\mu.$$

Then

$$i_r\frac{\omega}{2\pi}=Lp\frac{\omega}{2\pi}-i_r\frac{r}{2}-i_r\left(\frac{1}{2}-\frac{\omega}{2\pi}\right)$$



FIG. 27—CONDITIONS AS IN FIG. 19 EXCEPT FOR UNSYMMETRICAL RESISTANCE IN ARMATURE



FIG. 28—CONDITIONS AS IN FIG. 20 EXCEPT FOR UNSYMMETRICAL RESISTANCE IN ARMATURE



FIG. 29—CONDITIONS AS IN FIG. 21 EXCEPT FOR UNSYMMETRICAL RESISTANCE IN ARMATURE

As the coils are distributed in the winding, it is assumed that the inductance will vary as the number of coils, rather than as the square of that number. Mutual inductance is probably negligible.

Using the actual currents which occur in the windings, we have:

$$\begin{aligned} i_o &= -i_f, \\ i_b + i_a &= i_c, \text{ whence } p_1 = -p_3; \\ i_d - i_g &= i_e, \\ i_h - i_j &= 2i, \text{ whence } p_2 = -p_4. \end{aligned}$$

Or:

$$\begin{aligned} \frac{L}{2}p_1 + L\left(\frac{1}{2}-\frac{\omega}{2\pi}\right)p_3 \\ Lp_2 + i_or - i_r\left(\frac{3}{2}-\frac{\omega}{\pi}\right) &= 0. \end{aligned}$$

$$\frac{di_b}{dt} + i_b\frac{r}{L} = i_r\frac{r}{L}\left(\frac{3}{2} - 2\frac{\omega}{\pi}\right).$$

This equation is integrable by:

$$i_b = A e^{-\frac{r}{L}t} + Bt + C.$$



FIG. 30—CONDITIONS AS IN FIG. 22 EXCEPT FOR UNSYMMETRICAL RESISTANCE IN ARMATURE

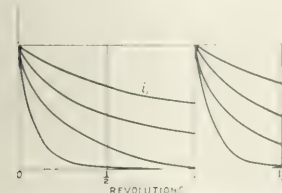


FIG. 31—POSSIBLE VARIATIONS IN ONE COMPONENT OF THE UNBALANCED CURRENT

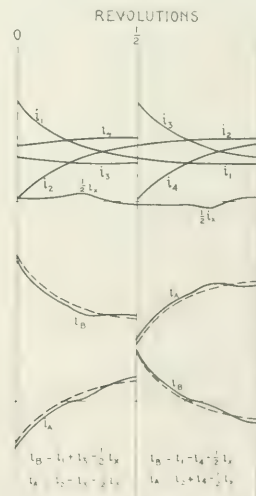


FIG. 32—AN EMPIRICAL DEVELOPMENT TO APPROXIMATE FIG. 22

Therefore:

$$e = e_o - i_or\frac{N_{\omega}}{2\pi} - Lp\frac{N_{\omega}}{2\pi}.$$

Where

$A$  is indeterminate.

$B = 2f i_r.$

$$C = \left(\frac{2fL}{r} + \frac{3}{2}\right)i_{or}$$

$$e = e_o - i_or\frac{N}{2} - L\frac{N}{2}p_1 - i_r\left(\frac{N}{2} - \frac{N_{\omega}}{2\pi}\right)$$



Therefore:

$$i_1 = \frac{2fL}{r} \left( \frac{3}{2} \right) i_0$$

The known condition that

$$i_1 = i_0$$

is not sufficient to determine the value of A.

#### Conclusions

(1) The values of the component currents  $i_1$ ,  $i_2$ ,  $i_3$ ,  $i_4$  need not be fixed for a given value of load current, because the interrelation of components may change while retaining the same totals.

(2) Similarly, for a fixed load, the currents  $i_0$ ,  $i_1$ ,  $i_2$  need not bear a fixed relation to each other.

(3) The assumption of logarithmic shapes for the component currents seems justified.

(4) Neither in the component currents nor in the actual currents do the transient terms reduce to zero and disappear.

(5) The magnetizing current of the reactance coil slightly distorts the actual current curves from the exponential form.

(6) The load remaining constant, an unbalancing of resistances leads to relations between the component currents and the actual currents differing from those assumed in Fig. 32 and illustrated in Figs. 19 to 25, inclusive. The new results are illustrated in Figs. 27 to 30 inclusive.

### COSTS OF ELECTRICAL EQUIPMENT

#### Tabulation of Expense Based on the Experience of an Eastern Company Serving a Populous District

The collection of equipment and construction cost data by central stations furnishes a helpful basis in estimating the expense entailed by proposed extensions or changes of plant. It is unfortunate that on almost every construction job local factors appear in the summarized vouchers which make it difficult for engineers in other places to make complete use of the data assembled; but this does not invalidate the value of such data in the form of selected items. In the accompanying tabulations are given various costs drawn from the vouchers of a central station in the East serving a community of 160,000 inhabitants, the items being mainly

TABLE I—COST OF 15,000/2300-VOLT TRANSFORMER SUB-STATION EQUIPMENT, ERECTED IN FACTORY DISTRICT, BUILDING NOT INCLUDED.

Six 500-kva step-down transformers.....	\$6,600.00
Fifty-four ventilator blades.....	22.75
One switchboard panel, 48 in. by 16 in. by 14 in.....	9.45
One 5-in. pipe bend and couplings.....	18.25
Fifteen disconnecting switches, 300 amp, 15,000 volts.....	138.60
Teaming transformers 2 miles to substation.....	18.00
Three 22-kva, single-phase, sixty-cycle induction feeder regulators.....	2,187.50
Wire, 136 ft., 750,000 circ. mil.....	88.40
Sixty-five 16,500-volt insulators.....	86.29
Three sixty-cycle no-voltage relays.....	29.16
Material and labor of installation.....	3,128.65
50 ft. of 150,000-circ. mil. wire and 200 ft. 1½-in. pipe.....	29.83

Total cost of equipment installed, including incidentals not summarized in above tabulation because of insufficient data..... \$12,728.72

those which can plainly be identified and utilized as a guide in other work, uncomplicated by incidental matters of a local nature which were not recorded by the company in sufficient detail to be of use. All costs apply to the period between July 1, 1913, and July 1, 1914.

TABLE II—COST OF EQUIPMENT FOR THE GENERATING PLANT

One 4500-kw, high-pressure steam turbine, 175 lb., 100 deg. superheat, 28 in. vacuum, 50 per cent continuous overload capacity, directly connected to a 6250-kva, sixty-cycle, three-phase, 13,200-volt generator; one condenser, low-level, jet type, 28 in. vacuum when condensing 88,500 lb. steam per hour when supplied with injection water at 70 deg. Fahr., complete with turbine-driven pumps, and one 6-in. constant-pressure valve for low-pressure steam line from auxiliaries, with 6-in. opening in turbine casing; total, not installed.....	\$58,345
One condenser, complete.....	8,980
One 45 000-cu. ft. turbine-driven blower, delivered.....	2,532
One three-phase motor, 1 hp, 220 volts, sixty cycles.....	99
Three oil-immersed, water-cooled automatic regulators for 110-volt circuit.....	3,050
Three 2300-volt regulators.....	2,664
One 1½-hp, 220-volt induction motor for 8-in. pump.....	223
Pipe, 140 ft. (6-in. size).....	21
One aluminum-cable, 12,000-volt lightning arrester.....	360
Cable, 1,000,000 circ. mil., 1450 ft.....	2,102
One 8.5-in., 300-lb. steam gage.....	12
Six 600-amp disconnecting switches.....	54
Three water-cooled sixty-cycle, 2000-kva transformers, 13,200/2300 volts.....	6,700
Wire cloth, 300 sq. ft.....	9
One graphic voltmeter, 90-130 cycles.....	42
Two sixty-cycle, 50-watt, 2200-volt potential transformers.....	36
One 5-amp, sixty-cycle power-factor indicator, 110 volts.....	40
One 5-amp (1500-kw) polyphase indicating wattmeter.....	56
One 7-in. oil filter press.....	370
Fourteen 8-in. tubes.....	41

TABLE III—UNIT COSTS OF TRANSFORMERS\*

Rating	Number	Amount	Cost Each	Cost per K
Watts				
500	20	\$299.88	\$15.00	\$30.00
1000	1	18.74	18.74	18.74
2000	11	274.93	24.99	12.50
Kilowatts				
1	22	522.81	23.60	23.60
1.5	12	325.51	27.12	18.00
2	15	467.70	31.20	15.60
2.5	10	343.88	34.38	13.70
3	7	265.21	37.88	12.62
4	5	227.93	45.58	9.11
5	9	582.34	64.70	12.94
7.5	13	868.35	66.70	8.90
10	9	715.96	79.55	7.96
15	7	791.83	113.12	7.50
25	6	912.40	152.06	6.08
30	1	173.60	173.60	5.78
40	7	1826.33	260.90	6.32
50	12	3384.24	282.02	5.64
75	6	2084.54	347.42	4.63
110	3	1110.80	370.26	3.36
125	3	1294.93	431.64	3.46
150	4	1976.02	494.00	3.29

\*The first three transformers in the table were sign transformers; the others were mainly of 2300, 550, 220 or 110 volts. The prices given are factory prices.

TABLE IV—UNIT COST OF METERS\*

Amp	Number	Amount	Cost, Each
5	2236	\$15,921.16	\$7.15
10	83	612.62	7.35
15	33	210.24	6.36
20	92	729.21	7.91
25	9	100.09	11.12
30	26	284.21	10.90
40	32	396.51	12.40
50	18	277.76	15.40
60	18	259.04	14.40
80	18	288.92	16.05
100	16	283.22	17.70
120	5	139.36	27.83
125	1	41.17	41.17
150	34	1,201.93	35.40
200	7	159.68	22.81
300	1	54.87	54.87
400	4	135.03	33.76
500	1	55.15	55.15

\*Factory prices.

# Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods and Current Practice Among Successful Utilities

## How High Money Rate Aided Business

The tightness of the money market during the early months of the European war has not been without its beneficial side to the commercial departments of some central stations, despite the general depression in most classes of business. With interest rates forced to a high figure, manufacturers who were required to make factory extensions to care for growing business hesitated to add investment to their isolated plants and so sought service from the central station. Power users whom the central-station salesmen had never been able to secure before, under normal business conditions, were easily taken over during the period of high money rates. An automobile concern in Milwaukee which has always operated its own plant, despite the educational efforts of the local central station, recently ordered central-station service for its factory extensions. The entering wedge thus driven will, it is believed, be the means of introducing central-station service into the factory on a still larger scale after the relaxation of the financial stringency which was the immediate cause of installing electric motor drive.

## Selecting Washing-Machine "Prospects"

To concentrate sales effort on the most susceptible prospective customers for electric washing machines, a central station new-business manager in a Western city recently adopted a rather unusual procedure. He called about him his sales staff and informed the solicitors that they were to begin work at 6 a. m. the following Monday, instead of 8:30 a. m. as usual. Their work in the early hours, he said, would consist in making trips afoot over as great a part of their territories as possible, traversing the alleys and byways and noting where the washing was being done at home and in what places husbands were helping with the work.

When the solicitors had reported, lists of the men seen helping with the family washing were immediately prepared and salesmen were sent to show these prospective customers how they could save much time and labor by purchasing electric washing machines. The householders who had to do the work themselves were quick to appreciate the advantage of the motor-driven washers, and it was easy to make sales among this class of "prospects." Circular letters and personal calls by solicitors were later used on the other prospective customers in homes where the manual labor was done by the women of the house or by servants.

## A Forty-Dollar Public-Policy Idea

The suggestion which took the second prize, \$40, in the Commonwealth Edison Company's recent semi-annual award for meritorious suggestions was offered by Mr. P. F. Williams. In brief he advises that the company advertise its community spirit, showing the general public how a considerable part of the company's funds are expended each year for the good of the community and pointing out how in time the individual is benefited.

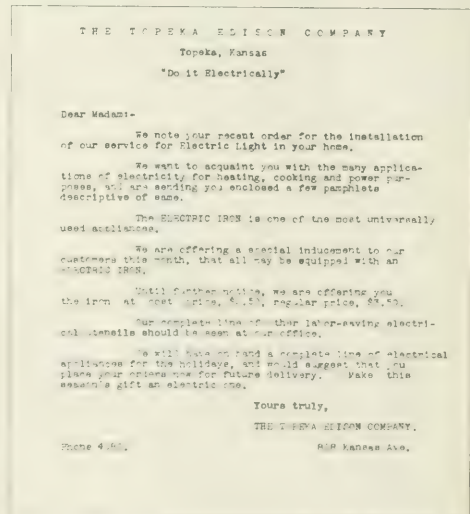
To carry out the idea more fully it was suggested that a carefully written yearbook be printed with illustrations showing new buildings erected, street improvements made and new territory built into during the year passed. Adding to these illustrations a statement of the cost of improvements, together with a summary of the plans for the ensuing year, and sending the book annually to each customer, would in time result in general public acceptance of the community idea. Such prevalent acceptance would generally benefit the company.

In connection with the yearbook it was suggested that newspaper advertisements of the same nature be used to call attention at intervals to the company's activities and give interesting facts which intimately concern the public.

Private right-of-way men employed by the company should also be provided with a well-written, illustrated booklet arranged in an interesting and convincing manner, with the community idea as the theme.

## Striking While the Iron Is Hot

When the name of a new residence customer is entered on the books of the Topeka (Kan.) Edison Company as an applicant for service a circular letter similar to the one shown herewith is mailed to the lady of the



FAC-SIMILE REPRODUCTION OF SUCCESSFUL CIRCULAR LETTER

house. The letter coming from the electric-service company at such a time is sure to receive some attention, even under a 1-cent stamp. The chances are that it will be read with care by more than one member of the family and will make a lasting impression. Using



this scheme during the last year, the Topeka company has been able to sell 500 flatirons and double its total appliance business without the aid of special campaigns.

### Results of Fall Housewiring Campaign at Kokomo, Ind.

During the autumn the Indiana Railway & Light Company, which operates a central station at Kokomo, Ind. (with a population of 22,000), concentrated its sales efforts on the wiring of already-built houses near its existing distribution lines. A special wiring campaign was started Oct. 15, based on a twelve-month extended-payment offer.

In this campaign the company's agents have secured the wiring contracts by persistent house-to-house solicitation, and the new-business department has then apportioned the orders equitably among the three local electrical contractors at a figure several per cent less than the customer's contracted price, which was itself based on quotations agreed upon by the contractors before the opening of the campaign. This small percentage difference the company receives in order to insure itself against possible losses in the collection of the monthly installments which are paid by the customers along with their monthly bills for lighting service. Following are the special offers which were made to owners of unwired houses in Kokomo:

#### Terms of the Four Special Offers

##### "A-1"—\$10.50

Wiring for four outlets, one in each of four rooms, each equipped with cord drop, socket and lamps (carbon, or 25-watt or 40-watt tungsten), one wall snap-switch in living room; all complete and ready to burn.

##### "A-6"—\$16.50

Wiring for six outlets, one in each of five rooms, each equipped with drop cord, socket and lamps (carbon, or 25-watt or 40-watt tungsten), two wall snap-switches, and one outlet on the porch, equipped with porch ball and ring.

##### "B-6"—\$22.50

Wiring for six outlets, one in each of five rooms, two of which are equipped with round-type, two-lamp brass fixtures, one with round-type brass pendent or bracket fixture, two with drop cords, sockets and lamps (carbon, or 25-watt or 40-watt or 60-watt tungsten), two wall snap-switches, and one outlet on porch equipped with ring and ball, all complete and ready to burn.

##### "C-6"—\$32.00

Wiring for six outlets, one in each of five rooms, two of which are equipped with square-type, two-lamp brass fixture, one with heavy square-type, brass pendent or bracket fixture, two with drop cords, sockets and lamps (carbon, or 25-watt, 40-watt or 60-watt tungsten), two wall snap-switches and one outlet on porch with ring and ball, all complete and ready to burn.

#### Methods of Advertising Campaign

Extensive publicity has been given to the housewiring plan locally. Newspaper display advertisements, billboards, lantern slides and large dodgers in colors have been used. In each case the special offer for wiring four rooms was featured, the advantages named for the customer being: "One whole year to pay, no interest, free inspection, and work guaranteed." Equally low prices and terms prevailed for additional rooms.

As Kokomo is a factory town, the dodger scheme was found to be very effective. The dodgers were hung throughout the various factory buildings and were also posted near the employees' gates. In this way the campaign was carried directly to the factory man with a small cottage, the type of citizen to whom the installment payment plan would especially appeal.

Another public advertising scheme that brought results was the projection of an announcement of the campaign by means of a lantern on a large screen stretched across the street. This plan proved especially

effective on election night when several thousand people were down town to read the election returns which were also shown on the same screen.

#### Use of Photographs by Salesmen

As shown herewith, photographs of the various fixture combinations were carried by the solicitors for the purpose of showing prospective customers the exact article they were being offered. The use of the photographs was found to be most advantageous, for many persons who had never had electric service were unfamiliar with the fixtures and fittings, and consequently much of the salesman's time and effort was saved by displaying the photographs. In addition, many misunderstandings which might have occurred when the wiremen appeared on the job as to the identity of the fixtures purchased were prevented by the display of these photographs with their numbers corresponding to the listings on the original contract which the customer had signed.

The work of solicitation has thus far been carried out along systematic lines, an extensive card-index and follow-up system being employed. On Saturday mornings meetings are held and all contractors and salesmen

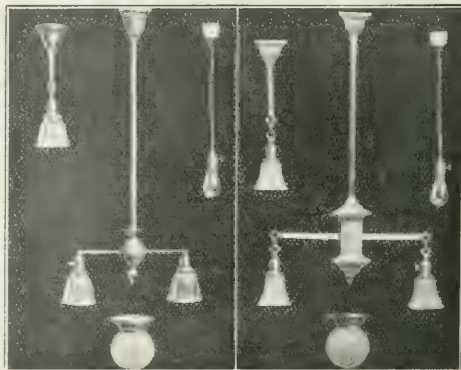


FIG. 1—SIX OUTLETS WIRED AND READY FOR SERVICE, \$22.80

FIG. 2—SIX OUTLETS WITH TWO TWO-LAMP FIXTURES, \$32

are urged to be present. Questions of price, specifications and various differences which have come up during the past week are brought up and disposed of in a satisfactory manner. The purpose of these meetings is to perfect and maintain harmony between the contractors themselves and with the central station and its agents—a condition which is, of course, essential if any new-business-getting plans are to be successfully carried out. A banquet and smoker have also been planned to further the good will and co-operative efforts of these men.

#### Results of One Month's Campaign

The campaign will probably be continued until Jan. 1, 1915. During the first thirty days of the effort 125 house-wiring contracts were secured, at an average cost of \$15.83 each. The average size of the houses wired has been five and two-fifths rooms. No poles or transformers have been needed to serve the new customers as all the houses thus far obtained have fallen within gaps along already-existing pole lines. During the last twenty-four months the Kokomo company has also added on its lines 1800 new customers in Kokomo and immediate vicinity. Of this number nearly 200 are rural customers.

Mr. O. M. Booher is the company's new-business manager and is in charge of the house-wiring campaign.

# Illumination and Wiring

## Ornamental Street Lamps Fed from Underground Cable System for Small Village

Ornamental street lamps like the one shown herewith are being installed at Merion, Pa., for the Merion Civic Association. The units are connected in series by underground cables. To harmonize with the dense foliage which borders the streets the association has employed lanterns resembling those which can be seen outside old roadside taverns in England. The lanterns are hexagonal in shape and are made of sheet copper with flint-glass panes. In each fixture 40-cp 4-amp series tungsten lamps are used. Supporting each lantern is a square cast-iron post bearing in raised letters the name of the village. One hundred and nine of these fixtures



ORNAMENTAL LANTERN FOR STREET LIGHTING AT MERION, PA.

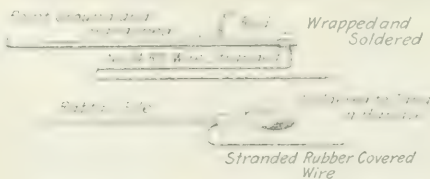
are being erected. Special plows pulled by gasoline engines are employed to make the cable trenches and draw in the conductors. By using this equipment cable is being laid much faster than it could be if the trenches were dug by hand and the cables pulled in by the usual method. The construction work is being done by the Philadelphia (Pa.) Electric Company, which will also furnish energy for the installation when it is completed.

## Contacts to Insure Correct Readings in Electrolysis Survey

In taking voltmeter readings for an electrolytic survey contacts may be made with the piping system forming the underground paths by means of the curb boxes, water meters, hydrants or gas drip risers. To make good contacts with these exposed portions of the piping system a 0.375-in. steel rod of sufficient length to reach down into the curb box and rest on the top of the brass cock can be used. One end of the rod should be ground to a sharp point and this point should be tempered.

About 20 ft. of No. 14 stranded rubber-covered wire should then be soldered to the other end of the rod to facilitate making connections to the voltmeter. When this rod is inserted into a curb box it should be held carefully so that it will not touch the sides of the box or the ground.

For making contact with the rails a small three-



CONTACT TOOLS FOR ELECTROLYSIS SURVEY

cornered file fixed in a handle is very convenient. A piece of rubber-covered wire should be soldered to the file inside the handle. It is well to remember that serious errors in potential readings may result unless a good rubber-covered wire or other waterproof wire is used, for on a wet day the wire is almost sure to become damp and to cause a ground as it lies in the street or on the wet grass or earth.

Contact-making devices such as those described were used in an electrolytic survey at Salina, Kan., and, according to Mr. W. R. Waggoner, of the Salina (Kan.) Light, Power & Gas Company, the results obtained were very satisfactory.

## Miniature Lamps for Table Christmas Tree

For the small Christmas tree used as the centerpiece of the Yuletide dinner table the ordinary Christmas-tree outfit of 14-volt lamps connected eight in series gives an incongruous appearance on account of the large diameter of the lamp bulbs. A much more appropriate lighting decoration can be made for such a small tree by stringing in series a number of little 3.8-volt flashlamp



LIGHTING THE TABLE CHRISTMAS TREE

bulbs, which are less than 0.5 in. in diameter. The tiny lamps are rated to take about 0.3 amp each, and although designed for multiple connection, they are fairly uniform in manufacture and hence operate well in series. For a 3-ft. tree fifteen or twenty lamps will show up well, and for connection to a 110-volt source this number should be connected in series with a 40-watt or 25-



watt tungsten lamp designed for the full voltage. The current through the 40-watt lamp will bring the tiny bulbs up to the intense brilliancy at which they ordinarily operate in the battery flashlamps. For continuous use on the dinner table, however, both the visual comfort of the diners and the life of the filaments will be conserved if the lamps are run in series with the 25-watt lamp. By this means the tiny lamps will be brought up to about the intensity of an old-fashioned carbon-lamp filament, thus simulating more nearly the color of candle flames. The little lamps can be bought at a net cost of from 13 cents to 15 cents each and can be connected by soldering the green-silk-covered jumper wires. At that end of the string which is to light the top of the tree distances of from 7 in. to 8 in. should be allowed between lamps, but the interval should be extended to 12 in. or 14 in. near the bottom of the tree. If desired, the full-sized ballast lamp (which, of course, operates at only fractional brilliancy), can be concealed in and used to illuminate some translucent table ornament, such as a miniature house, head of Santa Claus, etc. The string of lamps described can be made up complete with miniature bulbs, green wire, etc., for \$2.50.

## Letters to the Editors

### Charge for Surplus Power

*To the Editors of the Electrical World:*

SIRS:—Under the above caption Mr. Henry D. Jackson has dealt with an interesting and important subject in the conduct of the affairs of the central-station business.

I will state in the beginning that I believe that so-called "surplus power" available from reserve apparatus should be sold at a low rate subject to the conditions discussed herein. The extent to which this should be done is a matter which should receive careful consideration from the operator. Local conditions may alter the case materially. To pursue this practice to a degree where none of the fixed charges are considered is unsafe. But to make the rate based on the operating cost plus a portion of the prorated fixed charges is both desirable and necessary.

The important controlling factor to consider is whether or not the "surplus power" is demanded on the peak of the load. If it is, new apparatus must be installed to replace the reserve equipment which is being used. The new apparatus required may be a boiler, engine, turbine or generator; seldom all four. In such a case the rate for service would be based on the operating expenses plus the fixed charges accrued incident to the installation of the new apparatus, with possibly a small proportion of the prorated fixed charges on the whole plant. Unless this matter is carefully calculated, there is danger that the small consumer will be required to pay a prohibitive rate to give the property a fair return. If the small consumer's rate is excessive, there will be no small consumer and the fixed charges will be automatically thrown back on the large consumer.

If the new load does not come on the peak, the plant may be loaded up at a low rate to the point where the peak comes on what was formerly the off-peak and the former peak becomes the off-peak load. In no case should the rate be so low that the fixed charges are entirely ignored. On account of the very large number of kilowatt-hours over which the fixed charges may be distributed in taking on a load of this kind a consideration of a portion of them will not increase the rate materially.

The above statements may be illustrated by a rather

simple example. Assume a plant with a 500-kw peak from about 5 p. m. to 6 p. m. in the month of December which is a common occurrence. Ordinarily, to be safe a 500-kw reserve unit should be provided. On the ordinary off-peak load we should have in reserve not only the 500 kw but an additional 200 kw or 250 kw, thus making 700 kw or 750 kw in all. This is "surplus power" or, rather, "surplus equipment rating," on which fixed charges continue whether it is used or not. There can be no question of the desirability of putting the 750-kw equipment to work producing kilowatt-hours at a rate slightly above the cost of coal, oil and additional labor, together with a small portion of the prorated fixed charges.

In this connection it is important to consider another phase of the matter. A public utility company is bound by law to serve all applicants under similar circumstances within a reasonable distance of its lines without discrimination. If the output of the 75-kw equipment were all sold and a new applicant desired, say, 200 kw, it would have to be furnished at the same rate as previously made to sell the 750 kw. New equipment would be required and the fixed charges incident to this new equipment would have to be taken out of the profits or loaded onto the small consumer. Manifestly this could not be done without discrimination or raising the rates slightly.

The matter under consideration comes within the principle of considering what is lost by not having rather than what is gained by having. In all rate matters the principle of charging what the traffic will bear is to be considered. Heavy traffic requires a low rate under the law of competition from other sources of power, but before making such a rate the operator should make careful calculations looking far into the future.

Milwaukee, Wis.

H. G. D. NUTTING.

### A Tribute to Chairman Barker

*To the Editors of the Electrical World:*

SIRS:—In the sudden passing away of Chairman Barker of the Massachusetts Gas and Electric Light Commission a loss of more than local significance fell upon the two great industries which were associated in his lifework.

A pioneer in public utility regulation, Mr. Barker was probably the source of more applications of supervisory principles in this field than any other man in the country, for it fell to his lot to blaze the trail through many an untraversed wilderness, and well did he mark the pathways of wise policy for himself, his associates and others to follow. Conservative in temperament and judicial in mind, he never failed to appreciate the significance of progress, and while anything like ostentation was utterly foreign to him, he was by more than one leader of thought in the central-station industry appraised as the highest authority in this country in his responsible field.

Constantly his advice was sought outside the State, willingly he strove to meet every demand upon his great store of wisdom, and if all his quiet, unobtrusive responses to calls for advice could be known, the scope and amount of his service would be found amazing. The record of this pioneer commission in the years of his great services is the most tangible monument of his devotion to that far-sighted justice without which state regulation must fail, but with which those who take up the burdens of the industry when others lay them down will carry their service up and down the world and leave it better for their having lived.

Boston, Mass.

HOWARD S. KNOWLTON.

# Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

## Anchor Boards for Coal Pile

The accompanying sketch shows a method of preventing coal piles from spreading at the base, by inclosing the lower parts of the pile in courses of timbers anchored from within the pile itself. As the coal is filled in over the anchor timbers the weight of the coal serves



ANCHOR CONSTRUCTION TO PREVENT COAL PILE FROM SPREADING

75 deg. to 90 deg. to the empty drum of the dead boiler. To avoid reducing excessively the pressure in the boiler units already in operation, the valve which controls the flow of live steam is only "cracked." Mr. William Smith, engineer at the power station, says this plan has been a success.

## Blowers Connected Directly to Transformer Windings

In stations of the Edison Electric Illuminating Company of Brooklyn where air-cooled transformers are used the blowers are connected directly to the low-tension windings of the transformers. By this means the blower motor is automatically started and stopped when the transformer is energized or de-energized, respectively. A pin-wheel draft indicator is attached to each transformer above the air outlet, so that the station operator is able to tell on closing the transformer switch whether the blower motor is operating properly. The blowers deliver air to a common duct, which is normally divided into sections by dampers. In case any particular blower motor becomes inoperative, the transformer which it cools may be supplied with air from the common duct by opening the dampers at each end of its duct section.

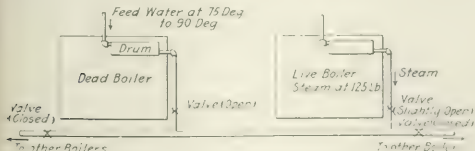
## Method of Keeping Turbine Blades Clean

Impure water even though treated is sometimes the cause of a fine coating of lime forming on turbine blades. Lime, magnesite and graphite carried over with the steam from water used in the boilers at Leavenworth, Kan., formed an objectionable coating on the blades of the turbine, making it quite a task to keep the machine clean. But now, since it has been found that kerosene injected into the steam line will clean the blades, the turbine gives no more trouble.

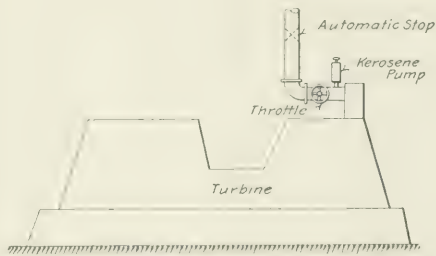
At a convenient spot in the steam line between the

## Scheme to Aid Quick Firing of Boilers

The use of electrical energy from transmission lines at Springfield, Mo., has done away with the necessity of operating some of the boilers in the power station of the Springfield Gas & Electric Company. The gas works across the street from the station, as well as the central heating system, still require live steam, but only in emergencies is the entire boiler plant needed. At such times it is necessary to bring some of the "dead" boilers quickly into service. Using the piping arrangement shown in the sketch herewith, it has been possible



PIPING TO AID QUICK FIRING OF BOILERS



KEROSENE PUMP TO CLEAN TURBINE BLADES

to put cold boilers in service at full steam pressure in forty-five minutes. The boiler equipment consists of three 350-hp, one 300-hp and two 500-hp units.

The auxiliary piping used to aid quick firing consists of connections which enable the engineer after lighting the fire to admit both live steam and feed water at

throttle and the valve rigging a small hand-pressure pump has been installed through which kerosene may be injected. Entering thus with the live steam, the oil particles are driven against all blades and only an occasional injection from the pump is needed to keep the blades bright and clean.

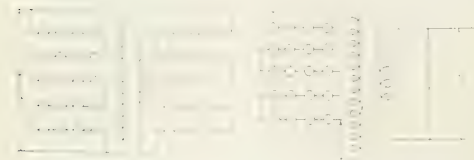


### Preventing Reversal of Polarity in Rotary Converters

Ordinarily the rotary converters used by the Edison Electric Illuminating Company of Brooklyn are started as direct-current motors, but in emergencies it is necessary to start them from the alternating-current system. To do this without reversing the polarity of the converter a 6-volt storage battery is connected across the field of the machine to maintain the residual magnetism. With the field winding practically short-circuited upon itself it is impossible to induce excessive potentials in the circuit which might destroy insulation or cause subsequent break-down. While the induced magnetism produced by starting the converter as an induction motor may temporarily reverse the polarity of the field cores the storage-battery current will eventually restore it, thereby causing the machine to build up properly. After the machine is once in step the field may be disconnected from the 6-volt storage battery and connected to the normal direct-current supply without reversing the polarity. This equipment has been in use for some time and has produced the desired result when starting rotary converters up to 100 kw in rating on the full voltage of their alternating-current supply. To start larger units it has been necessary to apply only 40 per cent of the supply voltage to prevent the machines drawing too large starting currents.

### Determining Approximate Ratio of Transformers Without Measuring Instruments

Frequently it happens that the voltage of a supply circuit must be raised or lowered for making tests or temporarily operating apparatus, but the ratios of the transformers which are available are unknown. In emergencies where voltmeters cannot be obtained for determining the ratio the approximate method described herewith can be employed. Unless there is reason to believe that the unit being tested has a high transformation ratio, twenty similarly rated 110-volt incandescent lamps should be connected across the terminals having the smaller cross-section and one lamp exactly the same as the others should be joined to the other terminals. With 110 volts applied to the latter the lamps in the secondary circuit should be gradually removed until those remaining burn with practically the same intensity as the one across the primary terminals. When a balance is obtained the ratio of the number of lamps in the secondary and primary circuits gives the ratio of transformation. If only high voltage is obtainable for testing the ratio of the transformer and it is known that the unit is designed for operating on this voltage, the method of testing described above may be reversed;

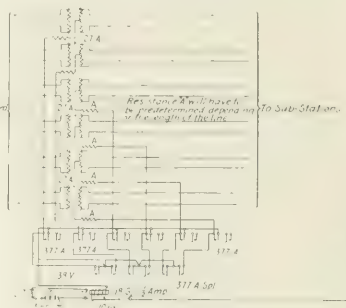


FIGS. 1 AND 2—TESTING RATIO WITH HIGH-VOLTAGE AND LOW-VOLTAGE ENERGY

that is, incandescent lamps having a combined voltage equal to that of the supply circuit should be connected in series across the small cross-section terminals and an equal number of similarly rated lamps across the other transformer taps. The latter should then be gradually removed until the intensity balance is secured, when the ratio can be computed as described above.

### Standby Signals Transmitted Over Existing Telephone Circuits

The Edison Electric Illuminating Company of Brooklyn has entered into an agreement with the New York Telephone Company to transmit standby signals from its system operator's office to various substations. Disturbance to telephonic communications over these cir-



CONNECTION OF SIGNALING APPARATUS TO TELEPHONE LINES

cuits is prevented by connecting the signal wires to the middle of coils bridged across the telephone circuits. Single-stroke bells operated by direct current are employed to give the signals. Each station is signaled from its respective key on the system operator's switch-board, which is arranged, however, so that all of the stations can be signaled simultaneously, individually or in groups.

Signals transmitted over this system are intended to notify the operator of the time when storage batteries must be charged and when to make ready for operating equipment. During the time which the system has been in use signals have been transmitted satisfactorily. The testing of the telephone circuits has caused false signals to be transmitted, but this has been the only thing to detract from the successful use of the method.

### Effect of Reactance on Paralleling Synchronous Apparatus

What affects the stability of operation of an alternating-current system consisting of several independent generating stations connected in parallel? A. E. R.

The stability of operation of an alternating-current system consisting of two or more generating stations connected in parallel depends on the synchronizing power tending to hold the generators in step. A sudden load or disturbance near one station may cause its generators to drop in speed. The busbar voltage will consequently lag in phase, thereby producing a resultant emf which will cause current to pass locally between the generators the speeds of which have changed relatively. If the impedance of the connecting circuits consist chiefly of resistance and relatively little reactance, the exchange current will be practically in time-phase with the resultant emf and the synchronizing power will be small. On the other hand, if there is little resistance but relatively considerable reactance in the circuit the current will lag behind the resultant emf and be nearer in time-phase with the busbar voltage of the generators the speeds of which have not changed. As a result the synchronizing power will be large and the overloaded generators will be relieved of part of their loads.

# Digest of Current Electrical Literature

## Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

### Generators, Motors and Transformers

**Parallel Working of Three-Phase Generators.**—F. PUNGA.—An English translation in abstract of his recent German article. The critical  $GD^2$  (kilogram-meter square) of three-phase generators of equal output and speed, but driven by different prime movers, is determined both by calculation and by experiment. A simple formula for the calculation of the natural period of dissimilar generators is also given.—*London Electrician*, Nov. 20, 1914.

### Lamps and Lighting

**Electric Vacuum Meter.**—W. ROHN.—The description of an indicating vacuum meter which permits measuring gas pressures down to 0.00001 mm mercury. It is based on the following principle: If a thermocouple in a vacuum is supplied with a certain amount of heat in a certain time, the rise of temperature of the joint is greater the less energy is abstracted from the thermocouple by heat conduction of the gas. That is, the temperature will be higher the better the vacuum. Radiation losses should be avoided as much as possible. In the instrument (Fig. 1) there are connected in series twenty couples  $a$  consisting of narrow strips of two nickel alloys (thermo emf = 0.06 millivolt per degree). These are placed between two glass rings of a thickness of 12 mm with a central circular hole of 50 mm diameter. The hole is made air-tight by the plate glass disk  $c$ . The glass box is connected by means of the tube  $n$  to the space in which the vacuum is to be determined. The glass box is placed in the thick nickel-plated metallic box, the object being to maintain the cold joints

This arrangement is shown in Fig. 2. The current is carried off from the thermocouples by means of the copper strips  $b$ . The thermo emf is measured by a sensitive millivolt meter of the D'Arsonval type for 18 millivolts, each scale division representing 0.0001 volt. By means of this instrument it is also possible with

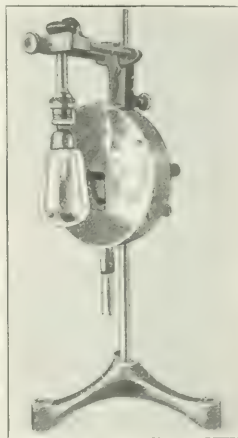


FIG. 2—ELECTRIC VACUUM METER

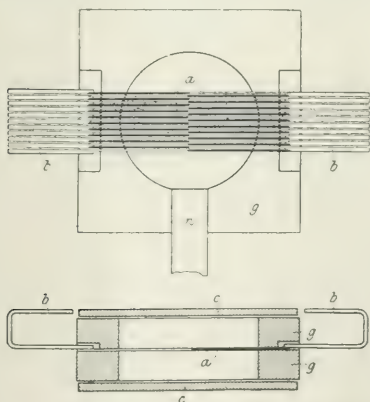


FIG. 1—DESIGN OF ELECTRIC VACUUM METER

on the thermocouples at constant temperature. The metallic box is mounted on a stand, and opposite to it is suspended an accurately adjustable heating lamp (an incandescent lamp of 10 cp and 10 volts) in such a way that the incandescent filament is parallel to and in the same level as a little window in the metallic box, so that the light from the lamp falls on the thermocouples.

the aid of a switch to control the lamp current, which is regulated by means of a rheostat. The instrument is intended for use in incandescent-lamp factories.—*Zeit. f. Electrochemie*, Vol. 10, page 539, 1914; abstracted in *Elek. Zeit.*, Nov. 12, 1914.

### Traction

**Electric Vehicle and the Central Station.**—H. BECKMANN.—The present status of electric vehicles in Europe, and especially in Berlin, is illustrated by a table according to the different applications. Besides the other advantages of the electric vehicle, one great point in its favor as compared with other types of automobiles is the universal tendency toward reduction of the price of electric energy as against the very considerable and sudden fluctuations of the price of gasoline. The author shows that the charging of electric vehicles should be a welcome addition to the load of central stations. He recommends that the European central station undertake an energetic propaganda for the electric vehicle according to American practice. Data are given on the charging plant of the central station of Neumarkt in Silesia and the charging station in Hanover Street in Berlin. In fifteen charging stations in greater Berlin there are now consumed annually 10,000,000 kw-hr. The author recommends the way in which the subject is being handled in the United States. He emphasizes that the consumption of gasoline in Germany represents a large amount of money which is lost to the country, as it goes abroad. Taxicabs, omnibuses and freight and delivery automobiles in Berlin alone consume yearly gasoline to the amount of \$2,500,-



000. If the electric-central-station managers would solicit the business in a systematic way they should be able to turn at least half of this sum over to the central station.—*Elek. Zeit.*, Nov. 12 and 19, 1914.

#### Installations, Systems and Appliances

*Siamese Central Station.*—FRANCIS B. SHAW.—A continuation of his illustrated article on the government electric generating station at Bangkok, Siam. The boiler house is equipped with eight boilers in four batteries, each capable of steaming a 1000-kw turbine set on full load. There are three Curtis multi-stage impulse turbines, coupled to three-phase generators with a continuous output of 1335 kva, or 1000 kw, with a power-factor of 0.75, voltage 3500 and frequency fifty cycles, and running at a speed of 3000 r.p.m. The exciters are mounted on the same shaft. In case of a break-down on the exciters, exciting current may be drawn from the battery, provision having been made for this. The article is to be concluded.—*London Elec. Rev.*, Nov. 13, 1914.

*Automatic Voltage Regulators.*—CHARLES C. GARRARD.—The conclusion of his illustrated article. As an example of an instrument of the pendulum type, the author describes the Taylor-Scotson regulator. He then takes up regulators of the resistance type and describes the Thury and Brown-Boveri instruments.—*London Electrician*, Nov. 13, 1914.

#### Wires, Wiring and Conduits

*Vulcanized Bitumen Cables.*—C. J. BEAVER.—The conclusion of his long paper on cables read before the (British) Institution of Electrical Engineers. The author gives considerable information on the chemistry of the subject. In the present instalment he deals with vulcanized bitumen cables. While there is a general similarity with rubber, there are decided limitations to this resemblance. The cohesion between the particles of material is much less in vulcanized bitumen than in rubber. The author discusses the variation of the physical properties of vulcanized bitumen over a range of temperature and methods of testing. With regard to the chemical properties, the stability of vulcanized bitumen is remarkable. Unlike rubber, it is not appreciably subject to natural deterioration under normal conditions of atmosphere and temperature, and it may therefore be regarded as comparable with paper insulation in that causes of deterioration are practically always extraneous causes. So far as direct chemical attacks which may be encountered in practice are concerned, the material is exceptionally inert to the action of substances of an acid character. It is much more susceptible to the action of alkaline substances. The direct action of such substances is usually, however, only superficial. Even if such waters contain free alkali equivalent to from 25 to 30 grains per gallon (estimated as sodium carbonate), which is considerably above the average for waters encountered in coal mines in England, and the vulcanized bitumen is freely exposed to their attack for two or three years, the depth of penetration of the action is inappreciable. Leaving the causes of deterioration due to direct attack and turning to secondary causes, the susceptibility of alkaline attack must have a great influence under continuous-current fault conditions which can produce electrolytic action, because in most soil conditions it is possible not only to form alkaline substances at parts which constitute the virtual negative electrode of the leakage circuit but to force such substances by osmotic pressure through the dielectric to the negative conductor. Under these circumstances both the direct action on the vulcanized bitumen of concentrated alkaline substances and the aggravated conditions due to the passage of current (producing continuous supplies of deleterious matter

and forcing them to the best position for attack) come into play. The author discusses the source of current-producing saponification effects on negative cables and the physically similar but chemically different effects on alternating-current and positive and neutral direct-current cables. Valuable observations were made in the tropics with the following results: First, they showed that leakage played a prominent part in bringing about softening of the vulcanized bitumen and that such currents, even of a very minute order, would produce a type of softening other than that caused by saponification in the well-known manner. Second, moisture must have been a factor in the case, although it was not proved that it had any other functions than that of rendering fibrous coverings and other paths conductive. The relation of the distribution of stains in tape coverings to that of softening of the vulcanized bitumen is confirmatory evidence of its presence. Third, it appeared likely that, in the presence of the two preceding factors, this particular form of softening occurred more readily in tropical than in temperate climates, and that temperature was, therefore, also a factor. (Climate would, of course, affect both the second and third factors, the alternations of temperature and moisture being extreme in most tropical countries.) Fourth, time is obviously important in all changes of the kind under consideration. The softening effects due to the combined agency of heat and moisture (steam) were experimentally reproduced, and in the light of these experimental reproductions hydrolysis of the glycerides of the fatty and hydroxyl acids contained in the vulcanized bitumen was clearly indicated. The results of analysis of the softened material, and a comparison thereof with the results obtained with the original vulcanized bitumen, confirmed this indication. Finally, a description of a method for providing a remedy is given. Some form of colloidal filling having the requisite physical properties to allow of its incorporation with vulcanized bitumen of such composition as not to be capable of decomposition by hydrolytic action, and which at the same time would exert a maximum protective effect when present in small proportion, is clearly required. After much experimental work it was found that high-grade vulcanized rubber could be treated in such a manner that it would fulfil the requirements as regards incorporation with vulcanized bitumen and would, in addition, exert a surprising degree of protection against hydrolytic and selective action, even when used in small proportions. In fact, there was, apparently, some kind of mutual protective action, because the resistance to softening under steam-pressure conditions was greater in the combined substance than in either of its components. It was found that the addition of about 6 per cent of vulcanized rubber trebles the time required to produce the softening and that up to about 12 per cent the time is proportionately increased. When larger proportions are used the curve rapidly becomes steep, and at from 40 to 50 per cent the protection from softening effects appears to be infinite. Remembering that the softening action occurs only under faulty conditions and requires from five to six years to develop a troublesome stage, the protection afforded by from 5 to 10 per cent of the rubber substance would appear to be ample under the worst conditions of practice. An account of the extensive discussion which followed the presentation of the paper is also given.—*London Electrician*, Nov. 20, 1914.

*The War and the Electric Wiring Contractor in Germany.*—E. WIKANDER.—On account of the war the business of the electric wiring contractor in Germany is in bad shape. In Germany very few new houses are being built, and in the older houses no installations are being made except when some special inducement is made by the central station. The author urges that the

central station should make such inducements not only to help the wiring contractor but also in the interest of the central station itself. For instance, the central station might pay at least part of the installation if the house owner or tenant guarantee to pay back within the next two years yearly 60 per cent of the amount on an instalment plan. Some system of this kind is used by the central station of Genoa, Italy. The central station of Strassburg, Germany, has gone even further and has made the whole installation at its own expense. The result has been that it now sells energy to hundreds of thousands of residences which would not have been electrically lighted otherwise for many years. The municipal plant of Frankfurt on the Main has introduced this year a similar system. The author finally refers to the difficulty of importing kerosene into Germany on account of the capture of oil steamers by the British fleet, and he suggests that the German answer should be to introduce electric light universally.—*Elek. Zeit.*, Nov. 12, 1914.

#### Electrochemistry and Batteries

**"Ironized" Steel Tubes.**—A note stating that non-corrosive steel tubes will soon be produced in a British plant for ferro-zincing and "ironizing" tubes according to a process of S. Cowper-Coles. It is a well-known fact that the purer the iron the less liable it is to pitting and corrosion, chemically pure iron being practically rustless. "Ferro-zincing" or "ironizing" turns these facts to account by coating the steel surface with almost pure iron, the only impurity of any significance being hydrogen. The addition of hydrogen is an advantage, for the reason that it makes the iron slightly more electropositive to the underlying steel than it would otherwise be, so that it forms a better protective coating. Another advantage of the coating of electrolytic iron is that the coating is homogeneous, and is not under unequal strain caused by mechanical operations, such as drawing or hammering, and has not been subjected to any heat or mechanical treatment, which, of necessity, causes impurities to be absorbed by the metal so treated. It is advantageous for many purposes to coat the electrolytic iron surface with zinc, as a zinc coating with an intermediate layer of pure iron-hydrogen alloy gives a greatly increased life to an ordinary steel tube or plate.—*London Electrician*, Nov. 20, 1914.

#### Units, Measurements and Instruments

**Thermostat for Low Temperatures.**—JAMES H. WALTON, JR., AND ROY C. JUDD.—A description of a thermostat which permits one to maintain the temperature constant anywhere between 0 deg. and —20 deg. C. The general plan consists of a primary bath and a secondary bath. The primary bath is filled with a mixture of ice, salt and water, which is pumped through a coil in the secondary bath. When the temperature of the solution in the secondary bath becomes too low a regulator closes a cock by means of an electric relay arrangement and shuts off the flow of the cold brine. Similarly, when the secondary bath becomes too warm the cock is opened and the flow of brine lowers the temperature. By using a mixture of calcium chloride and ice in the primary bath it is possible to keep the secondary bath at a temperature of from —25 deg. to —30 deg. C. The thermostat may also be used at somewhat higher temperatures. For example, ice water could be substituted for the brine solution, and at higher temperatures the primary bath could be entirely replaced by a boiler generating superheated steam.—*Journal Phys. Chem.*, December, 1914.

#### Miscellaneous

**The Engineer and the Chemist.**—FRANK BAILEY.—An abstract of his presidential address to the British

Association of Engineers-in-Charge on the subject of "The British Empire—and Our Work in It." The author compares the value of exports from Germany and from the United Kingdom in various industries and inquires as to the reason of the apparent failure of Great Britain to take a larger share of the trade. Finance, tariffs and adaptability contribute in some measure to the result. "The weakest link in our chain of progress appears to be the method of ascertaining the right way of going to work. Sometimes it is achieved by actual experience, or, in other words, by trial and error, but rarely by systematic examination. In such an investigation the services of the chemist are generally of great value, although they are seldom appreciated, except in chemical factories. Industrial chemistry can assist the engineer by defining the composition of substances, and when combined with some knowledge of engineering requirements the advice of the chemist is a good investment. In this matter the industrial chemist with a slight knowledge of mechanical engineering is capable of giving better assistance than the engineer with a rudimentary knowledge of chemistry; but it is essential that the engineer should place implicit faith in the chemist and adopt the whole of his advice, as otherwise a partial remedy may introduce new troubles." The selection of metals or alloys and that of lubricating oils, etc., are examples of work in which the chemist can be of great assistance.—*London Electrician*, Oct. 16, 1914.

## Book Reviews

**KONSTRUKTION UND PRÜFUNG DER ELEKTRIZITÄTS-ZÄHLER.** By A. Königsworther. Leipzig: Dr. Max Jänecke. 520 pages, 554 illus. Price, 16 marks.

A very substantial and carefully prepared treatise on the construction and testing of electricity meters for both direct-current and alternating-current service. It is divided into three sections. The first relates to fundamental principles, the second to the construction of meters, and the third to their testing. The book is copiously illustrated, there being more than one illustration per page on the average. These illustrations, which are well selected, are circuit diagrams, performance curves and pictures of machine parts. Although German meters constitute the bulk of the discussion, French, British, Italian and American meters are also considered. The book will interest all students of electric-power metering, especially those who wish to be informed upon the construction and testing of European meters.

**THE ELEMENTARY PRINCIPLES OF WIRELESS TELEGRAPHY.** By R. D. Bangay. London: The Marconi Press Agency, Ltd. 160 pages, 86 illus. Price, 1 shilling.

An instructive little book on the theory of radiotelegraphy and some of its applications. The reader who is inclined to study the brief presentation of the elements of electricity and magnetism set forth in the first part of the book should have little difficulty in apprehending the general discussion of wave motion and electrical oscillations which follows. The theoretical bases for the author's concise explanations seem to be accurate for the most part, though the presentation of the subject of pressure waves will lead an unsuspecting student to the belief that "ether waves" are not of transverse vibrational nature. The book is well worth the attention of workers in radiotelegraphy who are anxious to crystallize their conceptions and escape from the prevalent hazy notions as to elementary theory.

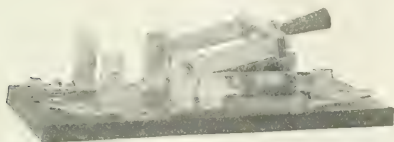


# New Apparatus and Appliances

An Illustrated Descriptive Record of Recently Developed  
Manufactured Products of Interest to Electrical Readers

## Knife Switch

A knife switch the blades of which can be changed from one set of clips to another so that the fuse connections can be either at the handle end or the hinge end has been developed by the Frank Adam Electric Com-



SWITCH WITH BLADES THROWN COMPLETELY OVER

pany, St. Louis, Mo. The change can be accomplished by loosening the compression bolts on the clips with a screwdriver and hinging the knife blades to the opposite set of clips. With such a switch the wireman can make a change on the job without sending for another switch if conditions at the installation should require that the fuse connections be at the opposite end of the switch. In the accompanying illustration the knife blades are shown completely thrown over.

## Magnetic Switches

Several kinds of magnetic switches, including a lock-out switch of the series-coil type and improved switches of the shunt-coil type, have recently been developed by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis. The lock-out switch is shown in the accom-



MAGNETIC LOCK-OUT SWITCH

panying illustration and is designed for the automatic starting of motors. High-contact pressures, it is claimed, are obtained with this switch, and there is considerable "follow-up" on contacts to allow for wear. When the flow of energy exceeds a predetermined and

adjustable amount the switch remains open, and when it falls below this value it remains closed. On the 100 amp switches the arcing contacts are the energy-carrying contacts also. For the larger switches laminate brush contacts are used to carry the energy, and for arcing auxiliary contacts are provided. The series-wound coil of this switch is divided into two parts, the upper being bar-wound and the lower consisting of copper and asbestos ribbon. The upper section of the coil tends to close the switch and the other part to hold it open.

## Metal Sign Receptacle

The sign receptacle shown in the accompanying illustration is equipped with heavy shoulders for holding screws. Wide slots and a guide are provided for leading the holding screws down to the nut. The nuts for the

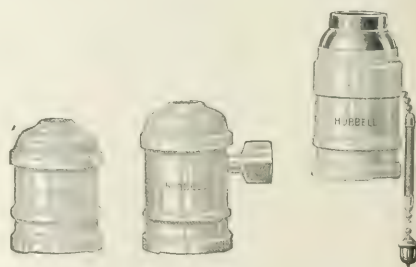


SIGN RECEPTACLE

holding screws are fastened in place by clips so that they cannot get out of position. The center contact is of phosphor bronze. The device is being made by the H. T. Paiste Company, Philadelphia, Pa., for which the selling agents are the Hart & Hegeman Manufacturing Company, Hartford, Conn.

## Porcelain Sockets

Porcelain sockets equipped with 0.5-in. aluminum caps have recently been developed by Harvey Hubbell Inc., Bridgeport, Conn. In Fig. 1 and Fig. 2 are shown

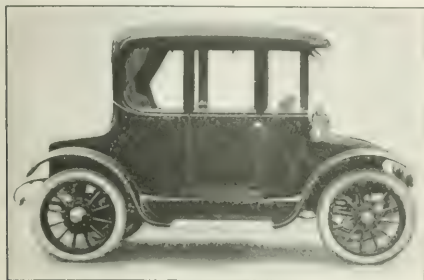


FIGS. 1, 2 AND 3—SOCKETS WITH ALUMINUM CAPS

key and keyless sockets provided with pendant caps, and in Fig. 3 a pull socket. The pull socket is rated at 250 watts at a pressure of 250 volts; the key socket at 250 watts at a pressure of 250 volts, and the keyless at 660 watts at a pressure of 250 volts.

### Five-Passenger Electric Brougham

In the latest car developed by the Ohio Electric Car Company, Toledo, Ohio, the body is of aluminum throughout and the window frames are made of solid aluminum castings. The doors are hung on steel hinges and a safety catch is provided on each door which prevents it from flying open when not fully closed. Chainless direct-shaft drive is used with this car, and the mo-



1915-MODEL ELECTRIC FIVE-PASSENGER CAR

tor is suspended by a ball-and-socket joint. The motor propeller shaft and rear axle form one rigid unit. The shaft is directly connected to the motor without reduction gears. The torsion tube, in which the shaft is held concentric by a double row of ball bearings, is connected to the rear axle and to the motor, thereby keeping the shaft in alignment. Either helical bevel driving gear or worm driving gear may be used with this car, as desired. A small disk is used for controlling purposes. By turning the disk in one direction four forward speeds are obtained; an accelerator button which is near the foot adds an extra speed. By turning the disk in the other direction three reversing speeds are obtained. The disk cannot be reversed without pressing a guard button, which prevents the possibility of turning it in the wrong way in an emergency. By pushing a controller-lock button the controller disk is locked and cannot be moved until unlocked by means of a key. The magnetic brake is operated by another button.

### Colored Toy Lantern

A small electric lantern designed especially for use by children has been developed by the American Ever

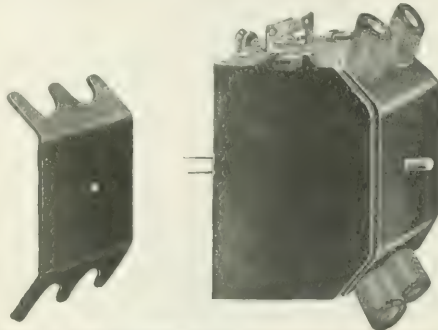


ELECTRIC LANTERN FOR CHILDREN

Ready Works, 304 Hudson Street, New York. The lantern is equipped with a colored-glass chimney, and the battery is placed in the case shown in the illustration. A small tungsten lamp is used with the lantern, and both the lamp and the battery can be renewed.

### Clamp for Flexible Non-Metallic Conduit

A clamp for fastening flexible non-metallic conduit or "loom" to switchboxes has been developed by the Adapti Manufacturing Company, Cleveland, Ohio. The clamp shown in Fig. 1 is of sufficiently heavy gage, the manufacturers declare, to withstand any strain that may be placed upon it. In Fig. 2 the device is shown at-



FIGS. 1 AND 2—CLAMP FOR NON-METALLIC CONDUIT

tached to an iron switch box made by the above company. The switch box is provided with a hole in the bottom to which the clamp can be fastened. The clamp itself is provided with a threaded hole. The clamp can be used to hold one, two, three or four conduits in place.

### Time Switch

Switchboard devices have been designed for show-window lighting circuits, signboard circuits, apartment-hall lighting circuits, etc., to cut off the supply of energy automatically at a certain definite time, by the Paragon Electric Company, 9 South Clinton Street, Chicago, Ill. Four models of these time switches are being made, two for outdoor use and two for indoor use. A clock and spring motor are used to operate the switch, which for currents of 30 amp or less is an ordinary snap switch. The cases for the outdoor type have a closed face, while those for indoor work are equipped with an open face so that the clock may be employed for designating the time. The switch can be adjusted so as to turn on the lamps at a certain time or turn them off at the proper moment. It will also turn on part of the lamps in a circuit at one time and the others at another



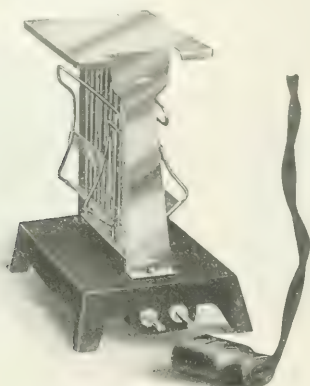
INDOOR-TYPE TIME SWITCH

time. The adjustment can be arranged so that a day can be skipped if desired. The outdoor types are equipped with heating coils and regulating thermostats to prevent the hardening of oil and the consequent clogging of the clock works in cold weather.



### Electric Toaster

The toaster shown in the accompanying illustration is designed to toast two slices of bread at one time. The top is of plain colonial design, and both top and frame are finished in nickel. A toast holder is mounted



SMALL ELECTRIC TOASTER

on each side of the device. A non-conducting base is provided which is finished in black. The base is heavy enough to prevent the toaster from easily tipping. The toaster is being placed on the market by the Cadillac Electric Manufacturing Company, Cadillac, Mich.

### Light-Weight Coffee Percolator

A light-weight coffee percolator made of aluminum and German silver which cannot impart a metallic taste to the coffee has been brought out by the Hotpoint Electric Heating Company, Ontario, Cal. It is provided with a lip-spout similar to that usually associated in the public mind with coffee pots. The heating unit, which is the same type as used in the flatirons made by this company, is guaranteed for five years. It is clamped between a shoulder inside the pot and a nut

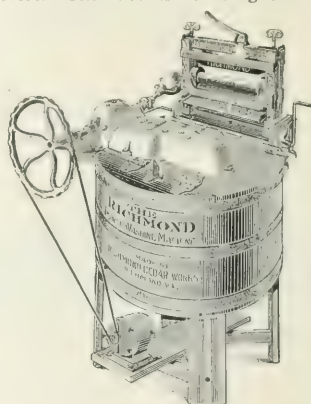


ALUMINUM COFFEE PERCOLATOR

in the base so that it can be replaced anywhere. Percolation can be started thirty seconds after pouring cold water in the receptacle and turning on the energy, it is declared. The device weighs only 24 oz. and is highly polished.

### Electric Dolly-Type Washing Machine

In the washing machine shown in the accompanying illustration three adjustments are provided, one for the wringer, another for the dolly and another for the reversing device. The tubs are of Virginia white cedar

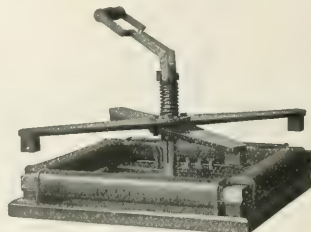


MOTOR-DRIVEN WASHER

and are fastened together by flat, galvanized-steel hoops. The bottoms of the tubs are corrugated, as are also the staves nearly to the top. The dolly is of seasoned hard wood and is equipped with smooth pins. The machine is connected to a 16-hp Emerson motor by rope drive. It has been placed on the market by the Richmond Cedar Works, Richmond, Va.

### Core-Loss Testing Outfit

Apparatus for determining the hysteresis and eddy losses of sheet iron and steel has recently been introduced. The equipment consists of a sample holder, a frequency meter, ammeter, voltmeter and wattmeter of suitable rating to make the required measurements, and the core loss is read directly on the wattmeter. The sample holder is shown in the illustration herewith, and consists of four solenoids mounted along the sides of a square wooden base in such a way that when the test pieces are placed in them a continuous magnetic circuit having four equal sides is formed, the corners of the circuit being held firmly down by means of a four-jawed clamp worked with a toggle-joint mechanism at the center. Each of the four coils has a primary and a secondary winding. The four primaries are connected



TESTING OUTFIT FOR CORE LOSS

in series, and the ends are brought out to terminal posts. The secondaries are arranged in the same manner. The outfit is being placed on the market by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

### Four-Cylinder, Single-Acting Vertical Diesel Engines

A large-sized Diesel engine of the vertical four-cylinder, single-acting, four-stroke-cycle, inclosed-crank-case, medium-speed type is shown in the accompanying illustration. The base-plate and frame (crank case) are separate, and large doors are provided for inspecting purposes. The cylinders and liners are independent castings.

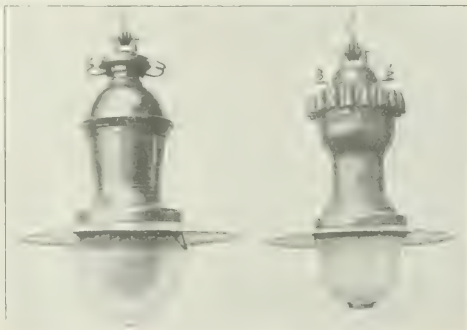
The cylinder heads contain the starting, fuel, admission and exhaust valves. The fuel valve is centrally placed in the head. The starting and fuel valves are operated by levers fulcrumed upon an eccentric quill which can be rotated by a hand lever so as to change the position of the valve levers relatively to their cams. With this arrangement the fuel valve levers are out of contact with their cams when the starting valve levers are in contact with their cams. The cam shaft is alongside of and level with the cylinder heads.

The fuel pump is of the multiple type and is operated from the two eccentrics on the vertical governor shaft, which revolves at engine speed. It gives two discharges of fuel for each power stroke. The governor is designed to keep the suction valve of the fuel pump open over a part of the working stroke of the fuel pump plunger. A three-stage air compressor is used, and it has the appearance of a fifth cylinder on the engine. The compressor is driven from the crank shaft.

The engine is equipped with a forced-lubrication system, the oil being fed at a pressure of 30 lb. per sq. in. For the large-sized units, a device which is automatically operated by the governor is provided for reducing the pressure of the air used for fuel injection whenever the load decreases. The large engines are equipped with another device which automatically adjusts both the period and the lift of the fuel needle. A so-called compression-relief gear is provided to re-

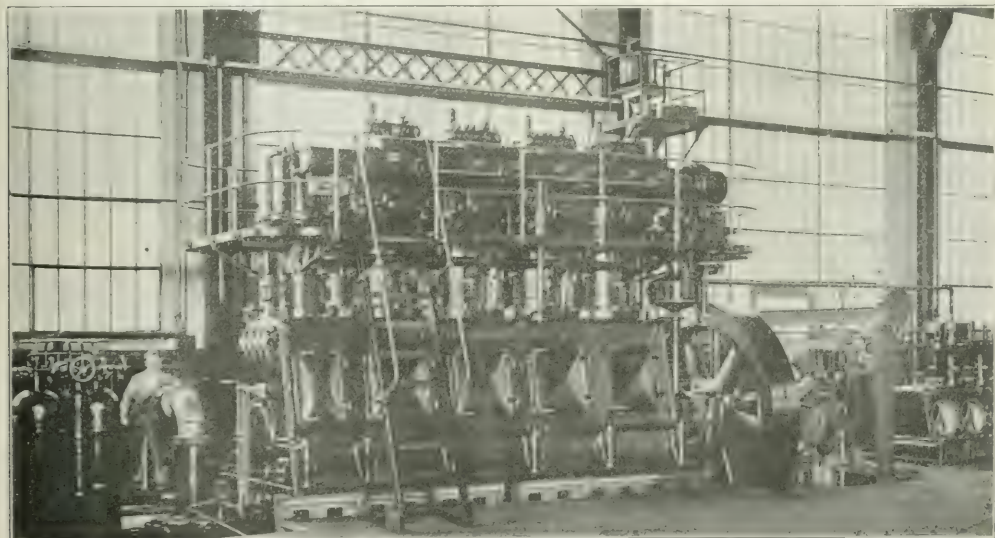
### Fixtures for Street-Lighting Service

Various types of fixtures for use with high-candle-power nitrogen-filled lamps designed for street lighting have been developed by the General Electric Company, Schenectady, N. Y. Two different classes of pendent units have been developed, and they are



PENDENT FIXTURES FOR NITROGEN-FILLED LAMPS

designated as form 1 and form 2. The form 1 unit resembles the arc lamp in general contour and appearance. This unit is arranged to be equipped with an opal diffusing globe, an opal diffusing globe and concentric reflector, a prismatic refractor and clear globe, or a prismatic refractor. The form 2 pendent units are cheaper than the form 1 fixtures, and they may be equipped with diffusing globe, concentric reflector and diffusing globe, radial-wave reflector, or concentric reflector and prismatic refractor. Both the form 1 and form 2 units are arranged to take a compen-



VERTICAL DIESEL ENGINE

duce the compression in the working cylinders when starting on compressed air.

The Type D engine, as it is called, is being manufactured by the Busch-Sulzer Brothers-Diesel Engine Company, St. Louis, Mo.

sator which is mounted under the dome and inside the casing. The refractor has two sections, one inside the other. The company has also designed a unit for ornamental street lighting, mounted on a standard. The lighting fixtures described are called "Novalux" units.



# Jobber, Dealer and Contractor

## Central-Station Advertisements That Stimulate Dealers' and Manufacturers' Holiday Trade

In a series of five newspaper advertisements which the New York Edison Company is running until Christmas attention is called to the variety of useful and fascinating electrical appliances which can be obtained in department stores or of electric dealers and appliance manufacturers. These advertisements also invite persons to visit the electric-service company's appliance display rooms, where numerous electrical devices suitable for Christmas presents are exhibited. To those who are unable to visit the electric shops it suggests that they consult the electrical directory of the Edison official bulletin to obtain the names of electrical dealers in their locality. In each of these advertisements a number of electrical appliances are mentioned, and the public is advised that the electric-service company will forward orders to manufacturers of electrical goods. Posters bearing the same text as the newspaper advertisements are displayed in the branch-office windows



**This Christmas  
Give Something Electrical**

Come in and see the great variety of devices on display

WINDOW-DISPLAY CARD

of the electric service company at the same time that the corresponding advertisement is being published. Devices mentioned on the posters are displayed in the windows, with cards similar to the one shown herewith, bearing a drawing representing Santa Claus standing beside an evergreen tree decorated with incandescent lamps, while below are the words, "This Christmas give something electrical." Stickers bearing a similar legend and drawing were attached to the consumer's electric service bills.

## Preparations for Holiday-Appliance Sale in Brooklyn

By informing residents of Brooklyn of the electrical gift-ware on sale at its appliance display room, both through personal invitations and a conspicuous outdoor sign, the Edison Electric Illuminating Company of that city succeeded in starting its holiday sales early in



FIG. 1—HOLIDAY-SALES BILLBOARD



FIG. 2—INTERIOR DISPLAY

December. Even last year's records, which showed three times the sales of previous seasons, did not come up to this year's result. During the first week of December the rush was unusually large. Many portable table lamps were disposed of, as well as electrical appliances, including irons, percolators, hot-plates, etc. The company's main and branch office display rooms were elaborately decorated, the Christmas shoppers being entertained with music from an electric piano and with refreshments prepared on electrically heated utensils. All articles sold during the holiday season were wrapped in holly-decorated paper, and the purchasers were provided with special Christmas cards, bearing the name of the Edison Shop, on which they could write the name of the person to receive the present as well as the name of the giver. Arrangements were made for delivering the gifts at any time before Christmas Day that the purchaser desired.

The accompanying photographs show the billboard advertising the holiday sales, as well as the interior decorations of the Electric Shop and of a display window in one of the branch offices. On the rear wall of the latter was a reindeer's head made of white papier-mâché sprinkled with mica to represent snow. The eyes were made of glass and were illuminated by incandescent lamps inside of the reindeer's head. A thermostat arranged to turn the lamps on and off alternately caused the eyes to blink and attract attention to the articles displayed in the show window.



FIG. 3—WINDOW DISPLAY

## Elaborate Electrical Christmas Displays at Boston

The possibilities of using electricity in outdoor Christmas display advertising are being realized to a greater extent at Boston, Mass., this season than ever before. Three of the larger department stores in the downtown district inaugurated the striking displays shown in the accompanying halftones on the first of the month, and these will be maintained until after Christmas in each case. All three displays are supplied with energy from the three-wire 110-220-volt direct-current underground mains of the Edison Electric Illuminating Company of Boston. Although within about five minutes' walk of one another, each display is invisible from the others and thus creates its own center of interest and tends to localize patronage.

Fig. 1 is a view of the display of Houghton & Dutton, a firm which has been a pioneer in the spectacular use of electricity in the holiday season at Boston and whose elaborate decorations have been illustrated in this paper prior to the present year. In this display Santa Claus appears to be dashing out of his castle into



FIG. 1—SANTA CLAUS AND HIS REINDEER

the snow. On the side are two symbolic groups representing peace and prosperity, while underneath four heroic-size figures supporting the piece represent the four corners of the globe and emphasize the universality of the Yuletide season. The installation includes a total of 4200 incandescent lamps ranging in size from 12 watts to 250 watts, the usual unit being rated at 20 watts. Flashers inside the store vary the coloring at the top of the bastions and elsewhere, and simulated icicles at the bottom glitter with realistic effect.

The display of the Gilchrist Company (Fig. 2) shows a huge Christmas fireside scene with a head of "Old Father Christmas" 6 ft. in height over the mantel, other features being ornamental columns, symbolic representations of celestial heralds, children of the earth riding forth on reindeer, Christmas bells, and, 50 ft. above the street, the "Star of Bethlehem," composed of 186 20-watt lamps. The display as a whole includes 2000 20-watt lamps, 100 8-cp candelabra lamps, 100 100-watt tungsten lamps and two 750-watt gas-filled lamps, the last-named being in upper bells flanking the main display. Red and green lamps of the 20-watt



FIG. 2—A CHRISTMAS FIRESIDE

size produce the so-called "icicle effect," and the open fire is simulated by 20-watt amber-colored candelabra lamps with a background of 100-watt units.

### Reindeer Give Place to Motor Car

At the store of the W. & A. Bacon Company (Fig. 3) a noteworthy display has been placed in operation showing the patron saint of the season seated in a flying automobile laden with gifts and good cheer with a large Christmas bell in festoons above. Twenty-watt lamps are used throughout, there being 1875 in the automobile alone and 200 in the bell and streamers. The automobile is 36 ft. long and 24 ft. high, and with the upper streamers and bell extends from the fifth to the second floor on the Washington Street façade of the building. The first two displays named were wired by Haley & Schaefer, Boston, the Bacon installation being made by employees of the house.



FIG. 3—A MODERN SANTA CLAUS



# Industrial and Financial News

## Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

**Rebuilding Edison Plant.**—The work of reconstruction of the parts of the plant of Thomas A. Edison, Inc., which were damaged by fire on Dec. 9 is progressing rapidly. Forces of men are engaged night and day and the plans for development of the new parts of the damaged structures are well under way.

**Apparatus for Softening, Weighing and Filtering Water.**—The Kennicott Company, Chicago Heights, Ill., manufacturer of apparatus for softening, filtering and weighing water, states that among the interesting power installations that it has made is that for the Mississippi River Power Company at Keokuk, Ia., which consists of a battery of filters which has a rated output of 60,000 gal. of water per hour.

**Battery, Lamp and Telegraph Instrument Export Trade Increases.**—The official figures for the October exports show that, with the exception of the battery, lamp and telegraph instrument trade, there was a lessened export trade for electrical apparatus in comparison with the previous year. The total value of electrical exports in October, 1914, was \$1,494,792, as compared with \$2,516,415 in October of the previous year.

**Motor Manufacturer's Plant Slightly Damaged by Fire.**—Two buildings in the foundry plant of the Robbins & Myers Company, Springfield, Ohio, were recently damaged by fire. Arrangements have been made with other foundries to continue the work carried on by the Robbins & Myers Company until the buildings are replaced, and the company's business will be neither hindered nor delayed. Work has already been begun to rebuild the property lost.

**Low-Priced Electric Toasters Selling Well.**—A toaster manufactured by the P. J. Electric Heating Company, 332 South LaSalle Street, Chicago, Ill., which was described in the *Electrical World* of Oct. 24, page 830, has met with considerable success. The toaster is a low-priced device, and Mr. P. J. Whiteside of the above company declares that the sales have been enormous. A large number of foreign orders have also been received. The P. J. company is working on other cooking devices, including electric ranges, which it expects to place on the market next spring.

**Ball-Bearing Company Busy.**—Weekly shipments are being received by the S K F Ball Bearing Company, 50 Church Street, New York, from its factory in Gothenburg, Sweden. The company's business in this country is very good. A large supply of ball bearings is being kept on hand, the company reports, in anticipation of a great amount of future business. The S K F bearings are especially meeting with favor for electric motors and generators, mine locomotives, textile and paper-making machinery, etc. Recently, they have been adapted for use with steel railroad cars.

**Switchboard Business Picking Up.**—On account of the depression in the building industry in and about New York City this fall, the Empire Engineering & Supply Company, 227 Fulton Street, New York, manufacturer of switchboards, reports that its business has not been very good; but since Dec. 1 the company has noted an improvement, and the prospects for the future are much better than they were two months ago. The above company is also making a number of electrical devices, among these being a recently developed automatic time switch and an attachment for pull sockets which lifts the chain and takes the strain off the socket.

**Demand for Electric Toys.**—The Lionel Manufacturing Company, 48 East Twenty-first street, New York, reports that it is selling a large number of its electrically operated

toys this season. Popular among these are the miniature trains and automobiles. Locomotives are faithfully modeled after the patterns of passenger and freight engines in general use, as are also the cars and other accessories. In this way the devices have considerable educational value. The toys can be operated by batteries or they may be placed on regular lighting circuits when suitable transformers are provided. Besides the demand for electrically driven toys during the Christmas season, many stores use them, especially the trains, for display purposes throughout the year. The above company makes its own toys, its factory being at Newark, N. J.

**Importers of Electrical Devices Doing Well.**—Considering the adverse conditions brought about by the European war, the Importer Sales Company, 19 East Twenty-first Street, reports that its business is quite good. This company has an agency in Berlin, Germany, and it imports a number of electrical devices. Shipments have recently been received via neutral countries, but they have necessarily been irregular. On account of the difficulty of receiving Christmas lighting outfits, the above concern is manufacturing two sets of its own this year, one set being operated on batteries and the other on an ordinary lighting circuit. Among the devices of interest which this company is importing is an instantaneous water heater, a so-called electric candle, an electric house lamp and a recently developed electrically illuminated clock.

**Christmas Selling Campaign.**—An extensive selling campaign for the holiday season has been inaugurated by the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa. The company is sending to the dealers posters, street-car cards, mailing letters and leaflets on any of which the name of a dealer can be printed if desired. The posters are attractively lithographed in six colors. Wreaths and placards are provided for window displays. The first page of the mailing letter is in the form of a letter, the dealer's business name and address going in the panel below a Christmas sketch. At the bottom of the letter space is provided for the personal signature of the dealer. The inside pages contain information on various electric devices suitable for Christmas gifts. The envelopes furnished with these mailing letters are blank and of good stock, thereby giving the mail a personal touch. The advertising leaflet contains information for the dealer and explains how he may obtain the advertising literature which the Westinghouse company is sending out.

**New York Safety Show.**—The second annual Exposition of Safety and Sanitation was held at New York Dec. 12-19, under the auspices of the American Museum of Safety. A number of the displays were of electrical interest, and showed many devices for the safeguarding of life not only in industrial occupations but in the home and on public thoroughfares as well. The New York Edison Company's booth contained appliances which the company is using to insure safety to its employees and to the public, including protected switching apparatus, a model tool cart and a danger flag, which is always unfurled, for open manholes. A completely equipped freight elevator was a feature of the Otis Elevator Company's exhibit. The exhibition of various types of fire alarms shown in the booth of the fire department of the city of New York also attracted considerable interest. Among the railroads, the Union Pacific, the Southern Pacific, the New York Central & Hudson River and the Brooklyn Rapid Transit were represented by complete exhibits. Other companies having exhibits were the Metropolitan Engineering Company, Brooklyn, N. Y.; the B. F. Sturtevant Company, Hyde Park, Mass., and the American Model & Instrument Company, Worcester, Mass.

## Corporate and Financial

**Ohio & Western Utilities Bonds.**—P. W. Brooks & Company, of New York, are offering \$625,000 Ohio & Western Utilities Company first lien collateral trust 5 per cent and 6 per cent sinking-fund gold bonds, dated Nov. 16, 1914, and due Aug. 1, 1929.

**Public Service Electric Company Sells Stock.**—The Public Service Electric Company of Newark, N. J., has sold to the parent company, the Public Service Corporation of New Jersey, \$2,000,000 of stock for cash at par, the proceeds to be used for construction and other corporate purposes.

**Cities Service Company.**—The Cities Service Company, in most of the cities in which it operates, is back to normal or nearly so, according to a statement by Mr. H. L. Doherty, president of the company. No immediate change is contemplated in the policy of deferring dividends, although the matter is under constant consideration.

**Olean Electric Light & Power Bonds.**—The Olean Electric Light & Power Company was authorized by the New York Commission, Second District, to issue \$7,200 6 per cent thirty-year first and refunding mortgage bonds at not less than 80, to aid in meeting certain bills and accounts payable, not properly chargeable to operating expense or income.

**Bond and Stock Authorization.**—The Railroad Commission of California has authorized the San Diego Consolidated Gas & Electric Company to issue \$250,000 of 6 per cent debenture bonds, due on Dec. 1, 1922, at not less than 93 and interest, and \$240,000 of common stock at not less than par. The proceeds are to be used for refunding obligations of \$472,296.

**Pennsylvania Water & Power Bond Offering.**—Messrs. Jackson & Curtis, of New York, are offering at 89 and interest a block of Pennsylvania Water & Power Company first mortgage 5 per cent sinking-fund gold bonds, dated Jan. 27, 1910, and due Jan. 1, 1940. This block of bonds was issued to reimburse the treasury for moneys expended out of income on recent extensions.

**Wisconsin-Minnesota Light & Power Stock.**—The Wisconsin-Minnesota Light & Power Company's stock recently authorized by the Michigan Railroad Commission has been used in the acquisition of several properties owned by the American Public Utilities Company. The transaction was merely an exchange of stock and getting several of the company's subsidiaries into one operating unit.

**San Diego (Cal.) Company to Issue Bonds and Common Stock.**—The California Railroad Commission has authorized the San Diego (Cal.) Consolidated Gas & Electric Company, a utility managed by H. M. Byllesby & Company, to issue \$240,000 in common stock and \$250,000 6 per cent debenture bonds, payable Dec. 1, 1922. The bonds are to be sold at not less than 93 and the stock at not less than par value.

**Scranton Electric Company Bonds.**—Harris, Forbes & Company, of New York, are offering an additional block of escrow bonds of the Scranton Electric Company. These bonds are first and refunding (non-first) mortgage 5 per cent gold bonds dated July 1, 1907, and due July 1, 1937. The earnings statement for the year ended Oct. 31, 1914, shows the net earnings to be approximately three times the bond interest.

**International Power Adjudged Insolvent.**—On Dec. 10 Chancellor Walker of the Court of Chancery of New Jersey filed an opinion deciding that the International Power Company of New Jersey was insolvent and that a receiver should be appointed and an injunction issued against the company restraining it from further business. The decision grew out of the charges of Mr. Henry W. Bull, of New York, chairman of the minority protective committee. The company has appealed from the decision to the Court of Errors.

**Northern New York Utilities Authorized to Issue Securities.**—The Public Service Commission of the Second District of New York has authorized the Northern New York Utilities, Inc., to issue securities amounting to \$310,000, consisting of \$200,000 of 5 per cent fifty-year first mortgage bonds, to be sold at not less than 90, \$80,000 of cumulative 7 per cent preferred stock, and \$50,000 of com-

mon stock. The proceeds are to be used for the purchase of the Carthage Electric Light & Power Company together with its obligations.

**Worcester Electric Light Company to Issue Stock.**—The Worcester (Mass.) Electric Light Company has been granted authority to issue 1000 shares of additional stock at \$200 per share to cancel notes issued and to meet the cost of enlargements of plant and additions to the distributing system.

**Northern California Power Authorized to Issue Stock.**—The application of the Northern California Power Company, Consolidated, to issue 5000 shares of 6 per cent cumulative preferred stock at 80 was approved by the California commission. The proceeds are to reimburse the treasury for \$225,000 expended for capital account and to provide \$175,000 for extension and betterments. The company was to have its properties appraised before Dec. 1, and if any deficiency was found to exist between the sum of the obligations and the preferred stock, on the one hand, and the value of the property, on the other, the company may be ordered to assess the stockholders to make up the deficiency. This precaution is to protect the preferred stock.

**Rochester Company to Issue Bonds.**—The Rochester Railway & Light Company was authorized by the New York Commission, Second District, to issue \$250,000 of 5 per cent fifty-year consolidated trust mortgage bonds, to refund a like amount of underlying bonds of the Brush Electric Light Company maturing on Jan. 15, 1915. The new bonds are to be sold at not less than 95. Should holders of the underlying bonds not be willing to exchange for the new bonds at not less than 95, permission is given to the company to enter into an agreement with such bondholders whereby an extension of the time for payment of the principal may be obtained for one year at an increase from 5 to 6 per cent interest during that time on the old bonds.

**Georgia Railway & Electric Bonds Sold.**—Charles C. Harrison, Jr., & Company, of Chicago, recently purchased and disposed of \$16,000 Georgia Railway & Electric Company refunding and improvement mortgage sinking fund 5 per cent gold bonds. The bonds were offered for 93.5. The company is leased under a 999-year contract, effective January, 1912, by the Georgia Railway & Power Company, which company assumes under the lease the railway and electric company's fixed charges, the 5 per cent preferred-stock dividends and the 8 per cent common-stock dividends. The refunding and improvement mortgage 5 per cent bonds are secured by a general lien on all property of the company, subject to \$10,444,000 prior liens. There was a sale of these bonds Dec. 4 at 95 and interest.

**Southern California Edison to Sell Bonds.**—The Railroad Commission of California has issued a supplemental order authorizing the Southern California Edison Company, of Los Angeles, to sell \$134,000 of its 6 per cent bonds at not less than 86. These are part of a previous issue amounting to \$2,500,000 which the company was authorized to sell at not less than 87½. The commission has also authorized the company to issue \$784,000 of 5 per cent bonds; \$266,000 may be issued at once, provided the company receives not less than 86 and interest. The proceeds will be used in paying promissory notes of \$250,000. The remaining \$518,000 bonds shall not be issued until the commission has made a further order specifying the minimum price of sale and the specific purposes to which the proceeds shall be applied.

**Columbus Companies to Vote for Consolidation.**—On Jan. 7, 1915, at the annual meeting, the stockholders of the Columbus (Ohio) Light, Heat & Power Company will vote upon the question of consolidation with the Columbus Railway, Power & Light Company. Already 75 per cent of the outstanding shares have been deposited in accordance with the proposition made by the larger company. Stockholders of the Columbus Light, Heat & Power Company will transfer their holdings on the terms the Columbus Edison Company stockholders received and they will get series A preferred stock of the Columbus Railway, Power & Light Company for their preferred and series B preferred for their common stock. It is thought that the Columbus Railway, Power & Light Company will proceed with the reorganization of its finances as soon as this consolidation is completed. Outstanding bonds of the various companies will be refunded.



**Boston Edison Shareholders.**—The Edison Illuminating Company of Boston has 4900 shareholders, with an average holding of forty-two shares. Fifteen shareholders have 1000 shares or over, they being the estates of George Peabody, Gordon McKay, S. B. Cabot, G. P. Upham, W. P. Mason and Quincy A. Shaw; Messrs. George R. White, George A. Gardner, William E. Rice, George A. Peabody, E. Pierson Beebe and J. Otis Wardwell, and Kidder Peabody & Company, the trustees of Harvard College and the Boston Insurance Company.

**Southern California Edison's Expansion.**—Assistant General Manager R. H. Ballard, of the Southern California Edison Company, Los Angeles, states that the year's expenditure for growth in demand will be \$1,762,000. The year's extensions have been made at the demand of an increasing population and not in new fields where a demand would have to be created. According to Mr. Ballard, the expenditure includes no large items but only small ones. The extension field covers the counties of Kern, Santa Barbara, Ventura, Los Angeles, Orange, Riverside and San Bernardino. The bulk of the expenditures was made in Los Angeles.

**Wisconsin Railway, Light & Power Company's Annual Report.**—The Wisconsin Railway, Light & Power Company has rendered its first report, covering the time from organization on Feb. 10, 1913, to June 30, 1914. The report shows the operations for the year ended June 30, 1914, and also for the period Feb. 10, 1913, to June 30, 1913. For the twelve months ended June 30, 1914, gross earnings were \$385,947, from which were deducted operating expenses and taxes amounting to \$248,116, leaving as net earnings \$137,831. Interest amounted to \$111,000, leaving a balance of \$26,831. The company has made many improvements to its properties and undertaken considerable new construction, the total cost of which was \$168,194. Mr. Clement C. Smith, president of the company, stated that while the street-railway earnings had fallen off materially, owing to the European war, the electric light and power earnings had suffered no loss to Aug. 1 and but a very small loss since then. Mr. Smith stated: "The company has used every endeavor to reduce expenses to meet the loss in earnings, and fortunately the completion of numerous improvements to the property has assisted in reducing the operating costs so that the net earnings still show a slight gain over last year."

**American Gas & Electric Declares Extra Dividend.**—The American Gas & Electric Company has declared an extra dividend of 2 per cent on the common stock. The dividend has been declared out of the surplus net earnings of the company and is payable in common stock on Jan. 2, 1915. The regular quarterly dividends of 1½ per cent on the preferred stock and 2 per cent on the common stock were declared. At the office of the company the following statement was made in reference to the extra dividend: "It has been the policy of the American Gas & Electric Company to disburse in common-stock dividends a reasonable part of its surplus earnings over and above the usual 8 per cent cash dividends, in line with which policy the company has declared an extra 2 per cent stock dividend, payable Jan. 2, 1915. The company also made an extra 2 per cent stock dividend July 1, 1914. The company attributes its satisfactory condition to its steadfast policy of making actual physical value the principal consideration when acquiring properties instead of capitalized earnings of the property acquired. This, combined with an efficient organization giving closest possible application to the affairs of the company, has made possible the furnishing of the best service the state of the art will permit at lowest possible rates, and resulted in good standing with the communities served. The earnings of the company have shown a very satisfactory increase over the previous year, due to the fact that the properties controlled by it are in various sections of the East and Middle West in which are established industries of an extremely diversified character. A large portion of the revenue derived by the local companies is from the sale of motor service, and while some lines of business served have been affected adversely, others have prospered, so that material increases in gross revenue are reported from practically every company of the American Gas & Electric organization."

## LIGHTING UTILITIES MAKE RECORD

After Two Months of War Depression Central Stations of Country Show a 7 Per Cent Growth

The electric utility companies of the United States have since the war began made for themselves an enviable record. It will be noted from the accompanying table that the companies in September, the second month of the war, showed an increase in both gross income and energy output of 7 per cent. Moreover, the decrease in the percentage rate of growth for gross income has been exceedingly small. On the other hand, the decrease in output growth rate percentage has been appreciable. This is explained by the fact that so many companies in the past year have made tremendous efforts toward increasing the domestic consumption of energy. One large company operating in the Central States stated that while the domestic consumers were using 10 per cent less energy for lighting purposes since the war began, the number of new customers was increasing to such an extent that the company was still showing large gains over the preceding year. One large holding company which controls properties in the Northwest, Southeast and Middle West stated that the efforts of the salesmen were being largely directed toward securing a greater

CENTRAL-STATION OPERATION STATISTICS OVER A THREE-MONTH PERIOD

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
July (66 per cent of industry)	\$14,086,822	\$12,970,325	8.5	803,848,850	649,720,026	23.8
August (70 per cent of industry)	15,298,226	14,200,649	7.8	778,109,565	718,274,456	8.2
September (70 per cent of industry)	15,708,695	14,694,205	7.0	782,450,2	733,754,420	6.8

number of domestic customers. This field is so far from the saturation point in many sections that the amount of new business which can be derived from it is of startling proportions. The companies have now come to realize that in order to keep their earnings up they must have on their lines a load which is very little affected by business depression.

The motor load is at times uncertain. While the large motor users ordinarily make a contract to use a certain minimum amount of energy, the generating companies must be in a position to furnish energy for the maximum demand of that company. Often in case of very large contracts this means the installation of additional machinery and apparatus, on which the generating company has to pay the annual fixed charges of depreciation, taxes and maintenance. These fixed charges go on irrespective of whether the demand is normal or not. When these fixed charges plus the operating charges are deducted from the gross earnings the result may not be entirely satisfactory. The companies, therefore, are now looking for a more stable way of reducing their operating charges, so that in times of depression they can still keep up a large amount of their load and yet not have a disproportional amount of fixed charges. It is undoubtedly for this reason that the companies have turned to the domestic users of energy as their field of growth. The results of their efforts can plainly be seen from the accompanying table.

While the figures in the table are for most purposes comparable, it must nevertheless be remembered that the same companies are not contained in each month's figures. There are some companies in the August and September figures which are not included in the July figures, and, unfortunately, the reverse is true. Our figures for October are so far rather incomplete. They include a number of companies not represented in the figures for the preceding months. The percentage growth in income was 7.4 and in

output 4.5. It will be noted that the rate of growth for income was better than for the month of September, while the output growth was not quite so good. In view of what has been said above, this was to be entirely expected. As soon as the industries of the country become stable and start to work on new orders the percentage rate of growth in output will once more show a growth by leaps and bounds.

During the month of October the companies which felt the strain the most were those operating in our largest cities. Those companies which were doing for the most part a lighting business and little or no motor business were showing large rates of growth, in some cases over 20 percent. The recent opening of the stock exchanges throughout the country will undoubtedly have its beneficial effect upon the manufacturers so that the amount of energy used in factories ought to increase rapidly.

## Business Notes

The Marion County Electric Company, Knoxville, Ia., is now the name of the concern which has been known as the Knoxville Electric Company.

The Yale & Towne Manufacturing Company.—M. C. Maxwell, for the past seven years head of the department of applied mechanics at Pratt Institute, Brooklyn, has been appointed superintendent of power and plant of the Yale & Towne Manufacturing Company, Stamford, Conn.

The American Manufacturers' Agency, Inc., 111 Monroe Street, Chicago, of which Mr. William H. McKinlock is president, has taken the Western and Northwestern agency for the switch boxes, plates, conduit boxes and cabinets made by the Federal Electric Company, of Pittsburgh, Pa.

## New Industrial Companies

The Utica Power Saving Company, of Utica, N. Y., has been organized by Stanley E. Gilbert, Thomas F. Conboy and Spencer Kellogg, of Utica, N. Y.

The Maher Manufacturing Company, of Libertyville, Ill., has been chartered with a capital stock of \$50,000 by N. L. Maher, L. W. Maher and E. C. Armitage. The company purposes to manufacture lighting fixtures and automobile accessories.

The Empire Lighting Fixture Company, of New York, N. Y., has been incorporated with a capital stock of \$25,000 to manufacture lighting fixtures and appliances, etc. The incorporators are L. Schaeffer, the Bronx; I. B. Ansorge and P. I. Ansorge, of Brooklyn, N. Y.

The Nichols Electric Company, of New York, N. Y., has been incorporated by N. Macaluso and J. Corami, of New York, N. Y., and J. Giaimo, of Paterson, N. J. The company is capitalized at \$25,000 and intends to manufacture wireless and other electrical apparatus.

The Allied Electric Company has filed articles of incorporation under the laws of the State of Delaware with a capital stock of \$750,000 for the purpose of manufacturing electric fans, etc. The incorporators are W. M. McEwen, V. P. Arnold and L. Klein, of Chicago, Ill.

Gaite, Peace & Company, of Brooklyn, has been chartered with a capital stock of \$15,000 to manufacture gas and electric fixtures. The incorporators are C. F. Peace, 1193 Lincoln Place, Brooklyn; E. H. Nostrand, Jamaica, and G. M. Hammond, Brooklyn.

The Kentucky Revivo Battery Company, of Louisville, Ky., has been chartered with a capital stock of \$200,000 for the purpose of manufacturing a patented electrical device. The incorporators are H. W. Embry, Sixteenth and Aebegust Streets, Louisville, Ky.; O. M. Billings and Henry Burnett.

The Southern Supply Company has filed articles of incorporation under the laws of the State of Maine with a capital stock of \$100,000 for the purpose of manufacturing, exporting, importing and dealing in electrical appliances, fixtures and supplies. A. F. Jones is president and T. L. Croteau treasurer, both of Portland, Ore.

The Tollometer Sales Company has filed articles of incorporation under the laws of the State of Delaware. The company is capitalized at \$100,000 and purposes to manufacture and sell tollometers and telephone appliances. The incorporators are F. R. Hansell, of Philadelphia, Pa.; G. H. B. Martin and S. C. Seymour, of Camden, N. J.

The Safety Signal Company, of New York, N. Y., has been incorporated by Arthur S. Dennen and Stanley C. Fowler. The company is capitalized at \$200,000 and intends to manufacture automobiles, general machinery, electrical devices, signals and safety devices for automobiles, etc. Arthur W. Dennen, 19 Cedar Street, New York, N. Y., is attorney.

The Electro-Chemical Supply & Engineering Company has filed articles of incorporation under the laws of the State of Delaware with a capital stock of \$100,000 for the purpose of manufacturing machinery used in connection with the electric chemical industry. The incorporators are Bert. R. Spencer and A. R. Yeakle, of Washington, D. C., and Joseph A. Burkhart, of Maryland.

The Marsden Electric Company, of Rutland, Vt., has been incorporated with a capital stock of \$25,000 by Arthur B. Marsden and R. L. Marsden, both of Manchester Center, and L. C. Davis, of Manchester Depot, Vt. The company intends to deal in electrical and gas fixtures and to do a general electrical contracting business, including building and installing electric and gas plants.

The Electric Supply Company, of Worcester, Mass., has been incorporated by interests identified with the C. C. Coghlin Electric Company, of Worcester, for the purpose of dealing in electrical, gas and automobile accessories. The place of business will be located at 294 Main Street, Worcester. Charles C. Coghlin is president and Edward F. Coghlin treasurer.

## Trade Publications

Insulating Varnishes.—"Insulating Varnishes and Compounds" is the subject of a booklet that is being sent out by the Sterling Varnish Company, Pittsburgh, Pa.

Fuses.—The Delta-Star Electric Company, 615 West Jackson Boulevard, Chicago, Ill., is sending out a placard containing list prices of several types of fuses.

Showcase Lighting.—Bulletin No. 22 recently issued by the National Lamp Works of the General Electric Company, Cleveland, Ohio, is entitled "Showcase Lighting."

Small Generating Set.—"Steam-Engine-Driven Generating Sets" is the subject of Bulletin No. 42,300, recently published by the General Electric Company, Schenectady, N. Y.

Conduit.—The Western Conduit Company, Youngstown, Ohio, has issued a booklet containing illustrations of representative buildings in San Francisco in which its "Buckeye" conduit is used.

Vacuum-Cup Washing Machine.—A motor-driven washing machine equipped with so-called vacuum cups is described in a bulletin issued by the Beebe Sales Company, Minneapolis, Minn.

Magnetic Switches.—Several recently developed magnetic switches are described and illustrated in a booklet recently issued by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

Asbestos-Covered Metal.—Bulletin No. 54 sent out by the Asbestos Protected Metal Company, Beaver Falls, Pa., is an attractively illustrated catalog describing asbestos-covered steel for roofing and for walls.

Incandescent Lamps.—The Franklin Electric Manufacturing Company, Hartford, Conn., is sending out a folder entitled "Shake Hands with the Franklin Man," which calls attention to features of its tungsten and carbon lamps.

Recording Gages and Thermometers.—Bulletin No. 86 issued by the Industrial Instrument Company, Foxboro, Mass., contains information on differential recording gages and orifice meters for measuring the flow of gas, and Bulletin No. 91 sent out by the same company describes and illustrates recording and indicating-dial-type thermometers.



**Lighting System.**—"Scientific Illumination" is the subject of a brochure issued by the General Electric Company, London, Eng.

**Dimming Devices.**—A large illustrated folder containing information on a dimming device for incandescent lamps is being sent out by the Wirt Company, Philadelphia, Pa.

**Wiring Devices.**—A number of wiring devices are illustrated and listed in Bulletin No. 400 recently published by the Fargo Manufacturing Company, Poughkeepsie, N. Y.

**Portable Electric Tools.**—Several types of electric drills, grinders, buffers, etc., are described in Bulletin No. 400 just issued by the Stow Manufacturing Company, Binghamton, N. Y.

**Single-Phase Motors.**—Bulletin No. 106 just issued by the Wagner Electric Manufacturing Company, St. Louis, Mo., contains information on several horizontal and vertical single-phase motors.

**Alternating-Current Motors.**—The Robbins & Myers Company, Springfield, Ohio, has issued a leaflet designated as No. 1031 which contains information on small alternating-current polyphase motors.

**Steel Transmission-Line Structures.**—The Archbold-Braley Company, Syracuse, N. Y., has issued a catalog containing information on a number of different types of steel transmission structures and catenary bridges.

**Turbo-Generator Sets.**—Small turbo-generator sets ranging in rating from 7 kw to 300 kw are described and illustrated in Bulletin No. 42,010 recently published by the General Electric Company, Schenectady, N. Y.

## Personal Mention

**Mr. W. P. Graham**, Dallas, Tex., has been elected secretary of the Electrical Contractors' Association of Texas.

**Mr. H. O. Fiske**, of Peterboro, Ont., has been appointed manager for the Peterboro public utilities, succeeding Mr. C. L. Howse.

**Mr. G. B. Frayer** has resigned as Chicago sales manager of the Edison Storage Battery Company to operate a ranch near Portland, Ore.

**Mr. Charles H. Dudley**, formerly of the Toronto Hydro-Electric System, has accepted the position of sales manager of the Volt Electric Company, Ltd., Toronto.

**Mr. L. C. Gidney**, superintendent of the municipal electric-light plant at Rutherfordton, N. C., will have charge of the city lighting plant at High Point, N. C., after Jan. 1, 1915.

**Mr. J. E. Cowles**, superintendent of the electrical department of the Southwestern Gas & Electric Company, Shreveport, La., has been elected president of the Shreveport Advertising Club.

**Mr. Elmer A. Clark**, claim agent of the Idaho Railway, Light & Power Company, Boise, Idaho, has accepted a similar position with the Utah Power & Light Company, Salt Lake City, Utah.

**Mr. Homer G. Knoderer**, who has been sales manager for the Western Electric Company at Cleveland, Ohio, has been appointed general sales manager of the Adams-Bagnall Electric Company, Cleveland.

**Mr. Norman B. Hickox**, former treasurer and manager of the Greenwood Advertising Company, Knoxville, Tenn., has accepted a position in the supply department of the Thomas Cusack Company, Chicago, Ill.

**Mr. George S. Baker** has been appointed general manager of the Chattanooga & Tennessee River Power Company, Chattanooga, Tenn., as successor to Mr. Byron T. Burt, who resigned to go to Buenos Aires as manager of the South American Trading Company.

**Mr. John H. Roemer**, chairman of the Wisconsin Railroad Commission, Madison, has resigned, effective Feb. 1, 1915, to join the organization of H. M. Byllesby & Company, Chicago, in charge of the latter's legal department. Mr. Roemer has served on the Wisconsin commission since 1907, when its duties were enlarged to include the regulation of other utilities than steam railroads. Four years ago he was

appointed chairman of the commission. Prior to his connection with the commission at Madison Mr. Roemer was fifteen years engaged in the practice of law at Milwaukee.

**Mr. John A. Britton**, vice-president and general manager of the Pacific Gas & Electric Company, was the guest of honor at a dinner of the McGraw Publishing Company, Inc., held at the Engineers' Club, New York, on Dec. 16 and attended by the executives and others connected with the various publications of the company.

**Mr. H. C. Hopson**, who has been in charge for six years of all the financial and accounting examinations relative to rates, reorganizations and capitalization for the New York Public Service Commission, Second District, has opened an office as counsel and attorney-at-law in Washington. While Mr. Hopson is with the New York commission no matter affecting New York public service corporations can be taken.

**Mr. Byron T. Burt** has resigned as general manager of the Chattanooga & Tennessee River Power Company, Chattanooga, Tenn., effective Jan. 1. Mr. Burt will leave the country to go to Buenos Aires early in 1915 as manager of the South American Trading Company. He was formerly manager of the old Chattanooga Electric Company until its consolidation with the Chattanooga Railway & Light Company. When the Chattanooga & Tennessee River Power Company was organized to construct the hydroelectric plant at Hale's Bar on the Tennessee River he was managing general manager. Mr. Burt will be succeeded by Mr. George S. Baker, who has been auditor of the company since it opened offices in Chattanooga.

**Mr. Harry W. Alexander**, publicity and sales manager of the Federal Light & Traction Company, New York, has resigned his position to become manager of the editorial and advertising section of the Society for Electrical Development. He will begin his new duties Jan. 1, 1915. Mr. Alexander has had varied experiences in publicity and sales work. He was born in Los Angeles July 17, 1888. In 1906 he entered the field of metropolitan journalism, starting with the Chicago *Inter Ocean*, where he successfully handled the departments of labor, finance, special assignments, politics and public utilities. At one time he held one of the editorial staff positions. Finding public utilities to his liking, early in 1911 he became associated with the Federal Light & Traction Company's operating department, resigning a year later to go with the construction forces of the Kansas City, Clay County & St. Joseph Railway, a electric line then building between Kansas City and St. Joseph, Mo. Returning late in 1912 to the Federal company, he became connected with the sales department and in May, 1913, became publicity manager. In this capacity he was first engaged to work toward effecting better public relations between the subsidiary companies and the local press and public. Later he received charge of the sales department, which he handled in conjunction with the publicity department, preparing all of the advertising copy and handling the appliance sales campaigns.

## Obituary

**Charles W. Macy**, president of the former Hudson (N. Y.) Electric Light & Power Company, died at his home in the city Dec. 3.

**Col. Edward Samuel Meier**, one of the most eminent mechanical engineers in the United States, a veteran of the Civil War and a past-president of the American Society of Mechanical Engineers, died in New York on Dec. 14.

**William H. Coughlin**, formerly superintendent of the Worcester (Mass.) Electric Light Company, died in Philadelphia Dec. 7. Mr. Coughlin was superintendent of the electric light company at Worcester from the time the company was established in 1883 until 1911.

**William Chandler**, vice-president and general manager of the Edison Sault Electric Company and president of the Chippewa Edison Company, of Sault Ste. Marie, Mich., died Dec. 10. Mr. Chandler was identified with the city's large industries and was a member of the State Legislature of Michigan from 1899 to 1901. He was vice-president of the Association of Edison Illuminating Companies for many years. A widow and a son survive him.

# Construction

## New England

**MANCHESTER, N. H.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Jan. 15, for the installation of a new electric freight elevator, etc., in the United States post office and court house at Manchester. For details see proposal columns. Wenderoth is supervising architect.

**MARBLEHEAD, MASS.**—Plans are being submitted by the Municipal Board for the municipal plant to operate the water-works system, which is now being operated from private company.

**NEEDHAM, MASS.**—The J. A. Beverly Co., 19 Essex Street, Haverhill, Mass., has secured the contract for electrical work on four buildings of the Needham Tire Co. located near the Charles River Station, Needham. The contract covers the installation of necessary equipment for lighting and power.

**PASCOAG, R. I.**—Because of its inability to fulfill its obligations to the Pascoag Electric district, as contained in a contract made last May, whereby it was to furnish electricity to the fire district for a period of 20 years, the Rhode Island Pwr. Transmission Co., 100 State Street, Providence, R. I. (Connecticut River Pwr. Co.) has assigned its rights, privileges and contracts in Burrillville to the Blackstone Valley Gas & Elec. Co., Pawtucket, which is controlled by the Stone & Webster Management Association, Boston, Mass. The latter company will carry out the contract with the fire district and will furnish energy in Pascoag.

**WALLING LAKE, R. I.**—Bids will be received at the office of the Board of Control and Supply, Providence, R. I., until Dec. 24, for installing electrical apparatus in the children's ward of the State Sanatorium at Walling Lake. Plans and specifications may be obtained of Walter F. Fontaine, Woonsocket, or at the office of the Board of Control and Supply, Providence. Gilbert R. Wenderoth is supervising architect.

**GROVE BEACH, CONN.**—Among the improvements contemplated by the town next year is the installation of an electric-lighting system.

**NEWTON, CONN.**—Plans are being considered to light the streets of the town by electricity.

**TORRINGTON, CONN.**—Plans have been prepared by E. H. Waterbury for the construction of an addition (16 ft. by 42 ft.) to the plant of the Torrington Electric Co. for the purpose of erecting a steel smokestack and the installation of two boilers.

## Middle Atlantic

**ALBANY, N. Y.**—The Delaware & Hudson Co., Albany, is reported, having secured the contract for the construction of a substation at Sheridan and Chapel Streets, Albany, to the Hunkin-Conkey Construction Co., at about \$160,000. This station when completed will be used to transform energy from the Spier Falls plant for the local street railways.

**BROOKLYN, N. Y.**—Bids will be received by William Williams, commissioner of Department of Supply, Gas and Electricity, until Dec. 29 for furnishing and maintaining electric lamps for lighting streets, parks and public places and furnishing electricity thereto and to public buildings, offices and structures, and for work in connection with electric-lighting equipment, during the year 1915. Blank forms of bid, proposals and contract can be obtained from Room 2324, Municipal Building, New York.

**CANAJOHARIE, N. Y.**—The Montgomery El. Lt. & Pwr. Co., of Canajoharie, is contemplating extending its transmission line to Cherry Valley to furnish electrical service there.

**NEW YORK, N. Y.**—Bids will be received by William Williams, commissioner of Department of Water Supply, Gas and Electricity, Municipal Building, New York, until Dec. 24 for furnishing and maintaining electric lamps for lighting streets, parks and public places and furnishing electricity thereto and to public buildings, offices and structures, and for work in connection with electric equipment. Blank forms of bid, proposals and contract, including specifications, can be obtained from Room 2324, Municipal Building, New York, N. Y.

**NEW YORK, N. Y.**—Bids will be received by William Williams, commissioner of Department of Water Supply, Gas and Electricity, Municipal Building, New York,

until Dec. 29 for furnishing and maintaining electric lamps for lighting streets, parks and public places and furnishing electricity thereto to public buildings, offices, places and structures, and for work in connection with electric-lighting equipment, during the year 1915. Blank forms of bids, proposals and contract, including specifications, can be obtained from Room 2324, Municipal Building, Borough of Manhattan.

**FOUGHKEE, N. Y.**—Plans are being considered by the merchants on Academy Street for installing new lamps on that thoroughfare from Main Street to Canaan Street.

**ROCHESTER, N. Y.**—The Board of Contract and Supply has awarded a contract for additional lamps in Church, Allen, Elizabeth and Andrew Streets and in Plymouth Avenue North, and the contract for lighting 450 fire alarm boxes, to the Rochester Ry. & Lt. Co.

**ROCHESTER, N. Y.**—Bids will be received at the office of the secretary of the Board of Education, Municipal Building, Rochester, until Dec. 21 for installing electric lamps in Franklin School, No. 6, on Montrose Street. Specifications may be obtained at the office of Edwin S. Gordon, architect. J. S. Mullan is secretary.

**EMAUS, PA.**—The contract for electrical work in the new school building being erected in Emaus has been awarded to the Allentown El. Construction & Supply Co., of Allentown.

**HARRISBURG, PA.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Dec. 30 for the removal and installation of an elevator and furnishing a new electric passenger elevator and a hydraulic freight lift in the United States post office and court house at Harrisburg. Plans and specifications drawings and specifications. O. Wenderoth is supervising architect.

**POTTSVILLE, PA.**—The City Council has permitted the Edison El. Lt. & Pwr. Co. to install a new tensioning device on the Longdale Auto and through Norwegian Township. The company will supply electricity in Girardville and Ashland, and will also supply electricity in the town of Gilbert, Frackville and Mahanoy Place.

**RANDOLPH, PA.**—The local electric-light plant, owned by Woodworth & Grace, is reported to have been purchased by G. W. Gerst, of New York, N. Y. The new owner, it is understood, will extend the service to surrounding towns.

**SOUTH BETHELEHEM, PA.**—Plans are being prepared for the erection of a new high school building in South Bethlehem, for which the amount of \$100,000 has been authorized. The building, it is said, will have an extensive electrical equipment. D. J. McCarty is superintendent of schools.

**BRIDGEGETON, N. J.**—The City Council has entered into a contract with the Bridge-ton El. Co. for lighting the streets of the city for a period of five years. The new contract provides for an ornamental light system in the business district and for many additional lamps.

**TRENTON, N. J.**—An investigation of the advisability of acquiring the Sanhican Creek for municipal power and lighting purposes has been recommended to the City Commission by Mayor Donnelly. He also asks that an engineer be employed to determine the possibilities of the development. It is estimated that additional power can be developed, and efficient power could be developed to pump the city water supply.

**BALTIMORE, MD.**—Bids will be received by the Board of Awards of Baltimore City, office of the city register, Baltimore, for the erection of a new power plant and erecting electric power equipment, including four 200-kva transformers, circuit-breakers and high-tension switchboard; all wiring, starters for alternating current motors, and furnishing two 200-hp motors and three 75-hp motors for the upper service pumping station, contract No. 31. Plans and specifications may be obtained at the office of the water engineer, City Hall, Baltimore, for which a deposit of \$5 will be required, to be refunded upon return of same. Robert L. Cleveland is acting water engineer.

**LOGAN, VA.**—Contracts have been awarded by the Logan County Lt. & Pwr. Co. for the erection of its new power plant in Logan as follows: For construction of a new power plant, McNulty, of Huntington, Va.; structural steel, Riverside Bridge Co., Martins Ferry, Ohio; concrete stack, General Concrete Construction Co., New York; electrical equipment, General Electric Co., Schenectady, N. Y.; boilers and superheaters, Edge Moor Iron Co., Edge Moor, Pa.; pumps, densifiers, heaters and auxiliary pumps, H. W. Worthington, Inc., Philadelphia, Pa.; stokers, Detroit, Stoker Co., Detroit, Mich.;

coal-handling equipment, C. W. Hunt Co., New York, N. Y., and transmission wire, Aluminum Co. of America, Pittsburgh, Pa. About 60 miles of 44,000-volt transmission line will be erected. Contracts for the transmission line, power-plant piping, traveling crane and miscellaneous equipment will be awarded shortly. Francis H. Weller, 1100 Building, Washington, D. C., is engineer. This company is controlled by the General Utilities & Operating Co., Baltimore, Md., of which J. C. Lucas is president.

**SUMMERSVILLE, VA.**—The Summersville & Gauley River Improvement Co. is reported to be interested in a project to develop water-power at Summersville, of Litchwood, Va., is interested.

**BALCONY FALLS, VA.** (not a post office).—Cecil L. Reid, engineer, of Fredericksburg, Va., is reported to be interested in a project to build a dam across the James River in connection with a hydroelectric development.

**RICHMOND, VA.**—Preliminary steps have been taken by the Administrative Board toward the installation of a new electrical lines in Ginter Park, Richmond, on various lots in the heart of the city and in the South Side and for the extension of those on Broad Street. A resolution has been adopted authorizing the city engineer to furnish the board with an estimate of the cost of carrying out this improvement.

**WASHINGTON, D. C.**—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Jan. 2 for an extension to the underground electric distribution system at the naval training station, Great Lakes, Ill. Plans and specifications may be obtained on application to the navy bureau or to the commandant of the naval station named. H. R. Stanford is chief of bureau.

**WASHINGTON, D. C.**—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Dec. 29 for furnishing at the various navy yards and naval stations the following supplies: Washington, D. C., Schedule 7766—10,000 lb. seamless copper in ingots. Bids will also be received at the same place until Jan. 5, 1915, as follows: Charleston, S. C., Schedule 7715—one 500-gal. cast-iron condenser; Norfolk, Va., Schedule 7708—miscellaneous cotton-covered single-magnet wire. Norfolk, Va., Schedule 7708—150 water-tight bells and 12 water-tight buzzers; Brooklyn, N. Y., Schedule 7708—100 telephone cable; Philadelphia, Pa., Schedule 7708—miscellaneous cotton and silk-covered magnet wire. Brooklyn, N. Y., Schedule 7714—eight trolley hoists; Norfolk, Va., Schedule 7700—10,000 lb. seamless brass tubing, miscellaneous annealed seamless copper tubing; Charleston, S. C., Schedule 7719—cold-drawn seamless boiler tubes. Bids will also be received until Jan. 12, 1915, for furnishing one automobile ambulance at the navy yard at Puget Sound, Wash., at the navy yard at Puget Sound, Wash., at the navy yard at Puget Sound, Wash., at the navy yard at Puget Sound, Wash. Applications should give the schedule desired by number.

**WASHINGTON, D. C.**—Foreign Trade opportunities as announced by the Bureau of Foreign and Domestic Commerce in the Daily Consular and Trade Reports: No. 14,728—An American consular officer in Europe advises that a firm in his district desires to place orders with American manufacturers of gas pipes up to 8 in. in diameter, lathes, industrial mechanical appliances and instruments, rotary oil mills and implements, cotton and rubber, for furnishing one automobile ambulance at the navy yard at Puget Sound, Wash., at the navy yard at Puget Sound, Wash., at the navy yard at Puget Sound, Wash., at the navy yard at Puget Sound, Wash. Applications should give the schedule desired by number.

**WASHINGTON, D. C.**—Foreign Trade opportunities as announced by the Bureau of Foreign and Domestic Commerce in the Daily Consular and Trade Reports: No. 14,728—An American consular officer in Europe advises that a firm in his district desires to place orders with American manufacturers of gas pipes up to 8 in. in diameter, lathes, industrial mechanical appliances and instruments, rotary oil mills and implements, cotton and rubber, for furnishing one automobile ambulance at the navy yard at Puget Sound, Wash., at the navy yard at Puget Sound, Wash., at the navy yard at Puget Sound, Wash., at the navy yard at Puget Sound, Wash. Applications should give the schedule desired by number.



American engine similar to the German Otto engine. He desires catalogs containing full descriptive literature and illustrations. The agent is especially interested in a gasoline engine for industrial use, but will consider engines which consume crude oil. The literature should be in English. No 11, 7-4. A commission basis in the Near East desires to be placed in communication with manufacturers of pumps, turbines and hydraulic machinery, oil and gasoline motors and tractors, cotton gins, agricultural, industrial and household tools, etc. The contractor states that this firm is in a position to obtain large contracts. Further information may be obtained on application to the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., or to the following branch offices: Room 409, United States Custom House, New York, N. Y.; 629 Federal Building, Chicago, Ill.; Association of Commerce Building, New Orleans, La.; 310 United States Custom House, San Francisco, Cal.; 521 Post Office Building, Atlanta, Ga.; 1207 Alaska Building, Seattle, Wash., and 752 Oliver Building, Boston, Mass.

## North Central

**MOUNT MORRIS, MICH.**—At an election held recently the proposal to grant the Flint El. Co. of Flint, a franchise to supply electricity in Mount Morris was carried.

**BOWLING GREEN, OHIO.**—Bids will be received by D. C. Brown, of Napoleon, Ohio, secretary of the board of trustees of the Bowling Green State Normal College, Bowling Green, Ohio, Jan. 9 for furnishing material and construction of fireproof power station, stack, tunnel system, water supply and softening plant, electrical work, gas-fitting, steam coils, pumps, etc., according to plans and specifications on file with the secretary of the board, Napoleon; also at the office of Victor Donahay, state auditor, Columbus, Ohio; Howard & Merriam, architects, 8 East Fifth Street, Cincinnati, and H. B. Williams, president, Bowling Green, and at the Builders' Exchange in the following cities: Columbus, Toledo, Cleveland, Dayton and Cincinnati. Ohio. Bids will be received on the whole work or any part of the work.

**COLUMBUS, OHIO.**—Bids will be received by E. L. Bargar, director of public utility, City Hall, Columbus, Ohio, until Dec. 26 for furnishing high-grade rubber-insulated, lead-covered telephone cable as follows: 776 ft. carrying 50 twisted pairs; 255 ft. carrying 10 twisted pairs; 705 ft. carrying 6 twisted pairs; 492 ft. carrying 5 twisted pairs; 1255 ft. carrying 4 twisted pairs, and 1000 ft. carrying 2 twisted pairs. All cable to be made in accordance with specifications which are on file in the office of the director of public safety.

**FREMONT, OHIO.**—The County Commissioners have granted the Ohio Lt. & Pwr. Co. a franchise to erect and maintain transmission lines in Adams County. The company proposes to erect a high-tension line (33,000 volts) from its power house in Tiffin into Fremont, enabling the company to connect its power houses in Tiffin, Fremont and Fostoria.

**NEW PHILADELPHIA, OHIO.**—The County El. Co. of New Philadelphia, it is reported, has agreed to make a number of improvements to its plant here.

**SANDUSKY, OHIO.**—The City Council has awarded the Sandusky Gas & El. Co. a contract for the installation of an ornamental street-lighting system in the business district.

**CARLISLE, KY.**—The electric-light franchise recently drafted by the City Council has been purchased by the Carlisle El. Lt. & Pwr. Co.

**HORSE CAVE, KY.**—J. K. Scages and P. T. Vaughan have purchased control of the Reid Mill Co., which operates the local electric-lighting system. The business hereafter will be operated under the name of the Scages Milling Co.

**LEXINGTON, KY.**—The Lexington Utilities Co. has submitted plans to the Board of Commissioners for the maintenance of a proposed ornamental street-lighting system, consisting of 95 standards on Main Street, between Broadway and Walnut Street. Each standard is to carry two 300-watt type C incandescent lamps.

**LOUISVILLE, KY.**—The Board of Park Commissioners, it is reported, contemplates the polishing of the gasoline lamps in Shawnee Park, Shawnee Drive, Western Parkway and Southern Parkway and substituting electric lamps to be supplied by the Louisville Gas & El. Co.

**UNIONTOWN, KY.**—Plans, it is said, are being considered for improvements to the local electric-light plant.

**INDIANAPOLIS, IND.**—The Board of Park Commissioners has awarded a contract for lighting the parks, bridges and boulevard to the Merchants' Ht. & Lt. Co. of Indianapolis, for a period of ten years. The contract price for the initial year of instalment is \$24,206 per year. The contract provides for a minimum of 600 incandescent lamps of 100 cp and 143 incandescent lamps of 250 cp. At the expiration of the contract all of the equipment is to become the property of the city.

**CANTON, ILL.**—Within the next 30 days the Canton Gas & El. Co. expects to purchase two 90-ft., one 10-ft. and one 50-ft. steel towers for river crossing, three 200-kv., 13,000-volt transformers and three 100-kv., 13,000-volt transformers. The company has just completed the erection of a substation equipped with 300 kv. in transformers, three sets electrolytic arresters and three automatic 13,000-volt oil switches, with remote electric control. All of the above are to step up from a 2200 volt, two-phase, to 13,000 volts, three-phase, to supply energy to the Illinois Central electric railway substation, suburban towns and several drainage districts along the Illinois River. E. H. Neeley is secretary and manager.

**GRANTSBURG, WIS.**—The proposal to grant a franchise to the Grantsburg Lt. & Pwr. Co. to install and operate an electric light and power plant in Grantsburg will soon be submitted to the voters.

**OSHKOSH, WIS.**—The Board of Education has authorized Henry Auber to prepare plans for the new central plant to supply light, heat and power for the Central High School and annex and Beach Manual Training Institute city clerk.

**STILLWATER, MINN.**—The City Council is considering the question of establishing a municipal electric-lighting plant in Stillwater. The contract with the Consumers Pwr. Co. for street lighting expires April, 1915.

**BLENCOE, IA.**—The Blencoe El. Lt. Co. recently organized, has awarded the contract for the erection of a transmission line from Maud to the city of Midway, Iowa. Construction Co. of Onawa. The Blencoe company will purchase energy from the plant in Onawa and will also furnish electricity to parties along the line between the two towns. William Davis is president of the Blencoe company.

**FARRAGUT, IA.**—Arrangements are being made by the Farragut Lt. & Pwr. Co. for the installation of a 3-ton ice manufacturing plant.

**IOWA FALLS, IA.**—The Iowa River Lt. & Pwr. Co., of Eldora, is contemplating extending its transmission lines to Whittion and Conrad this winter to furnish electrical service to those towns.

**MASON CITY, IA.**—Application has been made to the City Council by H. F. True, of Ladysmith, Wis., for a franchise to erect a transmission line from Mason City to Nora Springs. Mr. True has been granted a franchise to supply electricity in Nora Springs.

**SALEM, MO.**—The Salem Lt. & Pwr. Co. expects to erect within the next few months a new smokestack (45 ft. high, 34 in. in diameter) to replace the present stock. C. A. Waller is general manager.

**RUSSELL, N. D.**—The installation of an electric-lighting plant in Russell is reported to be under consideration.

**HAYTI, S. D.**—Local capitalists, it is reported, have secured a general franchise by the Town Board to install and operate an electric-lighting system in Hayti.

**DILLER, NEB.**—The local electric-light plant has been closed down and plans are being considered for securing electricity for lighting the town from the plant in Fairbury.

**GRAND ISLAND, NEB.**—Within the next ten months the Grand Island El. Co. expects to construct a diverting dam and power house for generating apparatus of approximately 2500 kw; also to purchase a 750-kw steam-driven generating unit and a 2500-kw hydraulically driven generating unit and material for approximately 100 miles of transmission line. T. H. Fritts is general manager.

**NORFOLK, NEB.**—At an election held recently the proposal to authorize the City Council to enter into a contract with the Nebraska Gas & El. Co. of Norfolk, for lighting the streets of the city for a period of ten years was carried. The new contract provides for the erection of 460-cp lamps, the bus lines and a bracket system carrying 60-cp lamps in the residence district. Work will begin on the installation of the system at once.

**FORT LEAVENWORTH, KAN.**—Bids will be received for the construction of a master, Fort Leavenworth, Kan., until Jan. 11 for construction of library building, including electric wiring, plumbing and heating.

**LARNED, KAN.**—Preparations are being made for the installation of a municipal electric-light plant in Larned. The equipment will include two motor-driven turbine pumps, one 125-kw and one 150-kw electric generator unit (directly connected) and an electric distributing system complete, bids for which will be received Jan. 18, 1915. Worley & Black, Reliance Building, Kansas City, Mo., are engineers.

## Southern States

**KINSTON, N. C.**—Bids will be received at the office of the supervising architect, Washington, D. C., for the construction, including mechanical equipment, lighting fixtures and approaches, of the United States post office in Kinston, N. C. Drawings and specifications may be obtained at the above office or from the custodian of site at Kinston, N. C.

**WADLEY, GA.**—At an election to be held Dec. 21 the proposal to issue \$6,400 in bonds for the construction of a municipal electric-light plant will be submitted to the voters.

**PLANT CITY, FLA.**—The Plant City Ice & Pwr. Co., it is reported, is contemplating increasing the output of its electric plant.

**SAFETY HARBOR, FLA.**—The County Commissioners have granted the Falmadge and Co. Lohmeyer a franchise to construct and operate an electric-light plant.

**CHATTANOOGA, TENN.**—The Chattanooga Enameling & Stamping Co. is planning to build a plant to manufacture enameled sheet and iron products at a cost of about \$100,000. The factory will be equipped with electrically operated machinery. Plans are being prepared by W. F. Sears of Chattanooga. William Apphardt, of Wheeling, W. Va., is president of the company.

**McMINNVILLE, TENN.**—The Council is contemplating the development of water-power on Collins River, about 3½ miles from the city, to provide water for the water-works system. The present steam plant is to be held for use in emergencies. Claude W. Earsall is superintendent of the water-works light plant.

**HUNTSVILLE, ARK.**—Plans are being considered, it is reported, by Frank Barr, of Fayetteville, for the construction of an electric-light plant. Energy for operating the station was obtained from the plant of the Huntsville Milling Co.

**PINE BLUFF, ARK.**—The city of Pine Bluff is contemplating the purchase of the local electric-light plant and water-works. If the plants are taken over improvements will be made.

**FREEPORT, TEX.**—The Freepoint Lt. & Pwr. Co., recently incorporated, is reported to be contemplating the installation of an ornamental lighting system on Park Avenue, Second and Broad Streets in Freepoint.

**SAN ANGELO, TEX.**—Plans, it is reported, are being considered by the San Angelo Wtr. Lt. & Pwr. Co. for the installation of a 3,000,000-gal. electrically operated pump in the water-works pumping station, at a cost of about \$5,000.

**VICTORIA, TEX.**—The Texas Southern El. Co., which owns plants at Victoria, Cuero, Beeville, Bishop and Robstown, will begin work on the erection of a transmission line from Victoria to Cuero.

## Pacific States

**MONTESANO, WASH.**—Plans have been prepared, it is reported, by the Northwest El. & Wtr. Wks., of Montesano, for the construction of a new steam-driven power plant in this city. The proposed plant will be situated on the west front and will burn either wood or oil. The storage basin at Sylvia Lake will be enlarged. The feed lines throughout the city will be rebuilt; the existing feed lines in the new buildings will be replaced with copper wires. Work on the improvements will begin soon after the first of the year.

**SEATTLE, WASH.**—Bonds to the amount of \$400,000 have been sold, the proceeds to be used for the construction of a steam power plant on Lake Union.

**SEATTLE, WASH.**—The installation of an additional generating unit at the Cedar Falls power plant, at a cost of about \$500,000, has been recommended by D. Ross, chief engineer of the municipal electric plant. The plans provide for a third water main from the new masonry dam and power plant from the Cedar Falls dam to the power plant. Equipment to increase the output of the Cedar Falls system by 10,000 kw.

**SPOKANE, WASH.**—Plans are being considered by the Idaho Pwr. & Concentrating

Co. for the installation of a 600 hp. electric generating unit at its plant, 10 miles from Sandpoint and 1 mile from the town of Sandpoint on the Northern Pacific Railroad. The company expects to develop its water-power facilities and equipment to concentrate ores from this region.

**TACOMA, WASH.**—The City Council has authorized the city clerk to call for bids for furnishing and installing new luminous-arc lamps in the North End district of the city. The Council is also considering the question of installing all poles and wires on Union Avenue. South Tacoma, from Fifty-second Street to Fifty-eighth Street and installing luminous-arc lamps.

**VANCOUVER, WASH.**—Notice has recently been given by the Auditor of Clarke County by J. H. Cunningham of an appropriation of 500 cu. ft. per second of water of the east fork of the Lewis River. The water is to be used for hydraulic and electric power for municipal lighting, manufacturing and commercial purposes.

**BISHOP, CAL.**—The Nevada-California Pwr. Co. has applied to the State Railroad Commission for authority to execute an "open-ended" mortgage on all its property to secure an issue of first and refunding 6 per cent 50-year bonds. Of the proceeds it is proposed to use the proceeds of the sale of the existing bonds aggregating \$2,663,000, constructing a new hydroelectric station at Bishop's Creek and for other improvements and additions. The present valuation of the properties is placed at \$2,249,298. The company asks permission to issue bonds aggregating 85 per cent of the appraised value of the properties.

**RIVERSIDE, CAL.**—The Southern Sierras Pwr. Co., of Riverside, has awarded contract for the construction of a 33,000-volt, three-phase transmission line (wooden pole) from near Inyokern to Trona, Cal., at Seaside Lake or Box Lake, to supply electricity to the American Trona Corp., to be used in connection with the manufacture of potash, etc. The equipment will consist of three 75-kva, 33,000 2200-volt Fort Wayne transformers (at Trona), 35-ft., 7-in.-top poles, open-tank-treated bolls (20 per mile), insulators (Locke No. 319 and Ohio Brass Co. No. 9416), No. 6 solid copper wire, electrolytic, 33,000-volt, outdoor-type General Electric lightning arresters, M. A. Stumph, 1016 1/2, West Forty-second Street, Los Angeles, Cal., has the contract. C. O. Poole, chief engineer of the Southern Sierras Pwr. Co., Riverside, has charge of the work.

**SAN FRANCISCO, CAL.**—Plans are being prepared by M. M. O'Shaughnessy, city engineer, for the construction of a municipal electric railway through Golden Gate Park into the Sunset district, to cost about \$200,000.

**SAN FRANCISCO, CAL.**—The State Railroad Commission has authorized the Coast Valleys Gas & El. Co., of San Francisco, to issue \$100,000 in bonds, of which \$40,000 is to be used to be used to pay outstanding indebtedness and the remainder for additions and improvements.

**SAN FRANCISCO, CAL.**—The Board of Public Works has awarded the contract for constructing and installing the underground steam distributing system for the Civic Center buildings to the Willman-Lyman Co. at \$23,964. The contract for furnishing equipment for the power house has been awarded to the Davis Rodger Co., for \$11,950. T. W. McClenahan was awarded the contract for the construction

of the civic center power house, at \$10,800. The plant will be located at the corner of Larkin and McAllister Streets.

**LEHI, UTAH.**—Mayor W. E. Gurney and Councilmen W. S. Evans and William W. Hays have filed notice of appropriation of power site in the American Fork Canyon at the mouth of Deer Creek, where, it is estimated, 1200 hp could be developed. The flings are for two pipe lines, one from the main canyon and the other from Deer Creek, to be 18,000 ft. and 5000 ft. long, respectively, which will carry the water to a large reservoir to be built on Silver Lake flat, which will be connected with the power plant by a steel pipe line 7542 ft. long. The cost of the three proposed plants is estimated at \$150,000. The officials disclaim any intention of building the plant until after a bill has been passed by the Legislature giving cities of the third class greater bonding power.

**PHOENIX, ARIZ.**—The installation of an ornamental street-lighting system on North Central Avenue, to be owned by the city, is under consideration. For further information address the city engineer.

**FLAXVILLE, MONT.**—The Commercial Club is reported to be interested in a project to install an electric-light plant in Flaxville.

**THOMPSON FALLS, MONT.**—The Northwest Development Co., which is constructing a large hydroelectric power plant at Thompson Falls, is reported to be preparing to enter the Coeur d'Alene (Idaho) mining district to supply electricity to operate the machinery in the mines. Work will soon begin on the erection of the proposed transmission lines.

**PUEBLO, COL.**—The City Commissioners are considering the question of compelling the electric companies to place their wires underground in the new Mineral Palace paying district.

**RED CLIFF, COL.**—The installation of an electric-lighting system in Red Cliff is reported to be under consideration by John Fleming, of Red Cliff, who will soon apply for a franchise.

**GOLDFIELD, NEV.**—The City Council has awarded the contract for lighting the streets of the city to the California-Oregon Pwr. Co., of San Francisco, for a period of ten years. The contract provides for the installation of 18 street-lighting lamps, 35 single lamps on wooden posts and 16 lamps on iron standards and one large three-lamp cluster at the bridge, to be installed and in operation within 30 days.

## Canada

**KINGSTON, ONT.**—The City Council has awarded the Gananoue El. Lt. & Wtr. Supply Co., of Gananoue, a franchise to erect transmission lines in Kingston for the purpose of supplying electricity to operate the flour mills of the Kingston Flouring Co., at the foot of Brock Street, and also the flour mill at the foot of Gore Street.

**SHAWINIGAN FALLS, QUE.**—Plans have been prepared, it is reported, by the Shawinigan Wtr. & Pwr. Co. for the erection of a transmission line from its plant at Shawinigan Falls to the city of Quebec. Julian C. Smith, of Montreal, is general superintendent and chief engineer.

## Miscellaneous

**PANAMA**—Bids will be received at the office of the general purchasing officer, the Panama Canal, Washington, D. C., until Dec. 28 for furnishing iron and bronze castings, wire cable, sheet copper, etc. Blanks and general information relating to this circular (No. 883) may be obtained at the above office or from the office of the assistant purchasing agents, 24 State Street, New York, N. Y.; 614 Whitney-Central Building, New Orleans, La., and 1088 North Point Street, San Francisco, Cal. Major F. C. Boggs is general purchasing officer.

**MANILA, P. I.**—The Manila Pwr. Co., a Connecticut corporation with a capital stock of \$1,000,000, has been granted permission by the Philippine authorities to build and operate hydroelectric power plants, distribute electricity, acquire water rights and engage in other similar activities within the Philippine Archipelago.

## New Incorporations

**TAHOE, CAL.**—The Tahoe El. & Wtr. Co. has been incorporated with a capital stock of \$100,000 by Melville Jeffry and others.

**STITHTON, KY.**—The Stithton Ltg. Co. has been incorporated with a capital stock of \$3,000. The company, it is understood, will take over the local plant. C. H. Aubrey is president of the company and L. J. Metcalfe is secretary and treasurer.

**WINNFIELD, LA.**—The Johnson Ice & Lt. Co. has been incorporated with a capital stock of \$3,000. The officers are: J. M. Johnson, president, and J. E. Johnson, secretary.

**AUGUSTA, MAINE.**—The Santo Domingo Wtr. Lt. & Pwr. Co. has filed articles of incorporation under the laws of the State of Maine. The company is capitalized at \$1,000,000 and proposes to acquire, construct, operate, lease and sell aqueducts, waterworks, pumping stations, etc. L. J. Coleman is president and R. S. Buzzell is treasurer, both of Augusta.

**CAMDEN, N. J.**—The Clayton El. Lt. Co. has been incorporated with a capital stock of \$100,000 to operate electric-light plants. The incorporators are F. R. Hansell, J. A. Macleak and I. C. Clow, of Camden.

**COUDERSPORT, PA.**—The Coudersport El. & Pub. Ser. Co. has filed articles of incorporation under the laws of the State of Delaware with a capital stock of \$50,000. The company proposes to conduct a general garage business and to furnish electricity for lamps, heaters and motors. The incorporators are F. W. Kendig, T. J. Ryan and E. A. Olmstead, of Coudersport.

**FREEPORTE, TEX.**—The Freeport Lt. Wtr. & Ice Co. has been incorporated with a capital stock of \$5,000 by C. A. Jones, F. F. Hastings and W. T. Andrews.

**EXMORE, VA.**—The Exmore Lt. & Pwr. Co. has been chartered with a capital stock of \$10,000. The officers are: John T. E. Hyslop, of Belle Haven, Va., president, and John W. Chandler, of Exmore, secretary and treasurer.

# Weekly Record of Electrical Patents

## UNITED STATES PATENTS ISSUED DEC. 8, 1914.

[Prepared by Robert Starr Allyn, N. Y. Exchange Place, New York, N. Y.]

**1,119,800. ELECTRIC-CURRENT CONTROLLER:** L. Bradley, Muskegon, Mich. App. filed May 28, 1909. Holds a switch in the resistor.

**1,119,832. SWITCHING SOCKET OR CONNECTOR:** G. C. Knuff, Chicago, Ill. App. filed Dec. 12, 1913. Contacts of both plug and socket are axially disposed.

**1,119,838. ELECTRIC HEATING UNIT:** F. Kuhn, Detroit, Mich. App. filed March 8, 1913. Coil threaded through perforations in asbestos board.

**1,119,839. ELECTRIC TERMINAL BOX:** F. Kuhn, Detroit, Mich. App. filed March 8, 1913. Can be used as a socket to receive a terminal plug connector.

**1,119,840. ELECTRIC FLUID HEATER:** F. Kuhn, Detroit, Mich. App. filed Sept. 8, 1913. Particularly for use in connection with carburetors.

**1,119,841. ELECTRIC HEATER:** F. Kuhn, Detroit, Mich. App. filed Jan. 10, 1914. Insulated support for resistor.

**1,119,864. ELECTRIC CONNECTOR:** E. J. Ovington, Brookline, and J. E. Herlihy, Cambridge, Mass. App. filed Sept. 11, 1912. Plug-and-socket type.

**1,119,872. ELECTRODE HOODS:** H. J. Potts, Kansas City, Mo. App. filed Dec. 23, 1912. Holds different-sized electrodes.

**1,119,887. TROLLEY-POLE RETRIEVER:** T. B. Shanahan, Manlius, N. Y. App. filed Sept. 1, 1909. Automatically lowers pole when wheel leaves wire.

**1,119,901. HOIST:** A. C. Van De Velde, Chicago, Ill. App. filed Feb. 29, 1912. Has automatic brake and automatic limit stop.

**1,119,913. ELECTRIC RAILWAY:** G. Westinghouse (deceased), Pittsburgh, Pa. App. filed Aug. 17, 1904. Tunnel system with means to prevent short-circuiting upon decoupling.

**1,119,915. SERVICE-METER CIRCUIT FOR TELE-**

**PHONE EXCHANGE SYSTEMS:** S. B. Williams, Brooklyn, N. Y. App. filed July 12, 1913. For manual, semi or full automatic systems.

**1,119,923. SELECTIVE SWITCHING APPARATUS:** A. M. Ballard (deceased), New York, N. Y. App. filed July 30, 1909. Selective operations accurately and speedily accomplished.

**1,119,928. LAMP SOCKET:** J. Darby, Summit, N. J. App. filed March 12, 1910. Full socket.

**1,119,951. RECTIFIER:** V. M. Harris, Chicago, Ill. App. filed Aug. 24, 1912. Mechanical; compensates for current variations in the main line.

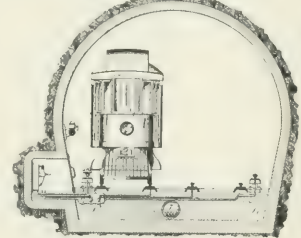
**1,119,952. TRANSMITTER FOR WIRELESS COMMUNICATIONS:** W. H. Harrison, New York, N. Y. App. filed Jan. 27, 1903. Uses a number of separate oscillators.

**1,119,953. BLOCK SIGNAL SYSTEM:** L. A. Hawkins, Schenectady, N. Y. App. filed Jan. 31, 1910. Tracks cross-bonded every block.



- 1,119,866. **ELECTRIC SWITCH:** C. J. Klein, Milwaukee, Wis. App. filed April 28, 1911. *Patented* Sweden.
- 1,119,867. **ADDING MACHINE:** H. Landsiedel, Poplar Bluff, Mo. App. filed April 29, 1912. Has automatic motor drive.
- 1,119,971. **CIRCUIT INTERRUPTER:** H. G. MacDonald, Pittsburgh, Pa. App. filed June 8, 1907. Manually operated device prevents unnecessary operation of overload circuit-breaker.
- 1,119,973. **LIGHTNING CONDUCTOR:** L. L. Mast, West Milton, Ohio. App. filed Dec. 16, 1910. Special joint for sheathed conductors.
- 1,119,975. **TROLLEY:** W. E. Moore, Pittsburgh, Pa. App. filed Feb. 16, 1912. The spring is housed within the hollow lower end of the pole.
- 1,119,987. **MOTOR CONTROLLER:** G. R. Redell, Milwaukee, Wis. App. filed Oct. 2, 1911. Particular method of changing motor field windings from series to parallel.
- 1,119,988. **COIL SUPPORT:** L. Rapp, Pittsburgh, Pa. App. filed Oct. 23, 1912. *Not described.*
- 1,120,003. **ELECTRIC HEATER:** A. A. Warner, New Britain, Conn. App. filed Aug. 7, 1913. Portable, reflector type.
- 1,120,006. **SYSTEM OF ELECTRICAL DISTRIBUTION:** J. L. Woodbridge, Philadelphia, Pa. App. filed Aug. 25, 1910. Embodies alternating-current circuit and storage battery.
- 1,120,018. **ELECTRIC-CURRENT-CONTROLLING DEVICE:** L. Bradley, Milwaukee, Wis. App. filed Jan. 29, 1912. Has compressible resistance.
- 1,120,025. **START AND STOP SIGNAL FOR RAILROAD CARS:** R. H. Cartmel, Detroit, Mich. App. filed Feb. 9, 1914. Motor-man's starting indicator is set only when conductor of each car in the train has signified readiness.
- 1,120,031. **EMERGENCY VALVE AND CIRCUIT-BREAKER TRIP:** H. Cordell and J. G. Tawse, Chicago, Ill. App. filed March 8, 1911. For cutting off propulsion current and applying brakes.
- 1,120,040. **HOLDING DEVICE FOR INSTRUMENTS:** C. W. Dunham, Swissvale, Pa. App. filed Feb. 24, 1914. For holding the delicate contacts of a relay or the like during shipment.
- 1,120,049. **TELEPHONE APPARATUS:** O. M. Glunt, Rutherford, N. J., and C. G. Mueller, Elizabeth, N. J. App. filed Aug. 27, 1913. Transmitter for limousine telephone.
- 1,120,054. **SYSTEM FOR SIGNALING THROUGH SPACE:** W. Harrison, New York, N. Y. App. filed July 20, 1905. Plurality of separate aersials and plurality of separate transformers.
- 1,120,057. **DIAPHRAGM HORN:** M. R. Hutchinson, West Orange, N. J. App. filed Oct. 26, 1909. Motor-operated.
- 1,120,074. **DISTRIBUTING AND MEASURING SYSTEM FOR ELECTRICITY:** T. M. R. Meikleham, New York, N. Y. App. filed Jan. 13, 1910. Alternating current or direct current; for measuring the plant capacity required by each consumer during peak of load.
- 1,120,077. **BATTERY HOLDER:** G. L. Patterson, New York, N. Y. App. filed Aug. 21, 1912. Interconnected battery holding units, screw-cell type.
- 1,120,084. **ANNUNCIATOR:** F. C. Ries, Macon, Ga. App. filed Oct. 8, 1913. Magnets with armatures which will vibrate for several minutes.
- 1,120,086. **ARC LAMP:** A. C. Roebuck, Chicago, Ill. App. filed Oct. 24, 1910. For optical projecting apparatus.
- 1,120,110. **INCANDESCENT ELECTRIC LAMP SOCKET:** A. Weber, Jr., Schenectady, N. Y. App. filed Jan. 15, 1909. Cap and shell lock with means for preventing turning of the socket body therein.
- 1,120,112. **TIMER AND DISTRIBUTER:** W. D. C. Wright, Philadelphia, Pa. App. filed June 6, 1914. Make-and-break devices can never stop in contact.
- 1,120,140. **ELECTRICAL SYSTEM OF DISTRIBUTION:** J. B. Entz, Cleveland, Ohio. App. filed Oct. 28, 1910. Storage battery in parallel with generator for regulating the fluctuations of a varying load.
- 1,120,148. **ELECTRICAL SYSTEM OF DISTRIBUTION:** R. C. Hull, Philadelphia, Pa. App. filed July 28, 1911. Storage battery maintains supply of current in case of failure of usual source.
- 1,120,160. **HANGER FOR ARC LAMPS:** C. E. Pope and R. S. Phillips, Cleveland, Ohio. App. filed Feb. 7, 1914. Provided with separable electrical connections for the lamp.
- 1,120,175. **PROCESS FOR RECOVERING PRECIOUS METALS:** F. W. Wiswell, Oakland,

- Cal. App. filed Feb. 11, 1914. From sand, gravel, etc., by use of mercury and with or without the aid of electric current.
- 1,120,191. **APPARATUS FOR ELECTROLYTIC PRODUCTION OF WIRE:** E. Gibbs, Plainfield, N. J. App. filed April 4, 1912. Electrode position and drawing.
- 1,120,207. **SELECTIVE SIGNALING SYSTEM:** O. T. Lademan, Milwaukee, Wis. App. filed April 30, 1912. Step-by-step variety; applied to a police system.
- 1,120,210. **LOCKING SWITCH:** J. Maibaum, New York, N. Y. App. filed July 11, 1913. Prevents separation of the switch blade or spreading of the switch contacts.
- 1,120,212. **PROTECTIVE DEVICE FOR ELECTRIC CIRCUITS:** A. V. A. McHarg, New York, N. Y. App. filed Nov. 28, 1913. Switch protected by a fuse which is not in the circuit.
- 1,120,214. **MEASURING THE QUANTITY OF FLUID FLOWING THROUGH PIPES:** K. Metzendorf, Berlin-Tegel, Germany. App. filed May 23, 1914. By means of the pressure difference in an electric way.
- 1,120,217. **ELECTRICAL MEASURING INSTRUMENT:** F. W. Morris, Brooklyn, N. Y. App. filed Dec. 24, 1912. Current measured by the mutual reaction of two fields.
- 1,120,221. **ELECTRIC FUSE:** T. E. Murray, New York, N. Y. App. filed Feb. 10, 1913. Fuse carrier readily insertible in case and a thread looped about the fuse indicates its blowing.
- 1,120,222. **ELECTRICALLY CONTROLLED CUT-OUT:** T. E. Murray and A. V. A. McHarg, New York, N. Y. App. filed July 11, 1913. Upon overload or failure device automatically withdraws the fuse plugs.
- 1,120,223. **FUSE BOX:** T. E. Murray, New York, N. Y. App. filed March 11, 1914. Slidable fuse-carrying plug must be withdrawn to break circuit before fuse can be inserted.
- 1,120,224. **ELECTRIC BATH CABINET:** T. E. Murray, New York, N. Y. App. filed March 11, 1914. Made up of plates flexibly hinged together.



1,119,913—Electric Railway

- 1,120,225. **ELECTRIC CUT-OUT:** T. E. Murray, New York, N. Y. App. filed March 28, 1914. Pivoted switch levers carrying fuse plugs.
- 1,120,226. **ELECTRIC FUSE:** T. E. Murray, Jr., Brooklyn, N. Y. App. filed March 28, 1914. Has a localized blowing point in closed gas-tight in insulating material.
- 1,120,241. **ELECTRIC TIME MECHANISM:** S. G. Rhodes, New York, N. Y. App. filed Oct. 17, 1912. Mercury contact carried by the pendulum.
- 1,120,259. **RESISTANCE UNIT:** H. J. Wiegand, Milwaukee, Wis. App. filed March 22, 1911. Resistance wire laced in convolutions on base and looped over peripheral projections on the base.
- 1,120,261. **TRANSLATOR FOR PRINTING TELEGRAPH SYSTEMS:** J. E. Wright, New York, N. Y. App. filed Aug. 22, 1913. Special arrangement of circuits and contacts.
- 1,120,301. **DISTRIBUTOR FOR ELECTRICAL IGNITION SYSTEMS FOR INTERNAL-COMBUSTION ENGINES:** E. Gassmann, Brooklyn, N. Y. App. filed Nov. 23, 1913. Made waterproof.
- 1,120,306. **MAGNETIC LIFT FOR ELECTRODES IN ELECTRIC OSCILLATORS:** C. D. Herold, San Jose, Cal. App. filed May 7, 1913. High-frequency oscillator with adjustable elements.
- 1,120,315. **MAGNETO-OPERATING MECHANISM:** L. F. Kristufek, Chicago, Ill. App. filed Dec. 1, 1911. Produces monetary acceleration of magneto when engine is operating slowly.
- 1,120,354. **PRIMARY CELL:** P. Young, Detroit, Mich. App. filed Feb. 10, 1914. Of small size and capable of being recharged.

- 1,120,356. **PERFORATED-TAPE REPRODUCER:** C. G. Ashley, Toronto, Ontario, Canada. App. filed Feb. 13, 1913. Transmitting tape can be reproduced either locally or at a distance.
- 1,120,375. **CLUTCH AND CONTROLLER FOR PRINTING PRESSES:** H. H. Cutler, Milwaukee, Wis. App. filed April 18, 1904. Utilizes effects of induction and of frictional contact.
- 1,120,376. **ALTERNATING-CURRENT MOTOR CONTROLLER:** W. E. Date, Westfield, N. J. App. filed Nov. 2, 1908. Resistance in the three phases of the secondary is balanced when the motor circuit is first closed.
- 1,120,382. **SWITCH:** B. Haskins, Milwaukee, Wis. App. filed May 13, 1911. Throw oil switch with new form of contact.
- 1,120,414. **AUTOMATIC RECIPROCATING ELECTROMAGNETIC MOTOR:** F. E. Schofield, Covington, and J. C. Cowen, Bellevue, Ky. App. filed July 7, 1911. For rock drills and the like.
- 1,120,459. **CONDITION INDICATING MECHANISM FOR SIGNALING SYSTEMS:** H. W. Doughty, Binghamton, N. Y. App. filed Sept. 19, 1912. Warns central station when springs of boxes need rewinding, etc.
- 1,120,472. **ELECTRICAL JUNCTION BOX:** E. H. Freeman, Trenton, N. J. App. filed April 11, 1912. Has interchangeable sides to meet different requirements.
- 1,120,492. **ELECTRIC LAMP:** S. M. Hino, Rock Springs, Wyo. App. filed Nov. 12, 1912. Multiple filament with switches for cutting in and out.
- 1,120,493. **X-RAY TUBE:** I. S. Hirsch, New York, N. Y. App. filed May 15, 1913. Has double walls to contain a cooling and ray-filtering medium.
- 1,120,498. **ELECTRIC SIGNALING DEVICE:** A. S. Huckins, Philadelphia, Pa. App. filed Jan. 14, 1914. Doorbell which automatically indicates when it is inoperative.
- 1,120,517. **DEVICE FOR PROTECTING TELEGRAPH AND LIKE LINES AGAINST INDUCTIVE ACTION FROM NEIGHBORING CIRCUITS:** O. Moll and F. Kuschewitz, County of Kent, England. App. filed May 22, 1913. Transformer with a capacity and a variable resistance.
- 1,120,554. **CONNECTOR FOR BATTERY TERMINALS AND OTHER ELECTRICAL CONDUCTORS:** A. H. Snyder, Lancaster, N. Y. App. filed Aug. 13, 1913. Contact pieces inclosed and protected from acid or acid fumes.
- 1,120,586. **CIRCUIT CLOSURE FOR ELECTRIC RAILWAYS:** A. W. Barnhart, Ellenboro, West Va. App. filed May 20, 1914. For railways of surface contact type.
- 1,120,589. **VEHICLE SAFETY SIGNAL LIGHT:** F. O. Bean, Somersworth, N. H. App. filed May 9, 1913. Tail-lights on opposite sides at rear controlled by turning of steering wheel.
- 1,120,605. **TELEPHONE SYSTEM:** W. W. Dean, Elyria, Ohio. App. filed March 12, 1908. Operator cannot connect ringing generator in circuit with a busy line.
- 1,120,606. **PARTY-LINE TELEPHONE SYSTEM:** W. W. Dean, Chicago, Ill. App. filed March 12, 1908. Ringing keys connected with a strand of the cord circuit through normal contacts of the supervisory relay.
- 1,120,613. **BURGALAR-ALARM WINDOW LOCK:** L. L. Grove, St. Louis, Mo. App. filed May 27, 1914. Sounds alarm when unlatched.
- 1,120,615. **ALTERNATING-CURRENT MOTOR:** V. M. Harris, Chicago, Ill. App. filed May 25, 1911. Synchronous type.
- 1,120,616. **MOTOR STARTER:** V. M. Harris, Chicago, Ill. App. filed Aug. 24, 1912. For synchronous motors.
- 1,120,619. **DIAPHRAGM HORN:** M. R. Hutchinson, West Orange, N. J. App. filed Oct. 26, 1909. Motor is disposed at an acute angle to the diaphragm.
- 1,120,623. **SUPERVISORY ALARM SYSTEM:** J. G. Nolen, New York, N. Y. App. filed July 25, 1909. For electro-pneumatic systems.
- 1,120,637. **APPARATUS FOR RECOVERING PRECIOUS METALS:** F. A. Wiswell, Oakland, Cal. App. filed Feb. 11, 1914. Has a toothed shell and a toothed drum rotating within the same.
- 1,120,639. **CAR TRUCK:** W. S. Adams, Philadelphia, Pa. App. filed March 30, 1914. Has arched semi-elliptic springs surmounted by coiled springs.
- 1,120,644. **ELECTRIC TROLLEY-LINE CONSTRUCTION:** L. S. Boggs, New Rochelle, N. Y. App. filed April 12, 1912. Trolley "deflectors" for overhead high-speed systems.

# Electrical World

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No. 26

## National Joint Line Committee

Some highly important work involving the healthy co-operation of practically all of the national associations interested in the subject has been undertaken by the national joint committee on overhead and underground line construction, the formation of which is recorded elsewhere in this issue. Being made up of the members of the separate committees dealing with this subject appointed by the dozen or so associations co-operating in the undertaking, it can safely be predicted that the national joint committee will serve to prevent duplication of work by the different committees, thereby minimizing the total labor involved, and to insure uniformity in the specifications adopted by the various associations, thereby avoiding all unnecessary conflicts. Its most effective efforts for the immediate future can be exerted in rearranging and redrafting existing specifications and formulating new specifications where none now exist. Doubtless the committee will be looked upon more and more as the court of last resort in the formulation and interpretation of specifications, and as such it should receive the hearty support of all interests concerned.

## Co-operation of Stockholders

An impressive co-operative movement by stockholders to speak for the Cincinnati Gas & Electric Company has been started. Thirty-three stockholders, acting as a committee, are asking all stockholders of the company to organize for an impartial hearing and fair rates. If the real co-operation of stockholders can be secured, the possibilities of such a movement are great. If the committee can overcome reluctance of individuals to reveal their property interests, it will have over 8000 men and women to call upon. This is not so large a total as the number of the consumers served, but it is composed of persons who will command a hearing. City officials have dealt so long with impersonal corporations that when they find that their friends and neighbors are a live part of the public utilities they may modify their views. For the protection of the rate of return and the principal of the investment stockholders look primarily to the officials of the companies. It is part of what company officials are paid to do. They are, however, only the representatives of the real individuals whose money is risked. They cannot talk as effectively or with as keen a feeling of anxiety and as much earnest determination for a "square deal" as 8000 persons, acting as a unit, can do. The entrance of Cincinnati stockholders into the electrical rate case is an example that we hope to see followed in other companies at critical times.

## The Use of Statistics

The use of statistics as a means of giving the public information about affairs was discussed at the recent meeting of the American Statistical Association. If they can be used truthfully and so intelligently as to be understood easily, statistics have an important place in public policy matters. If they cannot be so used as to be perfectly clear to the public, they are worse than useless. When two speakers cite, for instance, the experience of the same municipally owned and operated plant, one as an argument in favor of and the other as an argument against public ownership and operation, it is perfectly clear to the listening public that one or the other is either innocently or wilfully misrepresenting the real situation. Well-informed speakers have referred time and again to the 3-cent electric-railway fare prevailing in Cleveland without explanation of the fact that 1 cent is charged for transfers, and that, to produce this fare, the city forced a valuation under which stockholders lost 45 per cent of their stock. Similarly, public officials have spoken alluringly of the halfpenny fares in Glasgow without mention of the fact that only a limited distance could be traveled for this sum. These are points of misrepresentation which have come from proponents of public ownership. There are doubtless instances in which private-plant representatives have made like failures to tell all the facts fairly. Until statistics are tested and ready to stand public examination and questioning it is idle to offer them and to expect wholesome results to follow.

## Co-operation in Foreign Trade

In an article in *The Americas*, the magazine of the National City Bank of New York, Mr. John D. Ryan, president of the Amalgamated Copper Company, argues for legislation permitting combinations of manufacturers on matters of export trade. He points out that in normal times England permits combinations in both foreign and domestic trade which our laws forbid; that France encourages combinations, and that Germany actively fosters and sometimes compels them. The chief competitors of our manufacturers are actively aided in this respect by their governments. Our government is not only not active in aid or even passive in acceptance of conditions that promote trade but is hostile toward combinations. No earnest attempt has ever been made to explain to the public the difference between combinations on domestic business and combinations on foreign business. If such an attempt had been made, the public would know that combinations on foreign business need not affect prices or practices for



domestic consumers but would increase our foreign trade and thereby help to steady business and to reduce the fluctuations between heavy and light demand. The recommendation of Mr. Ryan is that the law be defined. Business men have had no decision on the question of their right under the Sherman law to form combinations among competitors to handle export trade. The removal of this great handicap would be a decided stimulus to foreign trade at a time when conditions demand that oversea markets shall receive attention.

### Photometry of Gas-Filled Lamps

In this issue appears an article by Messrs. G. W. Midlekauff and J. F. Skogland dealing with the curious phenomena observed in attempting to photometer gas-filled tungsten-filament lamps. The subject was discussed by Dr. C. H. Sharp before the New York Section of the Illuminating Engineering Society on Nov. 12, 1914. From Dr. Sharp's experiments it appeared that some very singular effects were observable in attempting to determine the mean horizontal candle-power by rotation of the gas-filled lamp. The present authors have investigated the subject in an elaborate and systematic manner and have discovered certain relations in the phenomena observed, which, however, are not such as to afford great comfort to the photometrist. In the first place, the variations in horizontal candle-power with the new lamps are so great that it is necessary to use accessory mirrors in order to eliminate the very great flicker. The distribution of light around the ordinary tungsten lamp is so nearly uniform that a low speed of rotation suffices for obtaining the proper value for the mean horizontal candle-power, which does not materially vary whether the lamp is used with its tip up or tip down. In the nitrogen-filled lamps the filaments are not mounted symmetrically about any axis whatever, with the result that not only is there a marked variation around the vertical axis but the lamp behaves differently when used with the tip up or the tip down, not only as regards the candle-power but with respect to the current. Moreover, when the speed of rotation is varied the current and the candle-power vary with the speed, in opposite directions, and the change is not the same when the lamps are used with the tip down as when they are used with the tip up.

The changes in candle-power are not negligible by any means, a difference as great as 14 per cent in the candle-power of the same lamp operated at constant voltage having been observed by the authors when varying the speed of rotation and the position of the lamp. They have investigated the facts sufficiently to discover practical methods of minimizing the difficulties, but the residual troubles are quite sufficient to be discouraging when one is absolutely driven to make a determination of the mean horizontal candle-power—a quantity of little importance in the particular class of lamp under discussion.

The results before us establish as a conviction what we held as an opinion when Dr. Sharp's paper appeared,

that there is only one proper way of dealing with these lamps, namely, to integrate their total light flux in a sphere photometer. The value thus determined well defines the properties of the lamp as an illuminant and defines it in a simple scientific way. There is really very little excuse for going to any trouble to secure the mean horizontal value of the candle-power, which is a quantity of no particular significance after it is obtained, especially since it is the average of large variations in individual directions. If a measurement of candle-power variation in azimuth has any significance whatever, it is the variation that is important and not the fictitious mean value, which would become worth considering only in case the lamp were to be used while rotating. More and more, lamps are likely to be rated in lumens or in mean spherical candles. Moreover, gas-filled lamps, especially in the larger sizes, will be practically always used in diffusing globes which so change the space distribution of the candle-power that a mean horizontal measurement of the candle-power of the bare lamp represents largely useless data. It is most instructive to bring out clearly the peculiarities of the gas-filled lamps, and if the difficulties set forth can discourage attempts at a very troublesome and valueless kind of determination the labor of the investigators will have been remarkably well spent.

### Incandescent Search-Lanterns

One of the notable gains in the introduction of the gas-filled incandescent lamp is its easy applicability to search-lamp practice, an advantage which ought to be felt in the progress of the present war. Until very recently it has been extremely difficult to obtain a powerful concentrated search-lamp except by use of the arc, but thanks to the introduction of the gas-filled lamp with a thick and comparatively stable filament, it is feasible to produce a medium power search-lamp extremely convenient to operate and taking relatively little energy. Considerable headway has already been made in the production of such lamps giving from 1000 to 2000 actual candle-power. The amount of electrical power required is so small that the whole equipment can conveniently be mounted on an automobile of moderate size or in case of need carried for considerable distances by men or horses.

A beam of light intense enough to detect the movement of hostile forces at 2000 yd. should be of great value, particularly when the apparatus is light enough to be readily shifted about in the trenches so that it may reappear in a different spot long before hostile artillery is able to get its range. Night attacks seem to be especially frequent, and sufficient light to disclose them even at a distance of a few hundred yards gives a chance for action in a period long enough to insure a repulse. Such search-lamps ought to be particularly valuable in repelling airship attacks, since their range is certainly adequate, except in very thick weather when airships themselves are likely to go astray, to pick up an object the size of a Zeppelin at any height attain-

able by such craft. With an incandescent search-lamp mounted on a fast automobile and followed by another with machine guns it ought to be possible to keep an airship once detected under fire for a long period. For many such military uses the incandescent search-lamp seems peculiarly fitted, and it will be rather surprising if it does not come into considerable use.

### Electro-Dynamic Stresses

In a paper read before the British Institution of Electrical Engineers, abstracted in the current issue, Mr. P. V. Hunter brought to the front a subject too often neglected, namely, the electro-dynamic strains attributable to the mutual effect of the magnetic fields and the conductors. One learns of this in theory at a very early stage of his electrical education, but actual experience with heavy currents is necessary to afford an adequate conception of the genuineness of the phenomena. Of course, the familiar example of these stresses is in the end windings of turbo-alternators where the necessary bracing has required a good deal of study and experiment. Mr. Hunter calls attention particularly to the heavy mechanical stresses occurring in transformers, stresses great enough to cause serious danger. He expresses the opinion that a majority of the transformers of present-day manufacture are inadequately protected against the mechanical stress of short-circuits. To be sure, some protection is afforded by the fact that the voltage of the generator is apt to decrease sufficiently during short-circuit to protect the transformers, but the danger multiplies as the generating system and generating units become larger.

Seemingly a large station has the advantage over a small one, yet it is a serious question whether, all things considered, there is not really a limiting size—a size beyond which exceptional precautions must be taken against those dangers which are proportional to the output. It is a familiar fact that the switchboard costs of a large station are enormously greater relatively than in the case of a small station, owing to the large amount of the switching apparatus, the complications introduced by feeder connections and the structural requirements in the station itself due to the great mass of switch gear and protecting apparatus which must be safely housed. In fact, a very interesting investigation might be made of these dimensional elements, one group of which Mr. Hunter brings to the front. His general view is that it is desirable as far as possible to protect against the mechanical stresses by sound construction, considering the use of reactors and various protective devices as auxiliary rather than primary. The reactance of generators he considers an element of safety to be depended on in preference to external reactors. Advantage can be taken of step-up transformers directly connected to the generator terminals and serving by their reactance greatly to lessen the danger of short-circuits.

There seems to be no good reason why in designing a station for high-voltage output the generator and transformer should not be considered a unit instead of

separate devices each of which must be elaborately protected against the other and provided with intricate means for shifting the load here, there and everywhere in the station. One does not insist upon facilities for driving any particular generator in a large station from any one of the steam turbines that are in use; it is sufficient if a unit be available when needed. The turbine, the generator and the transformers form just as logical a unit as does the ordinary turbo-generator. If considered in the light of this fact, station construction can be greatly simplified.

### Lighting of Country Roads

It is, of course, impracticable to extend far out beyond the thickly settled territory the kind of street lighting customarily employed in cities and towns. It is a fundamental principle in street lighting to adjust as far as may be the amount of lighting to the traffic needs of a community, and this as a rule implies very thorough lighting in the chief streets and much less toward the suburbs, where the requirements are different. However, at the present time traffic conditions are quite different from what they were ten years ago. By reason of the greatly increased and rapidly growing use of automobiles there has been a complete readjustment of traffic density with respect to both direction and time. Out of every city run a few streets which finally merge into roads through rural districts, leading in some definite direction to attract traffic, and it is highly desirable that such roads should be lighted, not for the purpose of surface illumination, which the headlamps of the vehicles themselves supply, but for a sufficient marking of the way to facilitate the passage of vehicles in general. Anywhere within the region lighted at all automobiles can run with comparative safety and ease in case of an accident to the main headlamps; horse-drawn vehicles can find the way readily enough in very unfavorable weather, and the progress of pedestrians is equally facilitated.

Under present conditions it is desirable to extend the lighting of towns along the principal roads, even if the lamps are small and widely spaced, in order better to point the way and facilitate the progress of all travel. The difference between walking or riding along an entirely dark road and along one even very badly lighted is astonishingly great. Even 40-watt or 50-watt lamps spaced twenty to the mile are a great deal better than nothing. From the standpoint of illumination judged by foot-candles such lighting as we here describe is negligible, but it actually does mark the route to a very material extent. If the councils of the smaller towns would co-operate to extend systematically the lighting along the chief roads, even on the most economical scale, they would confer a considerable benefit on the traveling public. Low-candle-power lamps spaced even at ten to the mile are not to be despised on a dark road. The cost of such road lighting is very small, and efforts should be made systematically to extend it from town to town over all chief roads.



# The News of the Week

## Activities and Events in the Electrical Field— Reports of Meetings—Commission Findings, Etc.

### Plans of National Joint Committee on Line Construction

For the purpose of completing its organization and laying out its working program the national joint committee on overhead and underground line construction held a meeting at the headquarters of the American Institute of Electrical Engineers on Dec. 16. According to present plans, this committee will prepare specifications on suggested practices, or perhaps recommend modifications of existing regulations relating to the following subjects: (1) Underground and undergrade crossings; (2) crossings of electric wires over electric-railway tracks; (3) crossings of trolley contact wires; (4) overhead crossings of wires or cables of telegraph, telephone, signal and other circuits of similar character over steam-railroad rights-of-way, track or lines of wires of the same classes; (5) overhead crossings of electric light and power lines; (6) parallel lines.

Specifications covering subject No. 4 already prepared by an earlier joint committee representing various interests are now being considered for adoption by the national joint committee. Subject No. 5 has been covered by the standard specifications adopted by the American Electric Railway Engineering Association. The other subjects are new, and specifications relating thereto will have to be prepared by the committee, which is enlisting the co-operation of all persons and associations interested in any way in line construction.

The national joint committee is made up of official delegates and alternates from the following organizations: American Railway Association, American Railway Engineering Association, Railway Signal Association, Association of Railway Telegraph Superintendents, National Electric Light Association, American Electric Railway Engineering Association, American Institute of Electrical Engineers, American Electric Railway Association, American Telephone & Telegraph Company, United States Bureau of Standards, Independent Telephone Association of America, Western Union Telegraph Company, and Postal Telegraph Company.

Mr. Farley Osgood, Newark, N. J., is chairman, and Mr. G. W. Palmer, Jr., Boston, is vice-chairman of the committee. The secretary is Mr. R. D. Coombs, 30 Church Street, New York, and Mr. W. H. Feller, 759 Broad Street, Newark, N. J., is the assistant secretary.

### Meeting of Oregon Electrical Contractors' Association

That contracts for electrical wiring and equipment should be let separately and not included in a lump contract for the building was the opinion of the members of the Oregon Electrical Contractors' Association, which held its annual convention in Albany, Ore., Dec. 9. Before the convention adjourned a resolution was adopted urging uniform effort to make separate contracts for electrical work the rule in Oregon. Officers were elected as follows: President, Mr. John Tomlinson, of Portland; first vice-president, Mr. Harry Sroufe,

of Portland; second vice-president, Mr. Joseph H. Ralston, of Albany; third vice-president, Mr. Lester Armistage, of Corvallis; secretary-treasurer, Mr. J. W. Oberender, of Portland. Messrs. S. C. Jagger and F. L. Green, both of Portland, were chosen to serve with the officers as an executive committee. Papers were presented as follows: "The Relation of the Contractor and Dealer to the Central Station," by Mr. J. L. White, manager of the Oregon Power Company, of Albany; "Credits and Collections," by Mr. P. A. Young, of S. E. Young & Son, of Albany; "The Jobber and the Contractor," by Mr. John F. Ryan, of the Portland office of the Western Electric Company; "The Central Station," by Mr. A. C. McMicken, of the Portland Railway, Light & Power Company. Approximately 100 delegates were in attendance.

### Accident to Cleveland Distribution System

A short-circuit of unknown origin crippled the direct-current distribution system of the Cleveland Electric Illuminating Company at about 3 a. m. on the morning of Dec. 16. It was necessary to shut down the Canal Road station and the East Seventeenth Street substation to control the situation. As soon as this was done steps were taken to cut the system in two by opening circuits at various junction boxes and, this accomplished, the East Seventeenth Street station was started up about 9.30 a. m., restoring service to the eastern portion of the business district. Meanwhile an abandoned station on East Third Street was tuned up, and several circuits were tied in there.

Temporary 1,000,000-circ. mil weatherproof cables were run overhead, and by the morning of Dec. 17 the bulk of the business district had energy, but the use of it was restricted until more cables could be installed. By the morning of Dec. 18 all parts of the district were supplied with energy as usual.

### Investments in Latin America

If American manufacturers are to acquire and retain the trade of the Latin republics of the southern part of this hemisphere, they should encourage the investment of American capital in those countries and the establishment of an American merchant marine, declared Mr. Edward N. Hurley, president of the Illinois Manufacturers' Association and the Hurley Machine Company, Chicago, in an address before the Chicago Traffic Club on Dec. 18.

Several fine boats flying the United States flag now sail each month from New York to Brazil and Argentina, but the bulk of the South American traffic is carried in British bottoms. American investments in foreign countries should be classed as domestic investments in many essential respects, for, as a result, declared Mr. Hurley, the foreign business of American manufacturers can be increased to a point where, except for labor and supplies paid for locally, practically all of the money invested will actually remain in the United States to purchase American-made products.

### Proposal for Texas Utilities Commission

If the Texas Legislature enacts at its next session the bill which has been drafted by State Senator A. C. Robbins, of Athens, there will be created a public utilities and corporation commission. The measure places all private and municipal public service plants under control of the proposed commission, to which is also given authority to inquire into the business of all corporations of whatever character. The bill provides for a commission of three members.

### Urge Need of More Publicity for the Electric Truck

At a meeting of the Chicago Section, E. V. A., Dec. 8, Chairman McDowell emphasized the need for more publicity for the electric truck, to reinforce the efforts of the manufacturers' salesmen. He suggested that some co-operative campaign be undertaken with the help of the local central station, and that newspaper space be used to reach the owners of the 90,000 horses in Chicago and vicinity. His suggestion met with the approval of the section, although it was pointed out by Mr. G. B. Foster that the publicity problem should be first analyzed to discover whether some more direct means of publicity might not be more economical for reaching prospective truck users. The discussion then turned on the need of dependable truck operating data. Figures collected by the N. E. L. A. and the *Electrical World* were referred to by several speakers. The compilation of truck operating costs based on mileage as well as on day's service was recommended, and the fallacy of too free generalizing in averages was pointed out.

### Rate Agreement Reached at Houston, Tex.

Under the new schedule of rates agreed upon between the City Council of Houston, Tex., and the Houston Lighting & Power Company, the primary charge for lighting service is 9 cents per kw-hr. and the secondary charge 5 cents per kw-hr., the minimum monthly bill being fixed at 50 cents. For motor service there is established a fixed charge of 25 cents per month per hp of rating, plus energy charges of 5 cents per kw-hr. primary and 2.5 cents per kw-hr. secondary. Residence customers may obtain the motor rate for electric cooking, provided that a separate meter is installed, the minimum charge on which is 50 cents per month. All bills for lighting are subject to a discount of 10 per cent if paid within ten days. Monthly flat rates are also fixed for ceiling fans operated during daylight hours and twenty-four hours per day. By action of the Council on Nov. 28 the new rates were made retroactive and effective as of April 1, 1914.

### Reply of Cincinnati Company to King Report

Mr. W. W. Freeman, president of the Union Gas & Electric Company, Cincinnati, Ohio, has submitted to the Cincinnati City Council the reply of his company to the valuation and rate-revision reports prepared by Mr. Arthur C. King, of Chicago (abstracted in these columns on Nov. 28). In the reply Mr. Freeman points out that the principle of rate-making employed by Mr. King ignores both the capitalization and the actual money invested in the property and undertakes instead to determine present value on a reproduction basis.

"It must be obvious," declares President Freeman, "that any figures thus obtained are nothing more than engineering opinions, however carefully formed, and

that grave injustice and injury to the company will be done unless the estimated values include every piece of property and every element of true value. Without admitting that this rate theory is logical in reasoning or fair in results, when fairly applied to the Cincinnati situation, such method proves that the present electric rates of the company are grossly inadequate to yield a reasonable rate of return upon the fair value of the electrical property."

Mr. Freeman points out that the electric rates of the company could be increased by almost 23 per cent without producing earnings in excess of a reasonable rate of return upon the present electrical property. It is not the intention or desire of the company to increase its rates for electric service. What the company prefers, and proposes to do, is to develop its business through low rates to an extent which will, if possible, produce business in sufficient bulk to offset the present inadequate revenue. The present rates in Cincinnati, the reply adds, are unusually low in comparison with those charged in other corresponding cities.

### Welfare Plans of Westinghouse Company

The Westinghouse Electric & Manufacturing Company has issued a preliminary statement regarding its sickness and accident relief, accident compensation and service pensions, on which its officers have been working for over a year. The plan will be put into effect on Jan. 1.

#### Relief Department

The privileges of the relief department are open to every employee, male or female, regardless of age, position or location, upon payment of small monthly dues. The company pays the expense of operation and maintenance of this department, the dues being reserved for the payment of benefits (proportioned to wages) for sickness and accident arising from causes other than employment. In the event of death the amount paid from the dues will be duplicated by the company, which will also meet any deficit that may arise. Benefits will continue as long as disability lasts, or until the age of seventy years, when pensions will be granted.

#### Accident Compensation Plan

An accident compensation fund is maintained entirely by the company for the benefit of all employees, male or female. This plan covers payment for disability due to accident, or for death resulting from accident while at work as an employee and makes provision for both total and partial disability. In case of total disability the company will pay as long as the disability lasts, even for life, two-thirds of the average wages received, and for partial disability, two-thirds of the reduction in the earning capacity of the employee, even though the employee should eventually leave its service. In case of death the company will immediately pay the dependents or next of kin \$150 as a pension to the widow or dependent husband or children under sixteen years of age. Medical, surgical and hospital expenses under the direction of the company's medical officers will be paid during disability from such accidents.

#### Service Pensions

Employees shall be retired at the age of seventy years, and those who at the time of such retirement are members of the relief department and have completed at least twenty years of continuous service are to be granted a pension amounting to 1 per cent of the average monthly wages during the last ten years of employment for every year of continuous service, with a minimum of \$20 per month and a maximum of \$100 per month.



Upon the death of the pensioner one-half of the pension will be paid to the widow until remarriage, provided that marriage occurred at least ten years before the granting of the pension. For the support of each child under sixteen years of age, and for each wholly dependent grandchild under sixteen years of age, one-fourth of the pension will be paid until they reach the age of sixteen years. The president may at his discretion retire any employee between the ages of sixty and seventy years who has been in the service the required time, and he may increase any pension for specially meritorious service by 25 per cent, but not beyond the maximum pension of \$160 per month. In states already having workmen's compensation laws, as New Jersey and Ohio, where the company also maintains plants, such laws may be substituted in whole or in part. Where the provisions of the Westinghouse plan are more liberal these will generally prevail.

### Safety Medal to Commonwealth Edison Company

The Travelers' Insurance Company Gold Medal, awarded annually for the past five years to the employer instituting the best safety work for the protection of employees and the public, is this year given to the Commonwealth Edison Company of Chicago. The award was made by a committee of the American Museum of Safety, the result being announced at a luncheon at Delmonico's, New York, Dec. 17, during the week of the International Exposition of Safety and Sanitation, at which the Commonwealth Edison Company had an exhibit of photographs showing its safety work.

### Hearing on Muscle Shoals Project

A hearing was held by the rivers and harbors committee of the House of Representatives in Washington on Dec. 12 on the proposal to improve the Tennessee River between Brown's Island and the Railroad Bridge below the city of Florence, Ala., the estimated cost of which is \$18,701,000, of which it is proposed that the Muscle Shoals Hydro-Electric Power Company shall pay the major part.

Nearly 200 persons were at the hearing. Governor O'Neal of Alabama, Mr. C. H. Huston, of Chattanooga, Tenn., Speaker Carmichael of the Alabama House of Representatives and Mr. J. W. Worthington, representing the power company, were among the speakers. Mr. Worthington said that there is no demand for power from Muscle Shoals at present, and that the demand would have to be created by the establishment of plants for the manufacture of fertilizer by a process which takes nitrogen out of the air for use in the soil. Governor O'Neal said that the price of transportation would be reduced if the Tennessee River were made navigable, and that if the cotton growers could obtain the fertilizer they would save millions of dollars annually expended for sodium nitrate sent from Chile.

### Franchise Value Recognized in Passaic Gas Case

The Court of Errors and Appeals of New Jersey has rendered an opinion in the Passaic gas case. It reverses the judgment of the Supreme Court and thus sets aside the order of the Board of Public Utility Commissioners making a rate of 90 cents for gas for the Public Service Gas Company in the Passaic district. The court holds that in the valuation of the property an allowance should have been made for franchise value. The court was

divided on the decision, the vote on which stood six to four, with six members not voting.

The decision says: "If, as we think is the law, substantial allowance should be made for the franchise of a gas plant if taken for public use, and the value of such franchise paid in money to the owners thereof, we fail to see why, so long as the plant and franchise possessing that value for sale or condemnation are held and operated by the owners, the latter should not be entitled to a reasonable income on all elements of their property, including the franchise, in the absence of any charter reservation or contract to the contrary."

### Central-Station Service for San Diego Exposition

A new 4000-kw steam-turbine set is being installed by the San Diego (Cal.) Consolidated Gas & Electric Company to supply the electrical service for the Panama-California Exposition, which will open at San Diego on New Year's Eve. The exposition lighting and motor load will total 2500 kw and is to be supplied exclusively by the local central-station company. Three 1000-kw transformers are also to be installed for the exposition service. This special equipment, it is promised, will be ready before the opening ceremonies.

### Stockholders in Cincinnati Rate Case

Stockholders of the Cincinnati Gas & Electric Company have organized a committee of thirty-three members to do all that lies in their power to protect the interests of the company in the pending rate negotiations with the City Council. They have issued circulars, booklets, postal-card pledges and Vol. 1, No. 1, of the *Stockholders' Herald*. The circular letter asking the support of other stockholders says in part:

"Are you sufficiently interested in preserving your stock in the Cincinnati Gas & Electric Company to join with the other stockholders of the company in forming an organization that will be capable of meeting a situation that has arisen?"

"The company has pending before the City Council an application for a renewal of its rates for supplying electricity. A well-defined and powerful propaganda seeks to impose unfair rates on the company with the ultimate end of destroying a large part of the value of the company's property.

"The undersigned stockholders are of the opinion that all stockholders should unite and take all steps necessary to procure for the company an impartial hearing and a fair rate for its service. This can be done only by the real owners of the property, namely, the stockholders, encouraging a movement that will secure for the company such rates as will be fair and will be a just return on the money invested in the company. Stockholders acting together can exercise a powerful influence upon public opinion which will offset the attacks of professional agitators who are more interested in their own selfish advancement than in the real progress of the city.

"In the next few weeks hearings will be held by the City Council relative to the electric-lighting question, and we believe it is the duty of stockholders to be present at these meetings. We also request, in justice to yourself and the company, that you do not hesitate to express publicly your opinion on this question."

The booklet giving facts and figures says that there is a lack of understanding that public and company interests are identical and that the millions invested in the company by citizens are entitled to encouragement

and a feeling of safety instead of attack and fear of confiscation. Another card quotes from a table of rates in various cities contained in the report made recently to the city by Mr. Arthur C. King, which shows that maximum rates in Cincinnati are decidedly low in comparison with other corresponding cities.

The *Stockholders' Herald*, under the caption "Let There Be Light," expresses its aims. The stockholders of the company number above 8000, more than one-half of whom are women. Of this large number only 15 per cent own in excess of fifty shares. Fully 25 per cent of the stockholders own between one and five shares.

## CHEAP WIRING METHODS DISCUSSED

**Electrical Manufacturers, Jobbers and Contractors Urge Delay in the Approval by the Underwriters of Grounded Concentric Wiring**

Judging by the opinions expressed at a meeting of electrical interests made up of electrical manufacturers, jobbers, contractors, etc., at the Biltmore Hotel, New York City, Dec. 22, the electrical industry is not quite ready for the change embodied in the proposal of the National Electric Light Association's committee on the wiring of existing buildings to have the Underwriters at their March meeting permit the use of a grounded concentric wire for interior work. While it was felt that the lighting companies have much to gain by such a change, the other branches of the industry fear that any scheme whereby construction is cheapened is fraught with danger and should not be passed for use by the National Electrical Code except after a most searching analysis of every detail and after giving manufacturers a chance to adjust themselves to the change.

Mr. George A. Cragin, of the American Steel & Wire Company, Worcester, Mass., was unanimously elected chairman and Mr. C. E. Corrigan, of the National Metal Molding Company, Pittsburgh, vice-chairman of the meeting. By unanimous consent also Mr. George H. Duffield, secretary of the National Electrical Contractors' Association, acted as secretary. The general object of the conference was explained by Mr. Charles L. Eidlitz, of the Metropolitan Electric Manufacturing Company, Long Island City.

Mr. Eidlitz gave the personnel of the committee appointed for the purpose of investigating a new method of wiring as outlined in past issues of the *Electrical World* and described at some length the Stannos wire used in England, for permission to use which in this country, he said, the Underwriters are now being importuned by the lighting companies. Without professing to know all of the details of the wiring system, Mr. Eidlitz said that offhand it would appear as though the manufacturers of wires, of sockets, of cut-outs, of fittings, of switches, of conduit and of other kinds of materials used in interior wiring work would be seriously affected by the proposed change.

Mr. Wallace Clarke, of the General Electric Company, explained the position of that company in the matter. He showed and described the Stannos wire used in England and also the cheaper Kuhlos wire used in Germany. The former has a soldered sheath outside of the insulated wire, whereas in the German system the sheath is simply crimped together. The patent situation with reference to the wire, he said, was such that any manufacturer in this country was free to manufacture it.

Mr. J. R. Strong, of the Tucker Electrical Construction Company, a past-president of the National Electrical Contractors' Association and a member of the

committee to which the matter of the concentric wire was submitted, said that the use of the concentric wire had not been approved by the Underwriters, had not been considered by the Underwriters in fact, and had been merely placed before a sub-committee appointed by the chairman of the electrical committee of the National Fire Protective Association and that that sub-committee had not yet made up its mind on the proposition.

Mr. H. B. Crouse, president of the Crouse-Hinds Company, commented on the fact that the manufacturers of America have invested a great deal of money, time and energy in working with the Underwriters toward the accomplishment of high-grade installations. Such being the case, the manufacturers should have every consideration and be given sufficient time to readjust their business if conditions are to change. For that purpose Mr. Crouse moved the appointment of a thoroughly representative committee to go into the matter with the sub-committee of the Underwriters. This suggestion was seconded by Mr. C. E. Corrigan. The general committee appointed was made up as follows: Mr. Charles L. Eidlitz, chairman; representing the wire manufacturers, Messrs. W. A. Connor of the Standard Underground Cable Company, Perth Amboy, N. J., R. K. Sheppard of the B. F. Goodrich Company, Akron, Ohio, and George A. Cragin of the American Steel & Wire Company, Worcester, Mass.; representing the conduit manufacturers, Messrs. C. E. Corrigan of the National Metal Moulding Company, Pittsburgh, Pa., F. C. Hodgkinson of the Safety-Armorite Conduit Company, Pittsburgh, and L. J. Campbell of the Western Conduit Company, Youngstown, Ohio; representing fitting manufacturers, Mr. H. B. Crouse of the Crouse-Hinds Company, Syracuse, N. Y., W. T. Pringle of the Pringle Electric Manufacturing Company, Philadelphia, and A. W. Berresford of the Cutler-Hammer Company, Milwaukee, Wis.; representing porcelain manufacturers, Mr. Herbert Sinclair of the Star Porcelain Company, Trenton, N. J., and J. E. Way of R. Thomas Sons Company, New York City; representing the jobbers, Mr. Frank S. Price of the Pettingell-Andrews Company, Boston, E. W. Rockafellow of the Western Electric Company, New York, and W. W. Low of the Electric Appliance Company, Chicago; representing the electrical contractors, Mr. Ernest Freeman of the Freeman-Sweet Company, Chicago, Mr. John R. Galloway of Washington, D. C., and John Livingstone of the J. Livingstone Company, New York City; representing electrical engineers, Mr. Gano Dunn of J. G. White & Company, New York City; representing fixture manufacturers, Mr. Louis McCarthy of the Macallen Company, Boston, Mass., and R. B. Benjamin of the Benjamin Electric Manufacturing Company, Chicago; representing manufacturers of conduit boxes, Mr. R. B. Corey of the Pratt-Chuck Company, New York City; representing socket manufacturers, Mr. W. C. Bryant of the Bryant Electric Company, Bridgeport, Conn.; representing fuse manufacturers, Mr. E. B. Hatch of the Johns-Pratt Company, Hartford, Mr. L. W. Downes of the D. & W. Fuse Company, Providence, and Bryson S. Horton of the Detroit Fuse & Manufacturing Company, Detroit, Mich.

The committee was instructed to make a thorough investigation of the proposed system and to report to a meeting to be called on Feb. 9. In the meantime the committee is also to confer with the sub-committee of the National Fire Protection Association and endeavor to secure a postponement of any action on the part of that committee on the scheme of concentric wiring for the present at least. A special committee was also appointed consisting of Messrs. R. K. Sheppard, chairman, H. B. Crouse, C. E. Corrigan, E. Freeman and F. S. Price.



## MR. BRITTON ON WATER-POWER BILL

Vice-President of Pacific Gas & Electric Company Outlines Conditions That Will Encourage Hydroelectric Development

At the hearing on the water-power bill before the committee on public lands of the United States Senate at Washington on Dec. 11 an extended statement was made by Mr. John A. Britton, vice-president and general manager of the Pacific Gas & Electric Company.

Mr. Britton has been in the public utility business for over forty years. He discussed the bill with respect more to practical operation than from any other point of view. Mr. Britton spoke of the beginning of water-power development in 1890. The beginning of the present Pacific Gas & Electric Company system was in a small 3000-hp plant; now the output is practically 200,000 hp. That development was made possible by rates that were comparable with costs of coal energy in the earlier days and subsequently energy from oil. California has been developed to its present industrial importance entirely through the development of hydroelectric plants and the resultant cheapening of power. It is as prosperous as it is by reason of cheap hydroelectric power. Rates in California for lighting, heating and motor service are lower by practically 50 per cent than in any other state with which Mr. Britton is familiar and lower by far than anywhere in the Eastern States except perhaps in instances governed by the Niagara development.

### Hydroelectric and Steam Energy

In the judgment of Mr. Britton, California has the very best public service commission that ever was appointed. Notwithstanding that regulation was developed, the companies in the entire State, from the time they first began the introduction of electrical energy, reduced their rates as business increased and as returns warranted without regulation, except in the congested sections such as in San Francisco. Mr. Britton prophesied that the time is not very far distant when the cost of hydroelectric generation and transmission to central points and the cost of steam generation and transmission will meet and cross, and that by reason of cheaper fuels owners of plants in a great many states will reduce the point of economical steam generation by locating where water can be obtained for condensation purposes, and steam will become a cheaper prime mover for the generation of electrical energy than will the falling waters of the streams.

The Pacific Gas & Electric Company courts regulation. There was not a public utility man in California who did not welcome the laws existing at present. In the Antioch and San José cases the commission found that the corporation was entitled to receive 8 per cent upon the reproduction value of the property devoted to the service of the public. It found that the average rate for energy delivered to the substations in the district was practically 7.3 mills per kw-hr. Steam power had been generated and delivered practically under the same conditions for less money where the efficiency of great turbines has been utilized on a high load-factor.

### Possible Injustice of Regulations

As an example of the great injustice that may be done by such regulations as are proposed by the bill under consideration, Mr. Britton referred to the development on the South Yuba River. The company owns in fee simple the lands surrounding Lake Spaulding and the lands and waters of the old Lake Spaulding, all the land involved in the aqueduct except a part of a quarter section of forest reserve land, and every other part of the development, including transmission lines, except a

small portion from the power houses to the centers of distribution. At the upper end of the lake to be created by this large dam and the enlargement of the present lake were practically 28 acres of land cornering on the forest reserve which was to be submerged at certain contours following the height of the dam as raised. The Department of Agriculture demanded that the company take out a permit to cover all of its properties, including the right to regulate not only the power houses directly contingent to the Lake Spaulding development but also the ten power houses in the large system of the company, and that it abide by all the rules and regulations of the Department of Agriculture because in all of the development, involving over \$60,000,000 of invested capital and the new development entailing an expenditure of finally over \$10,000,000, there were the 28 acres of land that would be submerged ultimately. The water used out of this reservoir is for the purpose not only of the generation of power under regulation of the State commission but also for irrigation at the present time of over 20,000 acres of State land and possibly, after it has furnished power, of over 50,000 additional acres. The company protested, but was forced unfortunately to bring suit against the Secretary of Agriculture to determine whether he had any constitutional right to demand application for the permit. The suit is pending in the United States Circuit Court.

Mr. Britton said that the California Gas & Electric Corporation, which was the immediate predecessor in interest of the Pacific Gas & Electric Company, was organized in 1903. Prior to that time two or three other independent power companies, organized largely by the same class of men that controlled the California Gas & Electric Corporation, had been in operation. At no time during the life of the subordinate corporations and the Pacific Gas & Electric Company was any attempt made to enter into competition with existing companies. The property of the companies absorbed and now owned by the Pacific Gas & Electric Company was purchased at the fair values fixed by the owners. The company did not seek to exercise its monopoly unjustly or in any way illegally. Approximately 150 cities, towns, villages and settlements of different character are served by the company. About one-half of the energy is developed by water-power and one-half by steam. San Francisco is almost entirely dependent upon steam for energy. The cost of steam energy in San Francisco, generated and delivered to a substation for distribution, would be something less than 8 mills per kw-hr. Mr. Britton quoted President Eshleman of the Railroad Commission of California as effectually disputing in a telegram to Congressman Kent the statement that ownership and control in such a large extent of territory as is served by the company is any factor as a monopoly. The company entered the field as a pioneer, and it has developed it to the fullest extent, developed thousands and thousands of acres of land that had been arid by giving cheap energy for irrigation, encouraged manufacturers, attracted industries to the State that never would have gone without cheap energy, and developed the manufacture of cement by giving a rate for energy that made it possible to sell cement in competition with foreign and Eastern producers. Instead of being classed as a monopoly, it should be classed more as a philanthropist for what it did for the benefit of California. If the company had to use coal instead of cheap fuel oil, the steam plants could not be operated at so low a cost as the water-power plants.

### Interlocking Directorates

Mr. Britton was asked if he had seen the diagram presented before the House of Representatives committee showing interlocking directorates of electrical com-

panies. He said that he had and that so far as it stated the relation as between individuals and the Pacific Gas & Electric Company it was accurate. The diagram called attention to the connection of Mr. Samuel Insull with the company as a director. In the appendix it mentions the holdings of Mr. Insull and quotes a statement from a newspaper to the effect that he had become the purchaser, together with a syndicate, of 40,000 shares of stock. So far as the records of the company show, that statement was untrue. Mr. Insull became interested in the company as a director when he bought approximately 10,000 shares of its stock as an investment. The company is controlled entirely by California men. It has \$32,000,000 of common stock and \$18,000,000 of preferred stock outstanding. In the Pacific Coast States there are 3976 stockholders out of a total of 5792, and they hold 234,751 shares. In the Middle States 65,000 shares are held, in the Eastern States 165,000, and in Europe 42,000. Of these totals, 1621 employees own \$548,600 of preferred stock and consumers of the company own \$1,325,000 of the preferred. In a campaign undertaken some time ago by the company preferred stock was sold to employees and consumers. The preferred stock was issued during the construction of the Lake Spaulding and South Yuba development. At that time bonds were not salable. The bonds authorized for the improvement by the Railroad Commission of California could not be sold, and money had to be borrowed wherever it could be found. The company borrowed \$7,500,000 in New York City on short-time notes and unfortunately had to pay for it 10 3/4 per cent per annum. Among the large holders of the stock are: Mr. Frank G. Drum, the president, 17,765 shares; William P. Bonbright & Company, Inc., 15,604 shares; Pacific Lighting Corporation, 13,000 shares; Mr. L. J. Hart, 11,000 shares; Mr. Samuel Insull, 10,132 shares; Mr. J. C. Cebrian, 5392 shares; A. Iselin & Company, 8409 shares; Equities Securities Company, 7826 shares; Illuminating & Power Securities Company, 6500 shares, and Public Utilities Corporation, 5500 shares. The average holdings are about sixty shares per stockholder. The preferred stock was issued by order of the commission at 82 1/2. After stockholders neglected to take the stock, employees and consumers and the general public of California were invited to subscribe.

#### Competition Now Prevented

Practically the entire remunerative field served by the company was covered also by competing companies prior to the creation of the Railroad Commission. Four companies operated in competition with the company in San Francisco and in and around Oakland at one time. That competition cut rates in some cases more than one-half and they have remained at the low figures. Competition existed even before hydroelectric energy was developed. As an example of competition which the commission is seeking to prevent, Mr. Britton cited the fact that the Great Western Power Company invaded the Sonoma Valley, where there are three towns of 3000 to 4000 population. The Pacific Gas & Electric Company had covered the entire territory and was serving every applicant. The commission at its first hearing decided that competition should be permitted, that the Pacific Gas & Electric Company was not giving the service that it should have given and had not met all demands for service. The company demurred but submitted to the ruling. At large expense the Great Western company built a distributing line in the valley and adjoining territory and began to give service. The reports of the first year showed that the total revenue of both companies was nearly equal to the revenue of the one that had occupied the field. There was also an additional investment involving hundreds of thousands of dollars

that was not earning anything. For that reason commissions are recognizing the fact that regulation of monopoly is more beneficial to the capital invested, and eventually to the consumer, than is competition as it has been allowed to exist. The congested centers of the large cities, such as San Francisco and Los Angeles, were never dependent and could not be made dependent entirely upon hydroelectric transmission.

#### The Fifty-Year Permit Provision

Speaking particularly about the bill; Mr. Britton said that the provision limiting the term of permit to a period not longer than fifty years would prevent the financing of any future project of this character. When rights are liable to be terminated at the will and pleasure of the government there would be no means by which the proper investments made on behalf of an enterprise could be returned. If the term is certain and known, there is a possibility that provision may be made for the proper return of the capital investment. The period ought to be fifty years and thereafter until terminated through some action of the government in taking the property over for its own benefit for purely public purposes and not for the purpose of going into competition with other companies operating in the same field. The rights ought to be practically in perpetuity because if a company operating an investment of this character for fifty years under proper state regulation gives a service to the public that is high in class and reasonable in rates it ought to be permitted to continue unless the government requires for some public purpose to acquire the plant. The term ought not to be less than fifty years, because in the present progressive state of the science of electric distribution no man can say what will happen.

#### Progress of the Art

Plants that ten years ago were considered of the highest efficiency are to-day merely junk, and the progress of science is so uncertain that no one would want to put in anything to-day that might by the termination or cessation of the lease in a brief period of time be determined to have no value. Mr. Britton expressed the belief that there is not a plant in existence to-day that was in existence when steam generation of electrical energy was first started. A great many of the first water-power plants are to-day mere heaps of junk. If, as President Wilson said, the door can be unlocked and regulation provided that will prevent monopoly, Mr. Britton believes that the securities of companies will sell at very much higher figures; the higher the figures the less the public will have to pay finally for the properties. Mr. Britton also said that he did not favor the clause providing that the chief officer of the department under whose supervision lands may be shall have the right to determine whether or not they shall be used for the purpose contemplated. In his judgment the bill ought to set forth specifically the form of lease with all the conditions pertaining thereto. The clause which provides that at no time shall any lessee deliver to any one consumer electric energy in excess of 50 per cent of the total output Mr. Britton characterized as absurd. In the development of electric chemical processes the country will be dependent largely on the economical utilization of undeveloped water-powers. Recently Mr. Britton had a call from an engineer from Norway who asked for a rate on 100,000 hp or more so that a plant for the manufacture of the nitrates could be established in California. There are developments now under way in California at different points where it will be possible for the greater part of the output to be consumed by an industry of that character which uses the energy twenty-four hours a day and 365 days



in the year. The ultimate interests of consumers will be served by that arrangement. It will enable the plant to sell the remainder of its supply of energy at a very much lower rate.

#### Value of Electrochemical Process

The load-factor of the Pacific Gas & Electric Company has been built up from practically 12 per cent in 1903 to 70 per cent now. The electrochemical process which is being used so well now in Norway and is so greatly encouraged in that country and in Canada is going to be one of the saviors of hydroelectric power and the beginning of low rates for energy generated in that way, and will perhaps change the tendency Mr. Britton mentioned, so that hydroelectric energy will continue to be below steam energy in cost of production. Mr. Britton said that companies in Norway are able to make low rates because they have no aqueducts to build and their construction costs are therefore restricted. They get water on top of the hills and take advantage of natural falls. Without this advantage in construction there are undeveloped projects to-day in California where the minimum cost per horse-power will be reached. In the early days, where the development of hydroelectric energy was in small units of 1200 hp, necessarily the cost per unit was very much greater than it is to-day. Water-power cost in those early days about \$300 per hp for installation. The Pacific Gas & Electric Company developed a plant not very long ago at a cost of \$51 per hp, but that was in a case where the water pens were entirely elevated and there was a natural flow from a continuous body of water at Nevada City. Advantage was taken of that by the installation of a pipe line and power house. The cost will run between that low price and \$150 or \$200 per hp now. If a company wants to sell 75 or 90 per cent of its output to one consumer, it is in the interest of the consuming public that that should be permitted.

Mr. Britton objected on economic grounds to the clause relating to the physical combination of plants or lines. He spoke of the purchases of energy made by the Pacific company from other companies in California. The various plants are tied together, and it is wise from an economic standpoint that this should be so. If it had not been for this arrangement, some of the companies would have been without energy for their customers at times. With state regulation there is no reason why the companies should not be tied together for the protection of the service and the public.

#### Properties Inseparable

One section provides for the acquisition of the properties which may be dependent in whole or in part for their usefulness upon the continuance of the lease. There will be no part of the entire \$60,000,000 of holdings of the Pacific Gas & Electric Company that would not be dependent in whole and in part upon the other parts. The company has ten power plants, no one of which by itself could supply the systems. The distribution systems are all tied in and are not separable. The rights to be granted over public lands of the United States should be guaranteed in absolute perpetuity, subject to such laws and regulations as will enforce proper conduct by the company. If the property is not supervised by the State commission, the United States then should have the right to appear. Mr. Britton expressed himself as personally favoring strongly a provision that a company of the character of the Pacific Gas & Electric Company should have the right to condemn United States land for its purposes as it can condemn State land in California for its purposes. If such land was condemned, the value of the land, even at the condemnation value, should not be taken into consideration in

rate-making. "We think more of the question of our absolute tenure of the land in the service of the public," said Mr. Britton, "than we do of the question of taking the value of the land into account at all as a means of return to be obtained from the consumer."

To build up an organization to take care of the conditions arising from the bill would paralyze any industry because of the burden of expense. If a property is to be taken over, "fair value" should be paid and the court should fix the compensation. Rights-of-way, water rights, lands and interests therein would increase in value. When hydroelectric energy was first introduced it was possible to obtain private rights-of-way over private lands for transmission lines and other privileges at minimum cost because people were anxious to get the energy and to encourage the enterprise. The company is contending before the Railroad Commission that it is entitled to have regarded as the value of the present rights-of-way the value that they possess to-day. Transmission lines are run along public roads in California in only a very few instances. The new transmission lines are all on private rights-of-way.

Mr. Britton said he did not understand the reason for the provision that no sale of energy shall be made to a distributing company without permission of the Secretary of the Interior. The company sells energy for lighting, heating and motor-service purposes to a number of distributing companies that it does not own or control in California. In a commission-regulated state there could not be any abuse because of the existence of separate corporations for generation and distribution. In California the commission would force a company to supply energy to a distributing company if it thought best to do so.

#### National Contractors to Meet in San Francisco

Announcement has been made that the National Electrical Contractors' Association will hold its next annual convention in San Francisco on July 18 to 24 inclusive. The convention headquarters will be in the Clift Hotel, and the meetings will be held in the Auditorium of the Civic Center. Contractors from the East will go in a special train, and the first two days in San Francisco will be devoted to sightseeing. A meeting of the directors and executive committee is scheduled for July 20. The program for the rest of the week is as follows:

*Wednesday, July 21.*—10 a. m., open session: address of welcome, president of the San Francisco association; address by Mr. John R. Galloway, president of the National Electrical Contractors' Association; address by Mayor James Rolph, Jr., of San Francisco; illustrated address by Mr. John Britton, manager Pacific Gas & Electric Company; address by Mr. Charles C. Moore, director-general of the Panama-Pacific International Exposition; address by Mr. W. S. Goodwin, sales manager Pacific States Electric Company. 2:30 p. m., business session. Evening, reception and dance at Clift Hotel.

*Thursday, July 22.*—10 a. m., business session at Auditorium, Market, Hayes and Larkin Streets. 2 p. m., automobile ride for ladies and guests through Golden Gate Park and Presidio. 2:30 p. m., business session, Auditorium. Evening, N. E. C. A. night at the "Zone," Exposition Grounds.

*Friday, July 23.*—10 a. m., final business session at Auditorium. 2:30 p. m., board of directors at Clift Hotel. 3:30 p. m., executive committee at Clift Hotel. 7 p. m., dinner-dance and vaudeville at Pompeian Court, Hale Building, Fifth and Market Streets.

*Saturday, July 24.*—Trip by special steamer around San Francisco Bay and through the Golden Gate, landing at Exposition Grounds early in the afternoon. Luncheon to be served on board.

## PUBLIC SERVICE COMMISSION NEWS

## Colorado Commission

The Public Utilities Commission of Colorado, in reply to a request from the Trinidad Electric Transmission Railway & Gas Company, has made an administrative ruling that in its opinion all services must be paid for in money and no free service can lawfully be rendered. The street-lighting contract which the company has with the city of Trinidad calls for free lights at various points.

In another ruling the commission holds that it is unlawful for public utilities to exchange free transportation or free service for advertising space in newspapers, for the reason that it is plainly contrary to the act, which is emphasized by the fact that an attempt was made in the Legislature to permit this practice. The attempt, however, failed.

The commission also rules that the provisions of the act are uniformly applicable in all parts of the State and that any charter provisions in conflict with it or with any orders issued by the commission are of no force and effect.

## Illinois Commission

The commission has decided that the price the Central Illinois Public Service Company is now charging for gas in Charleston, Ill., is not exorbitant. A lower rate has been ordered, however, because the company agrees that it may be able to sell more gas and thus make up for the deficiency. The rate is reduced from \$1.50 to \$1.35 gross, or \$1.25 net. The commission says:

"It is a matter of very serious doubt whether or not a gas utility in Charleston, under the present conditions of population, can ever pay a substantial return on the capital invested therein, because any reasonable rate of service, even a high one that some few residents might conclude to pay rather than be debarred from using gas could hardly be supposed to be sufficient to cover fully the indirect charges of operation (inseparable from all small plants), operating and depreciation charges, and to pay a reasonable rate of return to the stockholders."

## Idaho Commission

Taking the load-factor into consideration, the Public Utilities Commission fails to find any discrimination between the rates charged the Marsh Mining Company and other companies furnished with energy by the Washington Water Power Company.

Explaining that apparent discriminations of this and other kinds may be shown not to be so by an equalization of conditions causing them, the commission decided that there is no reason to believe that the Marsh Mining Company has suffered through rates favoring other companies. This decision, however, the commission says, has no bearing on the reasonableness or unreasonableness of rates charged by the Washington Water Power Company, except as they may be discriminatory in this instance. There is pending before the commission an investigation into these rates, and certain rates which the commission deems fair and equitable to consumers and company alike have been put into effect and are to be maintained until the conclusion of the investigation.

## New York Commissions

The Public Service Commission has approved the franchise of the Mechanicsville Electric Light & Gas Company to operate in Schaghticoke, Rensselaer County, and permits the exercise thereof under a contract with the town for lighting Hemstreet Park and the eastern

portion of the bridge from Mechanicsville, despite the objections of the Half Moon Light, Heat & Power Company, which was already furnishing energy to private consumers in the town.

The Half Moon company objected on the grounds that it should be protected from competition, under the terms of the public service commissions law, but in an opinion by Commissioner Emmet the commission finds that the intent of this part of the law was toward actual and dangerous competition and not the theoretical or harmless competition found in the present case.

Commissioner Emmet finds that the Half Moon company is the larger, stronger and more profitable concern, and that on the contract for street lighting its bid was \$12 per lamp as against the \$9.90 bid and accepted by the Mechanicsville company. The Half Moon company covers a far larger territory than the Mechanicsville company, and Mr. Emmet finds that it would hardly be conceivable that this business could be seriously injured by the entrance into so small a portion of its field as the exercise of a single street-lighting contract would involve.

## Ohio Commission

The commission has rendered a decision on the joint application of the Sidney Electric Company and the Western Ohio Railroad Company for the transfer of the lighting plant of the latter-named company in Sidney to the Sidney Electric Company. It appears to the commission that the amount agreed upon by the parties for the property is greatly in excess of the actual value and that the purchasing company intends to capitalize the property at its purchase price. It also appears to the commission that the transfer is contingent upon the execution of a contract between the companies fixing the rates which the Sidney Electric Company would be bound to pay to the Western Ohio Railroad Company for electrical energy.

The request of the Mahoning Light & Power Company of Youngstown for permission to purchase the Youngstown Heating Company's plant for \$125,000 has been granted. The company received authority to sell at 90 \$530,000 of 6 per cent bonds, to mature in twenty years, and \$400,000 of capital stock at par, all the proceeds to be invested in the plant and its improvement and development. The Youngstown Heating Company has a franchise to operate in Youngstown, and the new company will have the right to proceed with the construction of a plant. Opposition was made to the grant by the local company on the ground that the territory is now receiving adequate service and that there is no necessity for another company.

It is reported that the Youngstown & Sharon Railway & Light Company will appeal to the Supreme Court from the decision of the commission in the Mahoning County Light Company case. The new company, it is said, will confine its service to the business district of Youngstown, and the old company will appeal on the ground that it is unfair that the best of the business should be sought and the original company be forced to take the outlying business, which will not be so profitable.

The Mahoning County Light Company will begin at once the construction of a plant for furnishing energy for lighting and motor service and also steam heat.

The hearing of the case of the Cleveland Electric Illuminating Company on rates has been continued from Dec. 15 to Jan. 25, pending completion of the valuation.

## West Virginia Commission

Applications of four hydroelectric companies which proposed to develop water-powers have been refused by the commission.



## Current News Notes

**SLEET STORM BRINGS DOWN STEEL TOWERS.**—The Lehigh Navigation Electric Company has a large force of men employed in erecting wooden poles between Hauto and the Harwood Electric Company's station at Freeland, Pa., to take the place of the steel towers crushed during the recent wind and sleet storms. These poles will be replaced by greatly strengthened steel towers next summer.

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**COMMISSION'S CONSENT NOT NECESSARY FOR MUNICIPAL PLANT.**—The Pennsylvania Public Service Commission recently ruled that the borough of Gettysburg could build and operate its own electric plant to furnish electricity for its streets without obtaining the consent of the commission. The Gettysburg Light Company had filed a protest against the approval of the project of the commission, but the commission ruled that the making of electricity by the borough for street lighting is a governmental function.

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**NEEDLE ICE CAUSES SHUT-DOWN AT HAMILTON, ONT.**—Needle ice at the Decew Falls generating station of the Dominion Power & Transmission Company choked the big flumes during the night of Dec. 14, necessitating the shutting down of the station. Street-railway service and traffic on several suburban roads leading out of Hamilton were at a standstill until 11 o'clock on the morning of Dec. 15, and a number of factories were obliged to close down temporarily. Ice formed in the canal on Dec. 15, so no trouble is expected during the winter.

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**MUNICIPAL PLANT NEED NOT NECESSARILY BE A PROFITABLE VENTURE.**—According to a decision of the Franklin County Common Pleas Court at Columbus, Ohio, a municipality may operate electric and other plants at a loss if it sees fit to do so, making up the resulting deficit from taxes. The case arose on an injunction brought by a taxpayer against the Mayor of Columbus attempting to restrain him from charging a rate for electricity from the city's plant which was alleged to be inadequate to meet the cost of operation. The court held that no ground for injunction was stated. The case will be carried to the Supreme Court and is being watched with considerable interest, especially by companies operating electric plants, which have frequently contended that municipal plants do not charge enough to pay the actual expenses of operation.

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**REDUCTION IN ONTARIO HYDRO RATES.**—Announcement has been made by the Hon. Adam Beck, of the Hydro-Electric Power Commission of Ontario, that, beginning with Jan. 1, 1915, reductions in Hydro-electric rates averaging from 12 to 15 per cent will become effective in all the municipalities using Hydro service, with the exception of the city of Toronto. Port Arthur leads the list with a reduction of 25 per cent, and fifty-five municipalities get reductions of over 10 and under 20 per cent, while fourteen get a 10 per cent reduction. In order to encourage greater use of electricity in the homes of the people for toasters, stoves, irons, vacuum cleaners and such appliances, the commission, after extensive inquiry, has established the normal use of electricity for house lighting. This has been fixed at 40 kw-hr. for a house of 1000 sq. ft. floor area, and for all energy used up to this limit the ordinary rate is charged, but for all in excess of 40 kw-hr. on this class of residence one-half of the initial rate is to be charged. For every hundred feet of floor area over and above

1000, which is fixed as the standard, the estimate for lighting is advanced 3 kw-hr. Thus a house with 2000 sq. ft. floor space would be entitled to the half rate on all energy used over 70 kw-hr. The chief general reduction has been made in the floor space charge, which is to be reduced from 4 to 3 cents per 100 sq. ft. with a minimum service or area charge based upon 1000 sq. ft. and a maximum of 3000 sq. ft. This is the city rate. In villages and rural municipalities the minimum is 1200 sq. ft. of floor space, and in urban districts outside the municipalities the minimum monthly charge is for 1500 sq. ft. The maximum is the same all through. Hitherto there was no maximum, and the service charge increased indefinitely. The rates for energy used by motors with a few exceptions remain the same as those which now obtain.

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### SOCIETY MEETINGS

**WISCONSIN ELECTRICAL ASSOCIATION.**—The date of the Wisconsin Electrical Association annual meeting has been set for Jan. 20 to 22, the place being the Hotel Pfister, Milwaukee, Wis. Mr. George Allison, First National Bank Building, Milwaukee, is the secretary of the association.

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**MINNESOTA ELECTRICAL ASSOCIATION.**—At a recent meeting of the executive committee of the Minnesota Electrical Association it was decided to hold the 1915 meeting of the association at St. Paul, Minn., March 23 to 25. Mr. R. E. Brown is president of the Minnesota association, and the members of the executive committee are Messrs. P. T. Glidden, R. F. Pack and E. F. Strong. The secretary of the association is Mr. Fred A. Otto, 159 East Sixth Street, St. Paul.

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**CHICAGO ELECTRIC CLUB.**—At the meeting of the Chicago Electric Club on Dec. 17 Mr. John J. Arnold, vice-president of the First National Bank of Chicago, discussed "Currency Legislation—Old and New." Mr. S. B. Joseph, a banker of Buenos Aires, Argentina, advised the extension of American investments in South America if the American manufacturer is to hold permanently the commercial advantage he will gain during the period of the European war and the subsequent reconstruction while European capital is occupied elsewhere. Mr. William H. Lough, representing the United States Bureau of Foreign and Domestic Commerce, Washington, D. C., urged American businessmen to utilize the present opportunity for foreign trade extensions. Mr. C. P. Connelly, a former secretary of the club also spoke.

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**SECOND NATIONAL FOREIGN TRADE COUNCIL.**—"Greater prosperity through greater foreign trade" is the objective of the second National Foreign Trade Convention to be held at St. Louis on Jan. 21 and 22, 1915. Three thousand commercial and industrial organizations, corporations, firms and individuals engaged in foreign trade have been invited to send delegates. In a letter to them Mr. James A. Farrell, president of the United States Steel Corporation and chairman of the National Foreign Trade Council, says: "Co-ordinated effort of the entire nation—manufacturers, merchants, bankers, carriers and all others—working together in harmony with a well-defined national policy, will alone enable us to develop the possibilities now before us." To present the effect of the war on United States trade, Mr. John Bassett Moore, formerly counselor of the State Department, will speak on "Problems Arising in War and Commerce." Secretary of Commerce Redfield will open the convention.



PANAMA-PACIFIC INTERNATIONAL EXPOSITION FROM RUSSIAN HILL, SAN FRANCISCO

## Electrical Equipment of Panama-Pacific Exposition

Various features of the exterior and interior electric distribution system—Extensive use of wooden manholes and conduit—Decorative and general illumination

**T**HE main exhibit section of the Panama-Pacific International Exposition, which will be thrown open to the world in San Francisco on Feb. 20, is now complete, and the great group of white palaces facing San Francisco harbor is rapidly being filled with exhibits arriving in trainloads daily. From the "Zone" flanking one side of the exhibit section to the pavilions of the states and foreign nations on the other side, the grounds extend along the waterfront for almost 3 miles. Many of the spectacles to be shown upon the Zone have long since been completed and open to the public, and little remains to be done by the army of workmen to put the finishing touches on the entire exposition, which will be ready long in advance of the day set for its formal opening.

The electrical equipment of the exposition grounds is unlike that of any other exposition thus far held; for by means of a very generous contract with the Pacific Gas & Electric Company the exposition company is enabled to obtain excellent construction at minimum expense. Wherever possible standard equipment of the Pacific Gas & Electric Company is employed and the lead-covered cable, switches, transformers, etc., will be returned to the electric company after the exposition is over at their face value, the exposition company paying a rental, as it were, on the reclaimable equipment. In all other cases the construction is designed to last for

the life of the exposition, and consideration has been given in the layout to the fact that much of the wiring material will possess a scrap value.

### Electric Supply

Electricity for the exposition is supplied by the Pacific Gas & Electric Company from a substation erected by it in one end of the steam station belonging to the Sierra & San Francisco Power Company and situated outside the exposition grounds. The energy will be generated at the Pacific Gas & Electric Company's main steam plant in South San Francisco, and in case of an interruption of service the Sierra & San Francisco Power Company's steam station will take the exposition load.

The exposition company's feeders consist of three-conductor, three-phase, lead-covered cables, of 000, 00 and No. 2 capacity, with weatherproof neutrals forming three-phase, four-wire, 4000-volt feeders running in underground conduit from the Pacific Gas & Electric Company's substation to various parts of the grounds.

### Transformer Vaults

The main group of exhibit buildings are fed from fireproof concrete transformer stations installed in the corners of the buildings, with doors opening to the outside and with ventilating ducts built through to the roof. These vaults were all built with the approval of

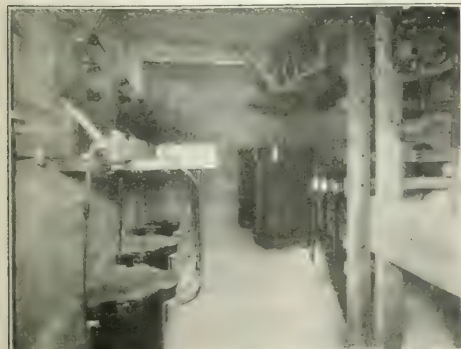


FIG. 1—TRANSFORMER VAULT, MANUFACTURES BUILDING



FIG. 2—TRANSFORMER VAULT IN AGRICULTURAL BUILDING





FIG. 3—TRANSFORMER VAULT IN LIBERAL ARTS BUILDING

the Pacific Board of Fire Underwriters and are fitted with a fireproof door held open by a fusible link and with an outer metallic screen door for ventilating purposes. Interior views of these vaults showing the

transformer vaults. Similar transformer vaults are also provided in the states and foreign sites, feeding the pavilions of the various state and foreign nations.

### Overhead Distribution

The Concessions District, at the extreme east end of the grounds, is fed by means of four four-wire, three-phase, 4000-volt overhead feeders running along the service roads back of the Concessions streets. These feeders are controlled from the same substation as the underground circuits; two of them will supply energy for motors and two will supply energy for lighting in the Concessions District. The extreme westerly part of the grounds, including the race track, drill grounds and stock yards, will be fed from an aerial extension of one of the underground cable feeders.

### Underground Distribution

The exposition's underground system consists of  $\frac{1}{8}$ -in. "linaduct" conduit laid in sections of wooden boxing approximately 18 ft. in length, having 1 in. of sand between the bottom of the box and the first layer of conduit and  $\frac{3}{4}$  in. of sand between each conduit in a layer. This sand is sluiced into place with water and a wood cover nailed over the box after the conduit is in place.

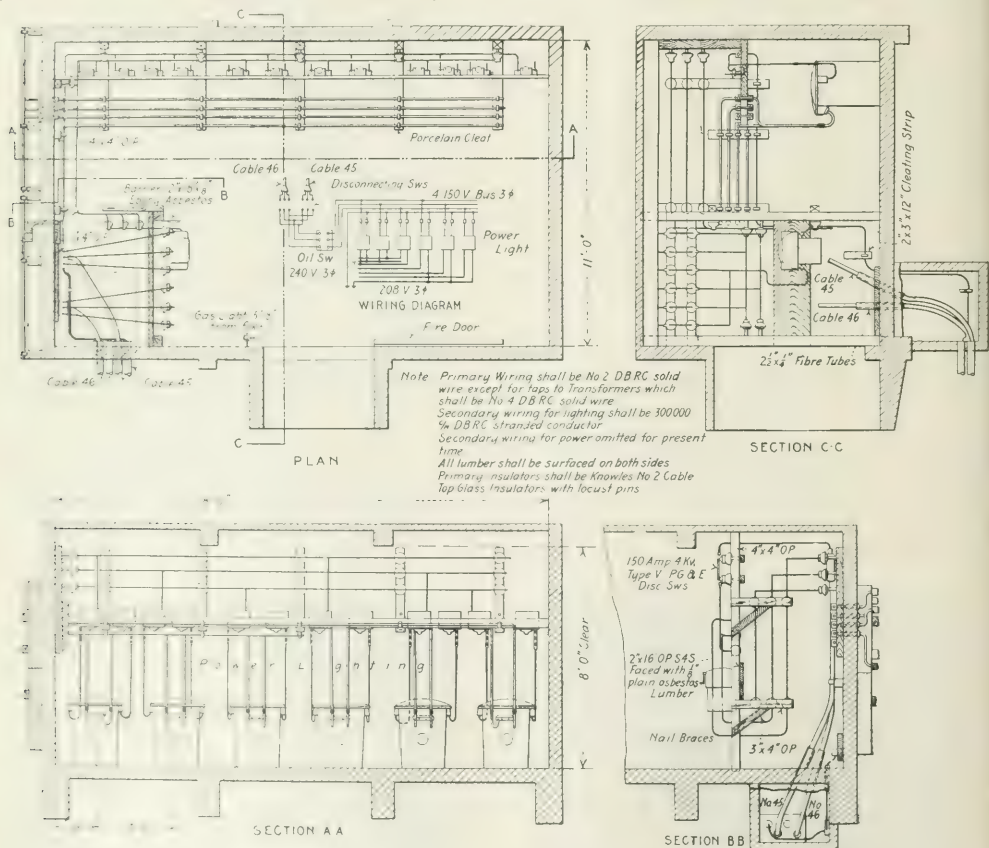


FIG. 4—GENERAL ARRANGEMENT OF PRIMARY-DISTRIBUTION TRANSFORMER VAULTS

equipment are given in Figs. 1, 2 and 3, showing vaults in the Manufactures, Agriculture and Liberal Arts buildings respectively. In addition Figs. 4 and 5 show details of wiring layout and arrangement in these

The manholes themselves are of Oregon pine, a detail of them being shown in Fig. 6. It will be noted that the manholes have a protruding entrance box with counterbored holes against which the conduit abuts, and

about 3 ft. of concrete is placed in the box nearest the manhole, this to form a rigid entrance for the conduits into the manhole and to form an anchorage against pulling. The protruding entrance, while very low in cost, gives the effect of a much longer manhole in allowing the bend of the cable to start before it actually

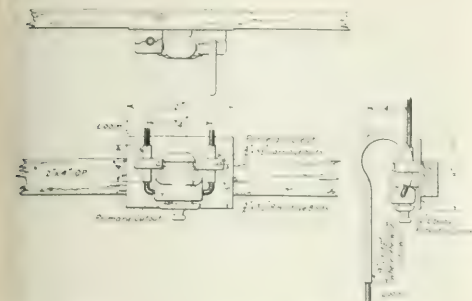


FIG. 5—METHOD OF MOUNTING PRIMARY CUT-OUTS AND LEADS

enters the manhole proper. The detail of another type of manholes used is shown in Fig. 8.

The details of the wooden-box construction are shown in Figs. 9 and 10. A portion of the conduit system using concrete construction is employed on the trunk line from the Avenue of Progress to the station and approximates about 1200 ft.

The type of wooden-box construction has proved not only low in cost but especially efficient under the prevailing conditions in withstanding strains due to undermining by the enormous number of earth cuts underneath and around it for sewer, water, gas and minor electric services. In some cases the conduit has supported a span of as much as 10 ft. without damage, and in numerous cases the whole weight of plaster scaffolding has rested on the box without detriment to the conduit.

The low-voltage distribution for lighting consists of transformation from 4000-volt star-connected mains to four-wire, three-phase, 115-volt lighting mains for

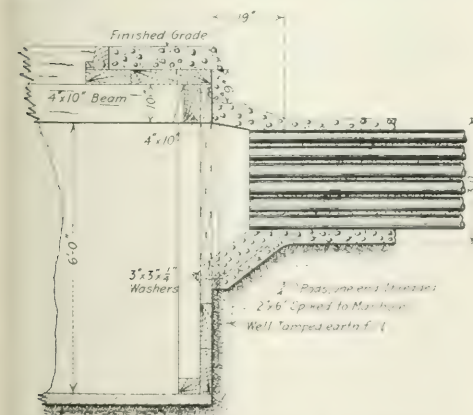


FIG. 6—SECTIONAL ELEVATION OF MANHOLE

general distribution. The lighting mains, in proportion to their size, are served from either one, two or three phases, and in many cases small three-phase motors are also fed from the outside of the four-wire

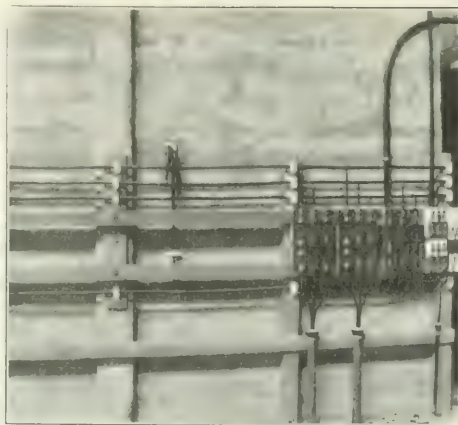


FIG. 7—TYPICAL DISTRIBUTION RACK ON EXTERIOR WALL OF TRANSFORMER VAULT

three-phase system which furnishes 208 volts, proving ample to run motors of small capacity.

The distribution for motors consists of transformation from 4000-volt star-connected mains to three-wire, 220-volt delta-connected circuits. Fig. 7, giving a view of the outside of one of the transformer vaults in the main group of buildings, shows the typical distribution rack from which the feeders proceed underneath the floors of the main exhibit palaces and there serve the exhibitors' booths. According to another scheme, in one of the Machinery Building vaults, owing to the heavy currents, the distributing busbars consist of flat copper strips.

#### Underground Cable System

Fig. 17 shows the general scheme of the underground cable system and switching arrangement in the transformer vaults. Owing to a very liberal contract made

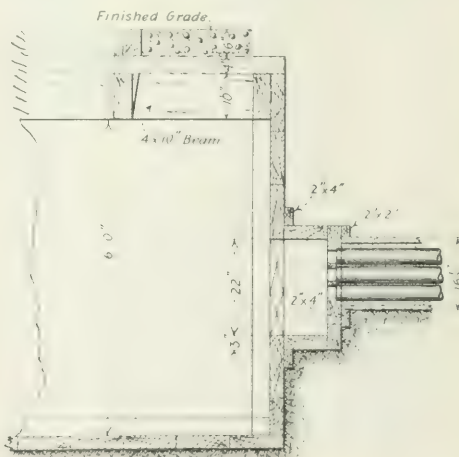


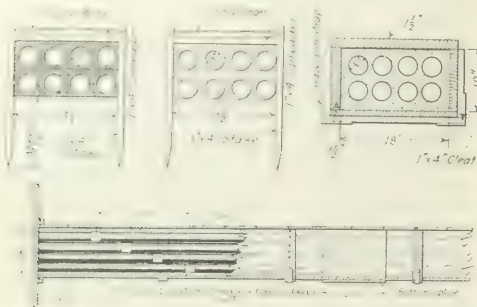
FIG. 8—DETAIL OF WOODEN MANHOLE

with the Pacific Gas & Electric Company the exposition company has been enabled to install a cable system of extreme flexibility—such that in case of losing half of the main cables the system would still be able, with very



little loss of time, to handle practically all of the load.

In order to furnish the necessary direct current for the approximate 2000 kw in searchlamps which will be around the grounds it was found necessary to install two 1000-kw motor-generator sets and two 250-kw bal-



FIGS. 9 AND 10—DETAILS OF CONDUIT CONSTRUCTION

ancer sets, these machines being installed in the Liberal Arts and Manufactures buildings and the Scintillator House. The 1000-kw machines are driven by 11,000-volt synchronous motors, and the 250-kw balancer sets are driven by two-phase, 2300-volt motors, a T-connection from 11,000 volts to 2300 volts being made to supply them with energy.

In the general illumination plan for the main group of buildings and courts, no direct illumination is used, and none is allowed on other buildings owned by con-



FIG. 11—TRAVELING CRANE ERECTING THREE-LAMP MAGNETITE-ARC FIXTURE

cessionaires or exhibitors that are situated within this district. Outline lighting is allowed in the states and foreign sites and Concessions streets when submitted for approval to the exposition company.

### Outside Illumination

The plans for street and general illumination consist of the following:

A number of series magnetite-arc circuits are installed, with the lamps set on ornamental poles grouper

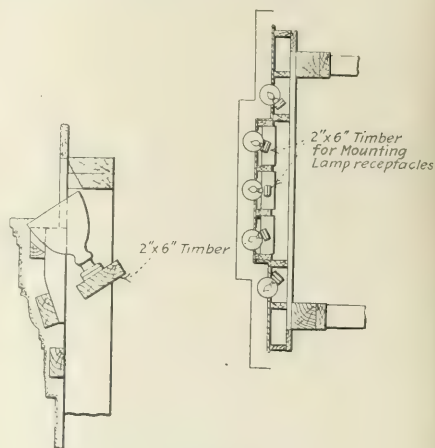


FIG. 12—DETAILS OF COVE LIGHTING IN COURT OF FOUR SEASONS

along the roads facing the main exhibit palaces. These lamps are placed in one-lamp, two-lamp, three-lamp, five-lamp and nine-lamp fixtures, being mounted on turned

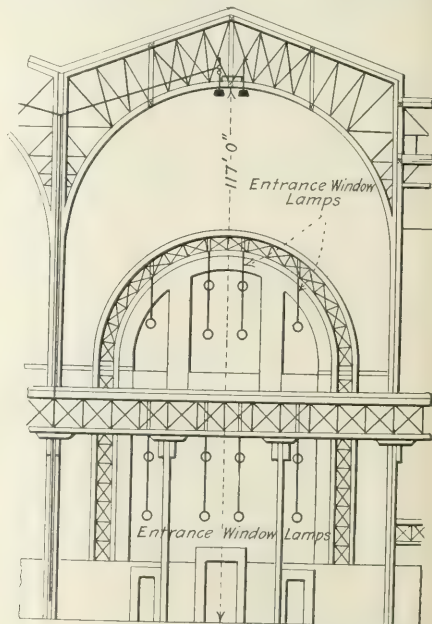


FIG. 13—DECORATIVE WINDOW LIGHTING IN MACHINERY PALACE

wooden poles with ornamental staff bases and ornamental staff deflecting shields, or decorated banners which act as deflectors. The plan of the illumination is to have the light thrown against the travertine-colored

ulls of the buildings, which in turn will furnish a secondary field of illumination for the area behind the lamps.

The ornamental heraldry banners are, to a small extent, translucent, and the ornamental staff detectors

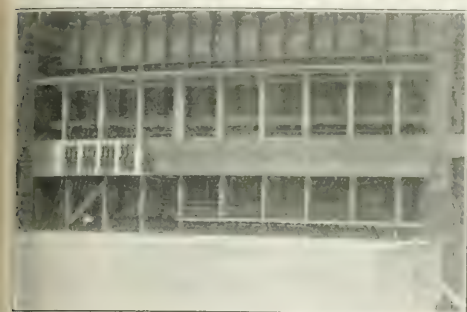


FIG. 14—DISTRIBUTION CIRCUITS FROM TRANSFORMER VAULTS IN MACHINERY BUILDING

se panels of translucent fabric which allows a mild glow to be seen from the back of the fixtures.

The street lighting in the court ways, South Gar-

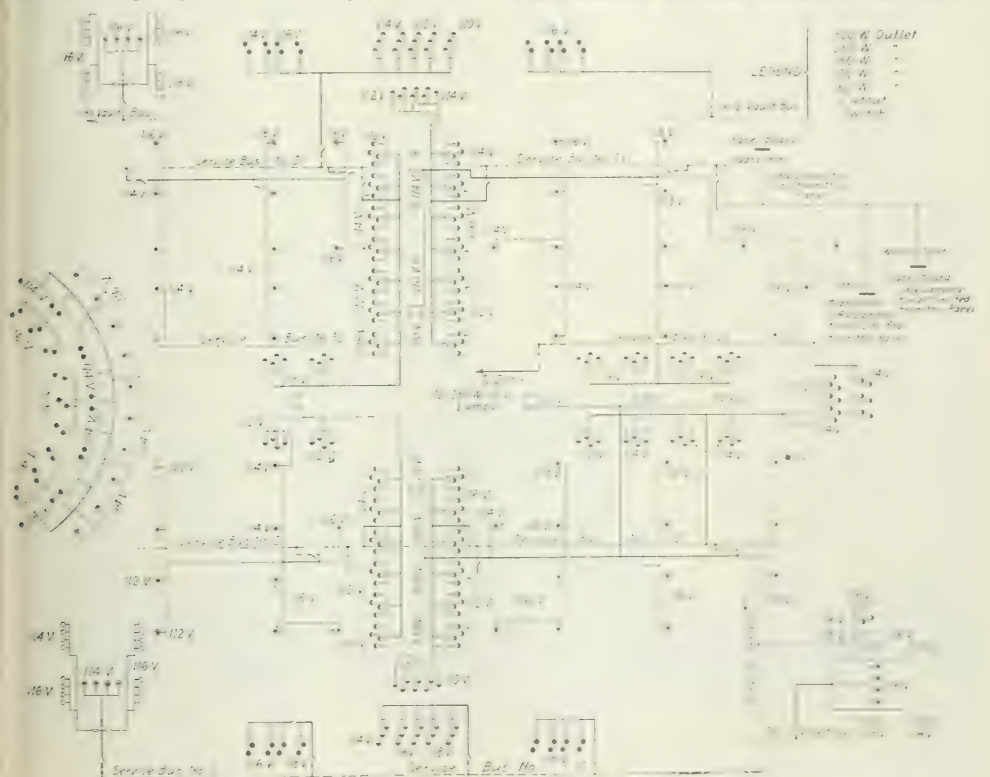


FIG. 15—WIRING DIAGRAM OF EDUCATION BUILDING

dens, and along portions of the water front consists of ornamental staff standards, on which are mounted high-efficiency tungsten lamps, varying in rating from 400 watts to 1500 watts.

The general illumination in the states and foreign sites is secured by means of 250 high-pressure gas arcs.

### Spectacular Illumination

The special outside lighting features consist of two



FIG. 16—WINCH USED FOR THE PURPOSE OF PULLING CABLES IN CONDUIT

ornamental fountains in the Court of Honor, the top of which consists of fluted columns of glass, approximately 5 ft. in diameter and made luminous by means of 200.

kw of 1500-watt tungsten lamps. There is an intermediate diffusing plate between the lamps and the fluted glass of the column proper.

Another feature is the glass dome of the Horticulture



Building, 150 ft. in diameter, a view of which is shown in Fig. 18. This dome will be rendered luminous by means of twelve 30-in. projectors situated on the ground floor directly beneath the dome, the lamps being arranged in a circle and tilted at an angle of approximately 45 deg., where their rays pass through revolving color screens and a revolving series of diffusing lenses, pro-

jectors will be mounted on top of the main entrance gates, along the hedges, and at various points on the roofs and parapet walls of the main group of buildings and tower.

In addition to these direct-current searchlamps, there will be used 200 6-volt incandescent, concentrated-filament spot lamps for the flood-lighting of special stat-

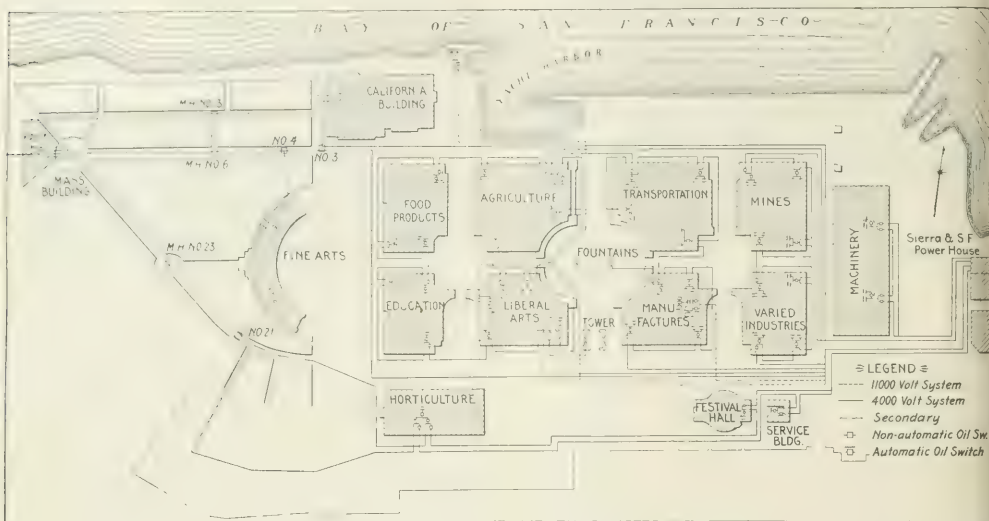


FIG. 17—GENERAL SYSTEM OF DISTRIBUTION IN EXHIBITION SECTION OF PANAMA EXPOSITION

ducing a uniform lighting field over the whole dome. By means of special differential drives on the color screens and on the lenses various effects and patterns can be produced on the glass dome.

Another notable outside illuminating feature will be the scintillator, situated on the point of land outside of Fulton Basin Harbor. Forty-eight 36-in. projectors will be mounted on this scintillator pier, and by means of

uary, and 250 500-watt, 120-volt concentrated-filament flood lamps for flag illumination around the main group of buildings and courts.

Further to complete the night picture from the outside of the buildings, a large number of tungsten units will be suspended with diffusing reflectors back of all clerestory windows and main entrance doors, the glass in all of these entrances being especially colored and

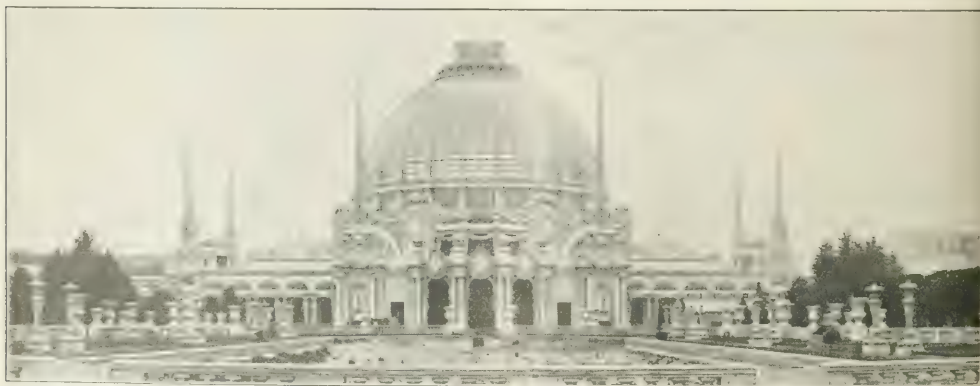


FIG. 18—GENERAL VIEW OF HORTICULTURE BUILDING WITH ITS IMMENSE GLASS DOME

color screens and diffusion doors a great variety of sky illuminating effects will be obtainable.

As a part of the general scheme of outside illumination in addition to the scintillator, approximately 320 searchlamps, varying in size from 13 in. to 30 in., will be used for flood-lighting various parts of the main group of buildings, statuary groups and towers. These

treated to give the effect of a brilliantly lighted building. These lamps will be turned on after the palaces have been closed and will continue to be used during the period of general illumination. After this period is over, a group of large wattage units suspended over the aisles, with special reflectors, will be turned on for the use of janitors. These reflectors have been very eco-

homically designed, and while the power used amounts to only 0.2 watt per sq. ft. of floor area, a very acceptable amount of illumination is obtained.

The details of the decorative window lighting in the Machinery Building are shown in Fig. 13.

Fig. 11 shows the steam traveling crane used in erecting the arc-lamp fixtures. The illustration shows a

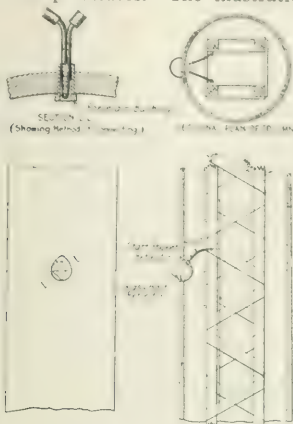


FIG. 19—COLUMN OUTLET AND REFLECTOR FOR COLONNADE

three-lamp magnetite-arc fixture being hoisted in place. The openings shown in the staff ornament at the top are blanked off with translucent fabric as mentioned elsewhere. The poles have a curved slot for concealing the wires and are painted to conform with the general color scheme and have an ornamental staff base installed at the ground line. For hauling the transformers to the various transformer stations on the ground a storage-battery truck with special rigging, as shown in Fig.



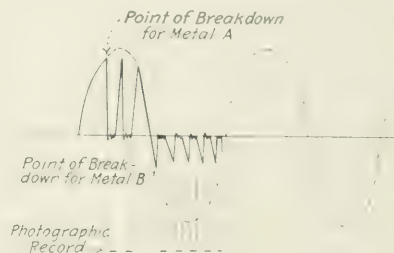
FIG. 20—BATTERY TRUCK EQUIPPED FOR CARRYING TRANSFORMERS

20, was used. The gasoline-engine-driven winch employed for drawing the cable in the underground conduit (Fig. 16) has proved serviceable and economical.

The entire electrical installation of the exposition was planned by Mr. G. L. Bailey, chief electrical and mechanical engineer, assisted by Mr. L. F. Leurey. The lighting features were in charge of Mr. W. D. Ryan.

## Spark Discharges Between Unlike Metals

Contrary to former impressions, the experimental results obtained by Prof. Daniel M. Rich, University of Michigan, seem to indicate that electric sparks take place from positive electrodes of certain metals more readily than from those of other metals. Applying an alternating-current potential to a spark-gap between a copper electrode and a zinc electrode, and rapidly photographing the spark discharges, the experimenter found that while discharges from the copper electrode during one-half cycle were quite limited, many sparks were given off from the zinc during the following one-half cycle of reverse direction. To account for this phenomenon, Professor Rich recently explained, before the American Physical Society, his belief that the potential must be built up to a higher value before it will jump from the copper as the positive electrode than is the case from the zinc as positive. It was also observed that an even number of sparks always occurred from one electrode while an odd number took place from the other. Oddly enough, these number sequences did not follow the law which they might be expected to obey, for, instead of the last spark oscillation occurring from the electrode



SPARKS BETWEEN ELECTRODES OF DIFFERENT METALS

which had the lowest break-down value, the reverse was true. Professor Rich thinks that the ionizing effect of the arc may perhaps rightly be held accountable for this unexpected occurrence.

## Electrolytic Oxygen Manufactured in St. Louis

Several factories in St. Louis, Mo., are now engaged in the electrolytic production of the commercial oxygen gas which has recently come to be an important agent in welding and cutting metals. The electrolyte used is a 10 per cent or 15 per cent solution of either caustic soda or caustic potash. As direct current traverses the electrolyte the oxygen given off at one electrode is collected and compressed, while the hydrogen given off at the other electrode is allowed to escape.

One well-equipped oxygen factory in St. Louis receives energy through three 75-kva transformers from twenty-five-cycle, 13,000-volt primary lines. At a reduced potential this alternating current is used to drive a 100-kw motor-generator set, a 20-hp motor connected to an air compressor and a 10-hp motor for miscellaneous work. Direct current for the electrolytic process is taken from the motor-generator set. With this equipment it is claimed that the oxygen company can produce about 3 cu. ft. of oxygen gas for each kilowatt-hour used. This plant operates continuously twenty-four hours a day. Another process, employing liquid-air, has been tried, and although less electricity is used, the first cost of the apparatus is declared to be higher than that which is required for the electrolytic process.



# Photometry of the Gas-Filled Lamp

An analysis of the causes for the variation of current and candle-power with speed of rotation. By G. W. Middlekauff and J. F. Skogland

**A**N investigation which the authors have had in progress for some time at the Bureau of Standards<sup>1</sup> has shown that all tungsten lamps of the vacuum type, within a wide range of wattage, have the same voltage-current-candle-power characteristics regardless of the make or method of manufacture. When this investigation was extended to include the gas-filled lamp, it was soon found that entirely new and unexpected variables, not present in the vacuum lamp, had to be considered and studied.

On account of irregularity in the arrangement of the filament as mounted in this type, there is a corresponding irregularity in the distribution of the light about the vertical axis. Consequently, in determining the mean horizontal candle-power it is necessary to rotate the lamp at a relatively high speed in order to avoid disagreeable flicker. Fortunately, this difficulty is readily overcome by placing back of the lamp two mirrors<sup>2</sup> inclined to each other so that the photometer screen is illuminated simultaneously by the direct light from the lamp and the reflected light from the mirrors. With this arrangement very low speeds of rotation may be used.

Although this expedient obviates the flicker difficulty, it does not eliminate the most serious trouble caused by rotation. It is found that both current and candle-power have different values when the lamp is rotating and when it is stationary, and that for any change in speed there is a corresponding change in current in one direction and in candle-power in the opposite direction. Furthermore, the direction of these changes depends upon whether the speed is above or below a certain (critical) value. For most values of speed these differences are of sufficient magnitude to affect seriously the results of candle-power and efficiency determinations.

The gas-filled lamp, therefore, presents one of the most perplexing problems of photometry, involving not only increased color difference difficulties over those encountered in photometering vacuum-type lamps but also the difficulty of dealing with variables which may introduce considerable uncertainty in the results.

Some of the results obtained in a study of this lamp are given below with the hope that they may not only aid in determining the cause of the observed variations but may also suggest a satisfactory and practical method of solving the photometric difficulties.

## Lamps, Apparatus and Method

The lamps used in the experiments described below were of the nitrogen-filled 450-watt series and 750-watt and 1000-watt multiple types, all having round bulbs with the filaments centrally mounted. The number of anchor wires in each varied from five to nine. Check measurements were made with a number of 200-watt series and 750-watt multiple lamps with straight side bulbs, the former having one anchor wire, the latter five.

Measurements of voltage and current were made simultaneously by means of two potentiometers. The rotator was supplied with mercury-cup connections and

two sockets so that the lamp could be mounted either tip up or tip down. The rotating mechanism was under perfect control at every speed which was determined by a specially designed indicator, and the current to the lamp was supplied from a storage battery, thus insuring perfectly steady working conditions. In the candle-power measurements use was made of the two-mirror arrangement described above.

A few preliminary tests indicated that for any change in speed the change in candle-power was, roughly, ten times the change in current but always in the opposite direction. As current can be measured with considerably higher accuracy than candle-power, such measurements furnish a convenient method of determining, approximately, the variation of the candle-power. It

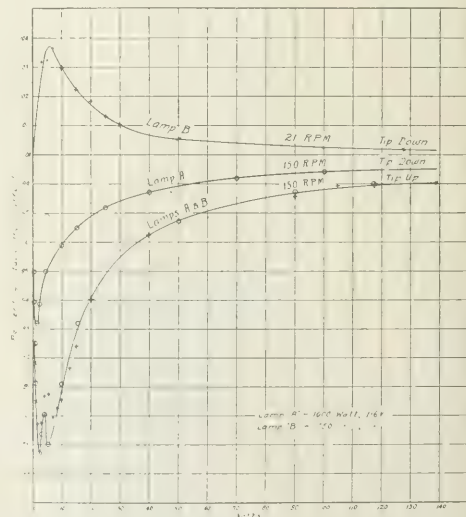


FIG. 1—RATIO OF CURRENT WITH LAMP ROTATING AT CONSTANT SPEED TO CURRENT WITH LAMP STATIONARY

was, therefore, decided that before making careful determinations of candle-power it would be advisable to make a series of measurements of voltage, current and speed, varying only one of these quantities at a time.

## Effect of Rotation on Current

In order to determine the effect of change in speed when the voltage on the lamp was held constant, a test was made with a 116-volt, 750-watt short-necked lamp, and three series of measurements were taken, these being with voltage held constant at 90, 105 and 116 respectively. In each series current readings were taken at different predetermined speeds, a reading with the lamp stationary being made as a check between the changes of speed. In this experiment the lamp was used first tip up and then tip down. With the lamp in either position and the speed above 40 r.p.m. the current de-

<sup>1</sup>Bulletin of the Bureau of Standards, Vol. 11, page 483. Scientific Paper No. 228.  
<sup>2</sup>Bulletin of the Bureau of Standards, Vol. 2, page 416.

creased with increasing speed, the effect with tip up being about twice as great as with the tip down. Other lamps of the same size and of different sizes (450 watts to 1000 watts) of different manufacture were tested in the same manner and similar results were obtained in every case.

When the 450-watt, 6.6-amp lamps were tested at con-

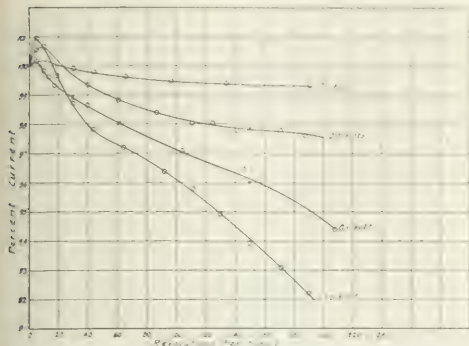


FIG. 2—RATIO OF CURRENT WITH LAMP ROTATING TIP DOWN AT DIFFERENT SPEEDS TO CURRENT WITH LAMP STATIONARY; VOLTAGE CONSTANT AT DIFFERENT VALUES

stant current it was found that the voltage increased with the speed. This might have been expected, for if the current decreases with increase of speed at constant voltage maintenance of the current observed with the lamp stationary must require an increase in voltage and power consumption as the lamp is rotated.

#### Current Variation at Constant Speed with Different Voltages

The next step was to determine the changes in current due to rotation at a specified speed at different values of voltage through a wide range. This test was applied to two lamps, the 750-watt lamp mentioned above and a 1000-watt lamp, both rated at 116 volts. Readings of current corresponding to a chosen voltage were made first with the lamp stationary, then with it rotating at a speed of 150 r.p.m. In this way the changes in current for each lamp at different voltages over a range from 0.5 volt to 100 volts were obtained. The results for both lamps rotated tip up are shown by the lowest curve in Fig. 1, values obtained for the 750-watt lamp being represented by crosses, those for the 1000-watt lamp by circles. The behavior of the current in these two lamps is thus shown to be practically identical at every value of voltage except from 3 volts to 8 volts, which is a critical region. It is probable that even within this region these curves would be found to coincide also were measurements made at a sufficiently large number of neighboring points. The upward indentation in the curve at this point is as real and reproducible as any other part of the curve. Its presence suggests that this curve may be considered as representing the resultant of simultaneous influences which affect the current.

The middle curve of Fig. 1 shows the change in current produced by the same speed with the 1000-watt lamp rotated tip down. This curve is traced through all values obtained except one in the neighborhood of 5 volts. This value indicates that an indentation would probably be found in this curve also were sufficient time taken to pass by small voltage steps through this region. It might be stated that in order to obtain accurate measurements of current values in this region at least

ten minutes is required at each point, as small variations of speed resulted in relatively large changes in current. These two curves are similar in form, both becoming asymptotic to the axis of abscissas at about 1 per cent and 0.5 per cent, respectively, below the current observed for the lamp in the stationary position. That is, for this speed, at about 85 per cent of the normal voltage, the current reaches a value which, from that point on, bears a practically constant ratio to the value at zero speed.

#### Current Variation at Constant Voltage with Different Speeds

In order to investigate further the behavior of the current in the critical region above mentioned, as well as at other points, measurements of current at constant voltage, with variable speed, in succession at different values of voltage were made on the 1000-watt lamp through a considerable range extending as low as 0.5 volt. The speed was varied from 5 r.p.m. to 200 r.p.m., the lamp being rotated tip down. The results of this test are shown in Fig. 2. The important fact indicated by these curves is that when the speed is reduced below a certain value there is a reversal in the direction of the change in current for all values of voltage.

In order to confirm this reversal effect, the 750-watt lamp was tested tip down while rotating at a speed of 21 r.p.m. The results of this test are shown by the uppermost curve of Fig. 1. It will be noted that this curve is of practically the same form as the other two curves of this figure but turned in the opposite direction and lying entirely above the 100 per cent or stationary values.

If values of current corresponding to different chosen values of speed be read from the various curves of Fig. 2 and be plotted, there may be obtained for the 1000-watt lamp a family of constant speed curves similar to those shown in Fig. 1.

#### Effect of Rotation on Candle-Power

The effect of rotation on candle-power was very strikingly shown by the following experiment: The voltage was so adjusted that the filament when stationary was just visible in a darkened room. Upon rotating the lamp

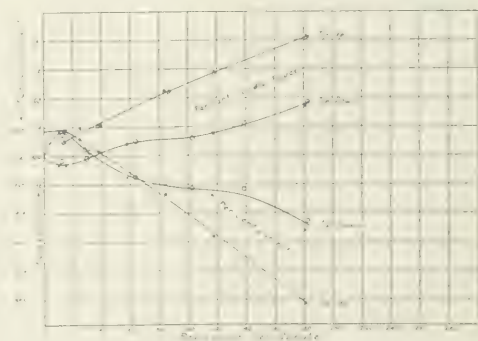


FIG. 3—RATIO OF CURRENT AND CANDLE-POWER WITH LAMP ROTATING TIP UP AND TIP DOWN TO CURRENT AND CANDLE-POWER, RESPECTIVELY, WITH LAMP STATIONARY TIP DOWN

at a speed of about 180 r.p.m. it was found that, although the current decreased in value, the intensity of the light largely increased, the effect being greater with the tip up than with the tip down, thus corroborating the preliminary measurements of current and candle-



power at higher voltages. With the lamp in either position the upper loops of the filament glowed more brightly than the lower ones, thereby indicating a considerable difference in temperature between neighboring regions of the gas.

As there was found a change in candle-power corresponding to every change in current and since there was a reversal in the direction of the change in current, it was considered probable that a reversal in the direction of the change in candle-power would be found also. This led to a series of simultaneous measurements of current and relative values of the candle-power, with voltage constant and speed varied over a wide range.

Results obtained in this way with the 750-watt lamp when run at 90 volts are shown by the curves of Fig. 3. All values of current and candle-power are expressed in percentages of the values of these two quantities obtained with the lamp stationary and the tip down. In determining the candle-power with the lamp stationary, readings were taken at intervals of 7.5 deg. about the vertical axis, there being a total of forty-eight determinations.

The curves for the lamp with the tip down are the result of two independent series of measurements made on different days, values obtained in the two series being represented by crosses and circles respectively.

#### Conclusions

The curves of these three figures disclose a number of interesting and important facts, as follows:

(1) With the lamp stationary both the current and the candle-power are greater with the tip up than with the tip down.

(2) For any change in the speed of rotation at constant voltage there is a corresponding change in the current in one direction and in the candle-power in the opposite direction.

(3) The ratio of the change in candle-power to the change in the current is practically constant, being about ten to one regardless of the position of the lamp.

(4) Values of the current and the candle-power are reproducible to a high degree of precision.

(5) Candle-power change with the tip up is about twice the change with the tip down. Similarly the change in current with the tip up is about twice the change with the tip down.

(6) Both the current change and the candle-power change reverse in sign, this occurring at a slightly lower speed with the tip up than with the tip down.

(7) For a given position of the lamp, both the current and the candle-power return to the stationary value at the same speed. For the lamp shown in Fig. 3 this occurs at 14 r.p.m. with the tip up and 34 r.p.m. with the tip down. For the tip-up position this point of intersection is determined by displacing the curves so that they coincide at the point of zero speed.

(8) For the lamp of Fig. 3 rotated at 180 r.p.m. with the tip up the change in candle-power is about 16 per cent, while at 70 r.p.m. with the tip down it is 2 per cent, giving a difference of 14 per cent. This is the discrepancy which is possible when lamps are photometered while rotating under these two different conditions.

#### A Practical Photometric Method

These results at once suggest a practical method of determining the mean horizontal candle-power without introducing errors due to rotation; that is, to photometer the lamp with the tip down while rotating at the particular speed which gives the same current value as when the lamp is stationary. The advantage of photometering the lamp rotating instead of stationary at a number of points around the vertical axis is that considerably less time and labor are required. The ad-

vantages of placing the lamp with the tip down are (1) the changes caused by variations in speed are less than with the tip up; (2) the current returns to stationary value at a more practical speed than it does with the tip up; (3) at zero speed the lamp thus takes the same current and has the same position as when in service or on life test.

Upon testing all available 450-watt to 1000-watt lamps, including both series and multiple types in round bulbs and one 750-watt lamp in a straight-side bulb, it was found that in every lamp while rotating with the tip down the current returned to the stationary value at a speed between 33 r.p.m. and 40 r.p.m. This held true for a considerable range in voltage, extending above and below normal. The series lamps included in this test have the same form of mount and practically the same arrangement of filament as the multiple lamps.

It is interesting to note that the current of a number of 200-watt, 6.6-amp lamps, with V-shaped filament and a single anchor wire, when submitted to this test did not return to the stationary value in current until a speed of from 140 r.p.m. to 160 r.p.m. was attained, the value of the current being greater than the stationary value up to the speed mentioned. It appears therefore that the smaller the number of loops and corresponding anchor wires in the lamp the greater the speed that is required to give the stationary value of current.

Although there was a considerable difference in the speeds required by lamps having different numbers of loops in the filament, it was possible to find for every lamp tested a speed at which the current change reversed in sign. Furthermore, in every case the return of the current to the stationary value occurred at a speed which can be used in practice.

#### Possible Errors Introduced by Rotation

The accompanying table shows the errors in efficiency, and the consequent errors in life values, introduced by measuring candle-power and watts while the lamp is rotating tip up and also tip down. The values given are the results of photometric measurements made on a 750-watt, 115-volt nitrogen-filled lamp having nine anchor wires.

DATA ON ERRORS IN EFFICIENCY AND LIFE VALUES

Position of Lamp	Speed in R.P.M.	Rated Volts at 0.70 Watt per Candle, Lamp Rotating	Watts per Candle at Rated Volts; Lamp Stationary, Tip Down	Per Cent Error in Rated Volts	Per Cent Error in Rated Watts per Candle	Per Cent Life at Rated Volts; Lamp Stationary, Tip Down
Tip down...	0	115.0	0.700	0.0	0.0	100
Tip down...	35	115.0	0.700	0.0	0.0	100
Tip down...	70	113.5	0.718	1.3	2.6	121
Tip down...	120	112.8	0.726	1.9	3.7	131
Tip down...	180	109.9	0.760	4.4	8.6	184
Tip up...	0	113.8	0.713	1.0	1.9	115
Tip up...	14	113.3	0.713	1.0	1.9	115
Tip up...	70	110.1	0.757	4.3	8.1	178
Tip up...	120	107.4	0.793	6.6	13.3	252
Tip up...	180	104.4	0.837	9.2	19.6	375

On account of the increased efficiency of this lamp caused by rotation, for example, at 70 r.p.m. tip down, it was found to have a specific consumption of 0.7 watt per candle at 113.5 volts instead of at 115 volts as found at zero speed with the tip down. If, therefore, the lamp had been photometered at the factory while rotating at this speed, it would have been rated at 113.5 volts and would have been operated on the life rack at 0.718 watt per candle instead of 0.7 watt per candle and would have had a life 21 per cent greater than would be expected from the rating. If, however, it had been photometered with the tip up at 180 r.p.m. (as is sometimes done in practice), it would have been rated as

having a specific consumption of 0.7 watt per candle at 104.4 volts. If put upon the life rack at this voltage, it would operate at 0.837 watt per candle instead of 0.7 watt per candle and give a life of 275 per cent in excess of normal. In other words, a long life performance is fictitious at the given specific consumption rating, or the consumption rating is fictitious for the given life. This holds true if the specific consumption is determined at any speed above that at which the current and candle-power have the same value as when the lamp is stationary with the tip down. For this lamp the particular speed is 35 r.p.m. For speeds below this value with the tip down, the specific consumption rating would be too high and the life value would be lower than expected from the rating.

#### Miscellaneous Tests

The following tests were made with a view to finding the cause of the variations observed in this type of lamp:

(1) To determine what effect external cooling of the bulb would have upon the current, a draft of air was driven against a 1000-watt lamp by means of an electric fan and a series of measurements of current were made at different speeds with "air on" and "air off." It was found that at every speed, including zero speed, there was a measurable increase in current due to the cooling effect of the fan, but that this increase was very small in comparison with the decrease in current due to the rotation of the lamp. Hence the decrease in current cannot be attributed to, and is only slightly affected by, external ventilation of the bulb by rotation.

(2) A 100-watt vacuum-type tungsten lamp with coil filament similar to that of the gas-filled lamp and similarly mounted in the bulb when rotated exhibited none of the changes observed with the gas-filled lamp. The same was found to be true in the case of a 500-watt vacuum-type tungsten lamp with straight filament mounted in the usual manner. The gas must therefore be the principal disturbing element which affects the changes observed in the gas-filled lamp.

(3) To determine the effect of possible distortion of the filament upon the candle-power in the horizontal plane, candle-power measurements at various angles with the vertical were made upon the 1000-watt lamp rotating with the tip down, first at a speed of 45 r.p.m. and then at a speed of 200 r.p.m. This is lamp A of Figs. 1 and 2. There was practically the same percentage increase in candle-power at every angle when the lamp was rotated at the higher speed, and hence the spherical reduction factor was not appreciably changed by rotation, being about 0.86 in both cases.

(4) Another test was made to determine whether or not the earth's magnetic field had a noticeable effect. This was done by placing the lamp in the middle of a solenoid having a field strength of about 500 gausses, and the current in the lamp was observed when the current in the solenoid was thrown on and off, both with the lamp stationary and rotating, but no change due to magnetism was detected.

#### Explanation of the Variations Observed in Current and Candle-Power

The results of these tests indicate quite conclusively that practically the whole of the effect observed in the change in current, candle-power and efficiency is due to a change in the convection currents of the gas within the bulb. At low speed, as seen above, there is an increase in the current over the stationary value for all voltages, the greater percentage increase being at the low voltages. At high speed there is a decrease in current from the stationary value for all voltages, the greatest percentage decrease being also at low voltages.

At low values of voltage when the lamp is stationary there is a considerable difference in temperature between the gas at the top and bottom of the bulb. Very low speeds of rotation disturb the steady current of hot gas which is rising in the center and flowing down at a distance from the axis, and the result is a lowering of the temperature of the gas about the filament. As the filament has a positive temperature-resistance coefficient, the resistance decreases and consequently the current increases at constant voltage. At high values of voltage the mean temperature of the gas is higher, and consequently the temperature of the filament is reduced in a lesser degree by rotation and the change in current, though positive, is less than at low voltage.

On the other hand, when the lamp is rotated at high speed the cooler gas at the bottom of the bulb is thrown out by centrifugal force and the hot gas tends to remain near the center, thus considerably retarding the convection currents which cool the filament. The result is an increase in the efficiency of the lamp and a decrease in the value of the current. At high voltages the mean temperature of the gas is higher and the retarding effect due to centrifugal force is decreased, and hence the change in current due to rotation is less than at low voltages.

The cooling effect of the gas is opposed by the heating effect of the current. At low speeds the former predominates, at high speeds the latter. Hence at low speeds the temperature of the filament is lowered and consequently the candle-power is decreased. At high speeds the temperature of the filament is raised, and hence there is an increase in the candle-power.

#### Photometry of Gas-Filled Incandescent Lamps

In the *Electrical World* for Nov. 21, page 992, there appears an abstract of a short paper on "The Photometry of Gas-Filled Incandescent Lamps," read Nov. 12 before the New York Section of the Illuminating Engineering Society by Dr. C. H. Sharp. In this abstract mechanical distortion of the filament is given as one of the causes of the increase observed in candle-power when the lamp is rotated. We found, however, as stated above, that the filament of a 1000-watt lamp having seven anchor wires was distorted very little if any when the speed was increased from 45 r.p.m. to 200 r.p.m. and we doubt if that effect generally is appreciable. We found, furthermore, that the change in candle-power was fairly large in the opposite direction at low speeds and low voltage and null at a particular intermediate speed.

It is stated also that series, or constant-current, lamps show small or negative increase in candle-power per watt. We found this to be true for all lamps, however, when the speed is below a certain value. This value of the speed is low for some lamps and high for others, seeming to depend upon the number of anchor wires supporting the filament. Had Dr. Sharp used a higher speed, it is quite probable that he would have found an increase instead of a decrease in candle-power per watt of the lamps referred to. It is evident that when held at constant current any gas-filled lamp will change in candle-power more rapidly with changes of speed than when held at constant voltage.

It is stated further in this abstract that the variations observed do not appear to follow any definite law. We found, however, that the lamps tested experienced changes of candle-power with speed which were exceedingly reproducible and follow the curves shown very closely on successive trials.

The authors acknowledge their indebtedness to Dr. E. B. Rosa for his kindly interest and valuable suggestions, and to Mr. H. B. Sinelnick for efficient assistance in the laboratory work.



# Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods and Current Practice Among Successful Utilities

## Advertising the Low Cost of Electric Service

An unusual advertisement run by the Ohio Light & Power Company, Newark, Ohio, in a local newspaper, listed the actual bills rendered 1000 citizens of Newark for electric-lighting service during the month of September. "The Table That Tells a Tale," as the advertising man puts it, read as follows:

\$0.70 to \$0.80.....	101	\$1.25 to \$1.50.....	101
0.60 to 0.70.....	75	1.50 to 1.75.....	57
0.70 to 0.80.....	51	1.75 to 2.00.....	59
0.80 to 0.90.....	57	2.00 to 3.00.....	67
0.90 to 1.00.....	83	3.00 to 5.00.....	46
1.00 to 1.25.....	86	More than \$5.00.....	15

A number of these consumers were using electric irons, toasters, vacuum cleaners and other appliances. The advertisement attracted much attention locally as proving the relatively low cost of electric service.

## The Physician's Electric Phaeton

Every city physician who uses an automobile in making professional calls could drive an electric vehicle to advantage, declared Mr. L. E. Hamburg, Chicago, himself an electric-car user for fourteen years, at a recent luncheon of the Chicago Section, E. V. A. Compared with the gasoline car, the doctor who drives to his patient's residence in an electric car enters the house with his hands immaculate, his person free from odors of gasoline and lubricating oil, and his clothing neatly arranged rather than set awry by some impromptu repair to the power plant of his car. Such little details in the personal appearance of the doctor are important in the sick-room. Physicians appreciate this fact and at once recognize the value of the electric car when its advantages are called to their attention. Mr. Hamburg predicted that an electric-vehicle campaign among Chicago physicians who drive gasoline cars would promptly result in making all of them users of "electrics."

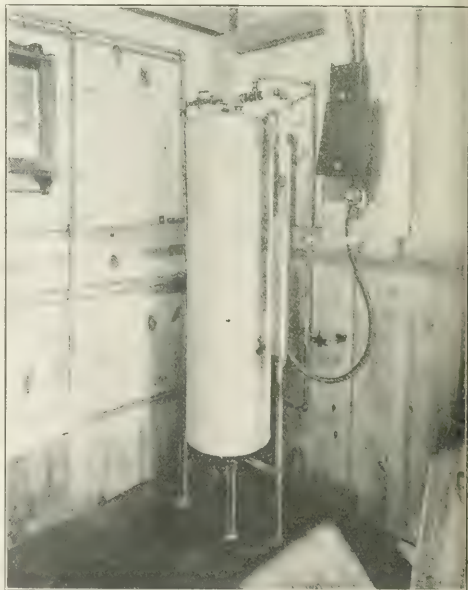
## Two Hundred Houses Wired in Sixty Days

With no line or transformer expense the Springfield (Mo.) Gas & Electric Company has added 200 new residence customers to its circuits in sixty days. The success of the campaign is largely accounted for by the fact that the company's basic wiring offer included only a few outlets, one for a drop lamp in the kitchen, another for an electric iron, and inexpensive fixtures in other rooms. So slight was the cost of such work that owners and renters of even the smallest houses were unable to forego the opportunity to secure electric service. Although these installations at first do not represent attractive connected loads, it has been found that the electrical progressive contractors in the city are continually adding a lamp outlet here and there, making the customers by degrees more profitable to the central station. Mr. S. R. Gallagher, new-business manager for the electric service company, uses an appropriate and catchy phrase in expressing the central idea of the campaign. He says: "Just get the man's feet wet; don't try to drown him."

## Electrically Heated Water for Beef Importer

Electrically heated water is employed by the Houston Steamship Company, Brooklyn, one of the largest importers of Argentine beef, in its employees' lavatories and for cleaning meat skids, trucks and skins. The apparatus for raising the temperature of the water is shown in the accompanying illustration. As hot water had to be used for only short periods and as no gas pipe were installed in or near the place where the water was required, it was estimated that the electrical equipment would be cheaper in the long run than boilers heated by gas or coal.

An ordinary 50-gal. tank is employed with a 3-kv electric heater surrounding a pipe leading from the top to the bottom of the reservoir. When the electric circuit is closed hot water rises in the vertical pipe and



ELECTRIC HEATER USED BY BEEF IMPORTER

is replaced by cold water from the bottom of the tank, thus producing a downward current of water in the tank and an upward flow in the heater pipe. Pipes tapping the top of the tank convey the hot water to the lavatories and hot-water faucets.

In the winter about 25 gal. of hot water is required for two and a half hours each day. In the summer months from 60 gal. to 75 gal. is used over twice this period. The difference in consumption is accounted for by the fact that skins cannot be washed in the winter as the water would freeze upon them. The Edison Electric Illuminating Company of Brooklyn, which furnishes electricity for operating the heater, charges for the energy at its regular motor-service rate.

## Savings Through Electric-Vehicle Operation at Wichita, Kan.

Electric vehicles of three sizes are being used successfully in the construction and the maintenance departments of the Kansas Gas & Electric Company at Wichita, Kan. Cost data which have been kept carefully by Mr. H. S. Sladen, manager of the company, since the purchase of these machines show that the electric trucks do the work required by the company at less

VEHICLE USE RECORD  
KANSAS GAS & ELECTRIC CO.

Name: \_\_\_\_\_

Vehicle No.: \_\_\_\_\_

Month: \_\_\_\_\_

Day: \_\_\_\_\_

Time: \_\_\_\_\_

Location: \_\_\_\_\_

Work: \_\_\_\_\_

Driver: \_\_\_\_\_

Remarks: \_\_\_\_\_

FORM OF RECORD USED IN WICHITA GARAGE

expense than any of its gasoline-driven machines. The trucks which the Wichita company has adopted for its use are of the 2-ton, 1-ton and 750-lb. sizes.

Using the largest truck on construction work, it has been found that this car can supply the needs of two or three line gangs, hauling the men and the construction materials, including poles, loaded on a dolly-type trailer. The 1-ton truck is used for answering trouble calls, for

TABLE I—COST OF OPERATION OF GENERAL VEHICLE COMPANY 2-TON ELECTRIC TRUCK

Month	Kw.-hr. Used	Mile-traveled	Kw.-hr. per Mile	Maintenance		Cents per Kw.-hr.	Total Cost	En-ergy	Total
				Material	Total				
1912									
Jan.	253	331	0.76						
Feb.	190	239	0.79	\$4.22	\$7.50				
March	159	256	0.62	12.88	4.77				
April	375	317	1.18	3.00	11.25				
May	380	302	1.26	2.38	11.40				
June	646	353	1.60	5.12	19.38				
July	522	376	1.39	13.19	15.66				
Aug.	390	357	1.06	3.42	20.33				
Sept.	451	308	1.46	4.15	13.53				
Oct.	553	313	1.78	4.27	16.74				
Nov.	647	256	2.53	11.01	19.41				
Dec.	596	312	1.91	14.17	17.88				
1913									
Jan.	583	229	2.55	14.90	14.90				
Feb.	1000	260	3.85	\$1.25	4.40				
March	671	431	1.56	1.10	20.13				
April	492	387	1.27	19	13.86				
May	418	300	1.39	2.68	11.81				
June	365	Est. 200	Est. 1.83	5.18	2.86				
July	527	Est. 210	2.51	1.40	0.07				
Aug.	539	395	1.36	4.58	12.60				
Sept.	434	443	0.98	6.82	11.08				
Oct.	634	486	1.32	2.48	45.77				
Nov.	655	517	1.85	5.02	36.77				
Dec.	488	316	1.55	1.54	14.67				
1914									
Jan.	612	333	1.76	4.36	0.84				
Feb.	561	282	1.95	14.10	62.52				
March	284	181	1.57	1.44	76.94				
April	594	442	1.34	1.34	19.02				
May	503	376	1.34	1.41	15.15				
June	395	327	1.21	1.36	5.06				
July	314	253	1.24	13.48	5.00				
Aug.	693	490	1.24	1.32	29.58				
Sept.	813	498	1.63	2.79	41.00				
Total	17,322	11,060	52.78	11.84	\$16.36				
Average	522	336	1.59	\$4.42	\$13.38				

doing general maintenance work and for hauling men and material for short line extensions. Wagons of the 750-lb. size were recently purchased for both the gas and the electric meter departments, but these machines have not been in service long enough to provide reliable operating data. For the larger trucks, however, the complete records as they were kept by the company are

given herewith. The company's record form used in the garage is also reproduced.

A brick building which was formerly the Wichita power house now serves as the company's garage. The garage was established and is maintained primarily for the company's own trucks, but the company's men also take care of a few customers' vehicles, somewhat reduc-

TABLE II—COST OF OPERATION OF GENERAL VEHICLE COMPANY 1-TON

Month	Kw.-hr. Used	Mile-traveled	Kw.-hr. per Mile	Maintenance		Cents per Kw.-hr.	Total Cost	En-ergy	Total
				Material	Total				
1913									
Jan.	813	45	1.79	\$3.44	\$3.44				
March	635	616	1.03	5.31	5.31				
April	449	581	0.77	1.31	13.47				
May	445	387	1.15	13.84	13.84				
June	484	322	0.67	0.28	1.82				
July	48	34	1.41	0.63	11.4				
Aug.	38	30	1.27	5.7	6.22				
Sept.	48	68	0.70	3.10	1.1				
Oct.	62	751	0.8	1.74	2.47				
Nov.	461	37	12.21	35.34	48.5				
Dec.	661	669	0.99	2.56	14.81				
1914									
Jan.	530	372	0.91	12.16	1.12				
Feb.	671	579	1.16	2.0	0.90				
March	677	481	1.41	0.35	0.22				
April	303	379	0.8	3.02	5.2				
May	600	700	0.87	1.88	6.4				
June	444	736	0.56	0.73	0.73				
July	551	688	0.80	5.78	6.95				
Aug.	569	715	0.79	6.0	54.95				
Sept.	767	881	0.87	0.92	0.06				
Total	11,796	13,015	19.81	\$91.3	\$301.94				
Average	362	619	0.94	\$4.38	\$9.79				

ing the garage labor charges per vehicle. A further saving could be effected here by taking in more outside trucks without increasing the present number of garage workmen.

The data tables are largely self-explanatory. It should be noted, however, that the data in the column headed "Kw.-hr. Used" were read from a meter on the direct-current side of a motor-generator set and therefore do not take into account any losses in the charging equipment, except the charging rheostat, which is between the meter and the truck. Figures in the "Maintenance" column fluctuate rather widely, owing to high labor charges when trucks were being overhauled or to the cost of making repairs of broken axles, motor or controller troubles, etc. Where "Maintenance Material" charges appear high the cause of the increase is generally traceable to the renewal of one of an unsatisfactory set of tires.

## Showing Up the Friction-Load Losses

"The manufacturer who runs his entire equipment up to its full capacity every minute of the day and every day in the year is a curiosity," said Mr. R. A. MacGregor, Toledo, Ohio, before the recent convention of new-business men at Cincinnati. However, motor-service salesmen are continually meeting manufacturers who think they are doing this. When pointing out to these men the saving to be made by eliminating friction, the argument is often advanced, "Why, that shaft takes no power; I can turn it by hand." It is well to meet this argument by saying, "Is that so? Well, let's see you turn it 250 times in a minute." That suggestion generally shows the friction load more nearly in its true light. Even a 1-hp friction waste, if allowed to continue nine hours a day, twenty-five days in the month and twelve months in the year, costs as much as the interest on \$1,000, if energy is purchased at 3 cents per kw-hr.



### Pointed Paragraphs on Public Policy

During nineteen years' experience in utility work Mr. D. L. Gaskill, of Greenville, Ohio, has observed that there are certain definite factors which tend to produce congenial relations between the public and the utility companies. In his characteristic epigrammatic style Mr. Gaskill recently gave some of his thoughts on this subject to the members of the Indiana Electric Light Association at their convention in Indianapolis. The following paragraphs are excerpts from his address:

"To-day to the alert public utility manager the public policy of the company is a distinct and well-defined part of his organization, calling for expenditure of time and money and bringing greater results, both good and bad, than any other department."

"The interest of the public in the utility is confined to two things—service and rates. When the utility has made the first of these perfect and the latter reasonable, and has convinced the public that it has done so, the public policy of that company is a pretty well-settled question."

"After nineteen years of experience I have come to the conclusion that a company should have rules covering but two points, the date for paying bills and its minimum charge. If there is anything a good, live, energetic American likes to do it is to break a rule. Always remember that a good many of your rules will not be understood by your customer. He will not even know about most of them, and when you call attention to an infraction of them he does not believe that you have law-making power even if you are a 'natural monopoly.' He may comply and even stand punishment, but he is an enemy from that time forward."

"I know of some cases in which regulations controlling service in Western towns are made by men in Eastern cities, and the fit they make is wondrous to behold. It is comparable to an elephant's blanket for a Shetland pony. Straightforward and open dealing, with few rules, will produce less discrimination than lots of rules and part of them broken."

"A central-station manager would better spend months educating his city council in the costs of street lighting, and then make a contract on the basis of cost plus a reasonable profit, than to play the game of catch-as-catch-can and get caught in the end by the town putting in a municipal plant."

"Street-lamp outages which cause people to wade unwittingly into muddy places are not conducive to the making of friends for the company. A globe half full of bugs will not interfere with the working of the arc, but it will interfere seriously with the placid operation of the mind of the citizen."

"A disordered liver and a utility manager have no business being incorporated in the same man. They won't mix. The man who can receive a complaint as if it were a pleasure is the pearl we are seeking. No other is worth the price of his wages."

"Not all complaints are worthy, not all are well founded, but all persons having them think that they are, and to receive them, attend to them, and make the complainant think he has attained his end, is the art we should cultivate."

"The 'trouble shooter' is another factor to be considered. Sometimes in disposition he is a cross between a grizzly bear and a wildcat, and the amount of dissatisfaction he distributes is proportional to the amount of work he does. The brightest, most pleasant and tactful man on the force is none too good for this work."

"I believe that it would be a good thing for utilities if a law could be passed requiring the public utility manager to call upon every business customer at least once a month and ascertain if his service is satisfactory."

## Illumination and Wiring

### Conduit Wiring on Plaster-Board Partitions and Ceilings

BY G. M. DURFEE

So-called "two-inch partitions" are now being constructed in many buildings, particularly in those of fireproof construction. These partitions are made either by plastering on metal lathe or on plaster-board surfaces that are supported on steel studding of small

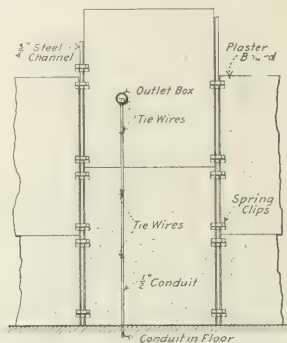


FIG. 1—OUTLET BOX AND CONDUIT WIRED TO PARTITION

angle or channel sections. In the construction of a plaster-board partition channels  $\frac{3}{4}$  in. deep are used to carry the plaster-board slabs, which are held to the channels with steel clips as shown in the illustrations. Because of the space economy of partitions of this type they are being utilized in a great many cases for the subdivision of office-building floor areas. It is because of their present and coming popularity that the wireman should be familiar with methods of carrying circuits within partitions of these types.

The partitions, when completed, are practically solid and comprise only fireproof materials, namely, steel and plaster. It is obvious, then, that the conduit method is the only one that is permissible within these thin partitions. Either rigid or flexible conduit can be used. As a rule, it will be more economical to use rigid conduit where it is not necessary to make a great number of turns and offsets in the conduit run. However, in some cases where the route of the run is very irregular flexible conduit may be the more economical. Inasmuch as the partition will dry out before the conductors are

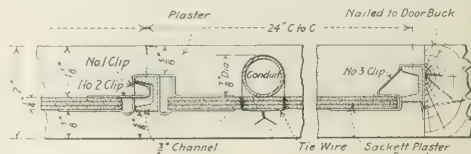


FIG. 2—CONDUIT IN A 2-IN. PLASTER-BOARD PARTITION

pulled in, it is unnecessary to use leaded, flexible metallic conduit. The unleaded conduit will be passed by the Underwriters' inspectors for any installation in a location where it will not be permanently damp.

Fig. 1 shows the method of installing a run of conduit and a bracket outlet box on a plaster-board partition. The conduit is installed on the partition after the plaster-board slabs have been placed. The conduit is held to the plaster board with tie wires, which, as shown in Fig. 2, pass around the conduit and through

holes in the board and are twisted together on the rear side of the board with a pair of pliers. This will draw the conduit tightly against the board. The holes for the tie wires in the plaster board can be made with a small twist drill turning in a bit brace. The outlet box is also supported to the plaster board with a tie wire.

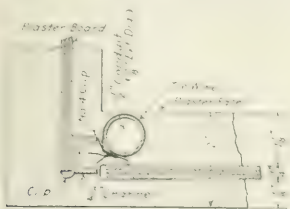


FIG. 3—CONDUIT BOUND TO CORNER CLIPS WITH TIE WIRES

It will be noted from Fig. 2 that the plaster board does not lie exactly in the center of the 2-in. partition, although the channel studs do lie in the exact center. There is a distance of  $\frac{5}{8}$  in. between the plaster board and one face of the partition, and of  $1\frac{1}{8}$  in. between the face of the plaster board and the other face of the partition.

Inasmuch as  $\frac{1}{2}$ -in. conduit is a trifle over  $\frac{7}{8}$ -in. external diameter, it is necessary to place the conduit on the  $1\frac{1}{8}$ -in. side of the plaster board, as suggested in Fig. 2. It is necessary to use a shallow outlet box having a depth not greater than  $1\frac{1}{8}$  in. for this work. If necessary, the box can be blocked out from the plaster board with small sticks of wood so that its outer edge will lie flush with the finished plaster line.

It is frequently possible to erect a conduit riser in a plaster-board partition at a corner or near one of the steel studs, as shown in Fig. 3. In such cases the conduit can be held with tie wires, as shown in Fig. 3, to the steel clips that clamp the plaster boards in place to the channel studs.

An outlet in a plaster-board ceiling can be arranged as shown in Fig. 4. There is only  $\frac{5}{8}$  in. finished plaster between the lower face of the plaster board and the finished plaster surface, so that there is scarcely room in this space for an outlet box. A ceiling plate might be used if the conduit runs were such that they could enter at the back of the plate. In most cases, however, the conduit runs will be horizontal, as shown in Fig. 4, and must enter the sides of the boxes. It will then usually be necessary to use  $2\frac{1}{4}$ -in. boxes in plaster-

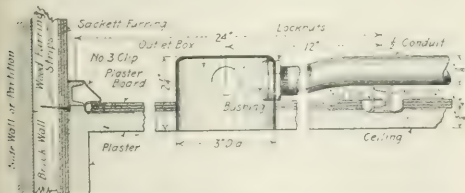


FIG. 4—OUTLET BOX IN A PLASTER-BOARD PARTITION

board ceilings, which will permit the conduit to enter the side knock-outs.

If an electrolier is to be supported from an outlet box in a plaster-board ceiling, it will be necessary to provide additional support for the outlet box to enable it to sustain the weight of the electrolier. This support can be provided by arranging a bridge across a couple of the channel section beams, or by arranging a piece of rod or strap iron vertically over the center of the box to some member above, so that it will be in

tension when a stress is imposed on the box. Frequently a piece of No. 6 soft-iron wire can be used for this tension member. It can be threaded through and tied in the screw-holes in the bottom of the outlet box and made fast over a beam or around some member that is placed directly above the outlet box.

## Illumination of a Motion-Picture-Theater Entrance

Knowing that an intensely illuminated entrance alongside of faintly lighted store fronts would attract attention, the proprietor of the motion-picture theater shown in the illustration has installed eight 1000-watt gas-filled lamps and two flame-arc lamps in the theater entrance. All the lamps are inclosed in diffusing globes, six of the gas-filled units being suspended from the ceiling of the entrance and two from brackets attached to the building front. An electric sign placed at right



BRILLIANTLY LIGHTED THEATER FRONT

angles to the sidewalk informs persons on the street of the location of the theater.

Electrical energy for the purpose of operating these lamps and the picture-projecting apparatus is furnished to the proprietor of the theater by the Edison Illuminating Company of Brooklyn, N. Y.

## Trainman's Storage-Battery Lamp

On that division of the Santa Fé Railroad which runs between Independence and Wellington, Kan., an ingenious flagman has changed his oil lantern into a modern electric lamp. To avoid purchasing batteries, however, he has connected the lantern through a long flexible cord to one of the lamp sockets used ordinarily for lighting the coach platform. He employs the lantern only for signaling the engineer from the rear platform of the train, and hence in actual use does not need to take the lantern far from the car. The idea of this progressive employee may possibly commend itself to other trainmen who are able to substitute electricity for kerosene.



## RECENT TELEPHONE PATENTS

## Automatic Exchanges and Apparatus

In calling a telephone user with automatic connecting apparatus it is usually necessary to turn a dial through definite angles of rotation, and hence for accurate calling there must be some indication of the signal through the sense of touch, sound or sight. To eliminate this disadvantage Messrs. W. M. Haralson and J. F. Pilkington, of Dallas, Tex., have patented the idea of attaching a small electric lamp to the center of the dial, which can be illuminated when the receiver hook is raised.

An improvement in dial signaling and connecting devices has been patented by Mr. C. A. Andersen, of Chicago, who has assigned his patent to the Andersen Electric & Manufacturing Company. The dial can be mounted on a bracket attached to the top of the subscriber's telephone set. Within the base of the case is a manually operable switch for changing the circuit connections so that the dial may be employed with either magneto or central-energy systems.

Mr. A. H. Dyson, of Chicago, has devised a system of automatic telephone operation, the patent for which has been assigned to the Kellogg Switchboard & Supply Company. With this system a connection is completed by the apparatus selecting the calling line first and the called line last. Two types of selectors and two sets of master switches are used to select the calling line. The primary master switch being so set that a non-busy primary selector is connected for operation when a call is sent in, the primary switch will select that bank of secondary selectors in the contact bank from which the calling line radiates. By means of the secondary master switch in that bank a secondary selector is connected to complete the call. With a semi-automatic system this results in connecting the calling line with a manual switchboard where an operator may complete the connection.

## Improved Telephone Instruments

High-voltage energy can be employed with the transmitter recently patented by Mr. J. Redding, of Malden, Mass. The transmitter is provided with a large number of small microphone buttons of the granular type, all of which are connected in series. The buttons are arranged symmetrically on the diaphragm of the transmitter.

A simple method of insulating one terminal of the transmitter from the frame has been patented by Mr. E. B. Craft, of Hackensack, N. J. The stationary stud fits snugly in an insulating washer which is forced into a counter-bored hole in the bridge. A clamping nut on the projecting end of the stud binds all parts together.

To increase the sensitivity of transmitters and receivers, Mr. S. G. Brown, of London, England, has developed a method of mounting the diaphragms so that they do not have to be clamped at the periphery. One method is to support the diaphragm at the electrode mounting only, and the other is to employ a magnetic reed or tongue which projects in front of the pole pieces. The diaphragms are made of extremely thin aluminum and are formed to follow the contour on the inclosing mouthpiece or earpiece respectively.

Mr. A. Rosenberg, of London, England, has patented an adjustable receiver which includes a magnet core and coil mounted on a thin plate which is dished outwardly. By turning a screw stud fastened to the middle of the dished portion and extending through the rear of the casing the dish can be flattened, thereby lengthening the air-gap between the cores and the diaphragm. A pointer on the screw stud indicates the length of the air-gap.

## Letter to the Editors

## Sulphur as a Conductor

To the Editors of the *Electrical World*:

SIRS:—In your issue of Nov. 7, 1914, you called attention to the remarkable similarity in the physico-chemical properties of selenium and sulphur, and stated that one would expect to find sulphur a conductor when under the influence of light. In this connection recent work of the writer showing that sulphur becomes a conductor may be of some interest.

Sulphur was first found by the writer to give off electrons under the influence of light of a longer wavelength than 3200 Angstrom units while experimenting in the Sloane Physical Laboratory of Yale University in 1911. Inasmuch as the eye can detect violet rays down to about 3800 Angstrom units, it is quite possible that sulphur is photoelectric throughout a small part of the visible region.

During further experiments on the electrical properties of sulphur carried on by the writer at the Massachusetts Agricultural College it was found that sulphur becomes a conductor under the influence of light. A report was made of this discovery to the American Physical Society under the title of the "Actino-dielectric Effect of Sulphur," as will be seen by referring to the *Physical Review*, Vol. 36, page 336, 1913, and to page 139, Vol. 34, *American Journal of Science*, 1912.

The experiment was conducted as follows: Sulphur was placed between two circular disks of brass. One disk was perforated so that light could fall on the sulphur. The perforated disk was so arranged that the terminal of a battery could be attached to it. The other disk was attached to an electrometer. The disks were inclosed in a brass chamber so arranged that it could be evacuated. The leads passed out of the chamber through amber plugs. Opposite the disk with holes in it was a glass window. As glass cuts off the ultra-violet rays which cause brass to give off electrons, no electrons could be produced except from the sulphur. The sensitiveness of the electrometer was about 1500 mm per volt. The source of light was a portable carbon arc lamp. When there was no light on the sulphur 100 or more volts could be impressed on it without causing the electrometer to move; that is, the sulphur was an insulator in the dark. However, the instant light fell on the sulphur the electrometer began to deflect. The direction of the deflection depended on whether the perforated disk was charged positively or negatively, thus showing the phenomenon to be one of conduction. An effect similar to this observed by Lenard in examining the phosphorescent alkaline earth sulphides was called by him the actino-dielectric effect.

The phenomena of the actino-dielectric effect should be clearly distinguished from the photoelectric effect. In the photoelectric effect the perforated disk is not in contact with the material and the deflection of the electrometer is always in one direction, and that is the one caused by the accumulation of a positive charge.

In order to obtain the photoelectric effect of sulphur a good vacuum is necessary, while the actino-dielectric effect can be obtained at atmospheric pressure. There is probably a direct relation between the photoelectric and actino-dielectric effect of sulphur. An investigation started some time ago by the writer on this subject at the Davy-Faraday Research Laboratory of the Royal Institution, London, was discontinued for various reasons. The fatigue effects somewhat complicate the problem, but the investigation of it would surely lead to very interesting results.

Pittsburgh, Pa.

CHESTER A. BUTMAN.

# Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects Questions and Answers

## Accident Caused by Mouse in Oil Switch

An undersized mouse recently caused an unusual accident in the generating station of the United Water, Gas & Electric Company at Hutchinson, Kan. In some way the rodent got into an oil switch, and the assistant engineer tried to remove it without interrupting service in the line controlled by that switch. By accident the mouse came into contact with the switch terminals, hereby causing a short-circuit which burned a man quite severely, although not dangerously. Immediately afterward the chief engineer opened the main switch, thus quickly clearing the trouble, and then restored service. The oil switch on which the accident occurred controlled a lightly loaded motor circuit, and service to these customers was restored promptly.

It has been suggested that such accidents can be avoided by keeping the oil switches so inclosed that small animals cannot reach the live parts.

## Illumination of Switchboards

If switchboards are lighted only by lamps placed along the tops of the panels, the lower portions of the board will be only faintly illuminated. To obtain a uniform distribution of light over the entire face of the board the lighting units may be arranged as shown in the halftone, which represents an installation at the Gold Street station of the Edison Electric Illuminating Company of Brooklyn, N. Y. In this station the switchboards are arranged parallel to each other on opposite

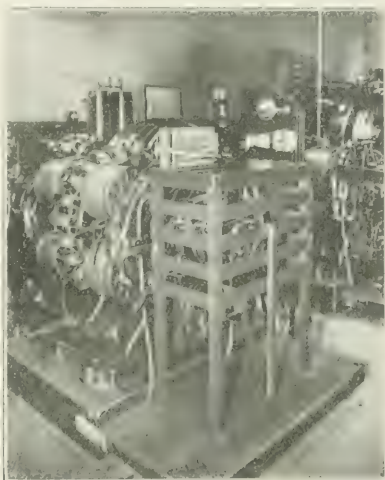


ILLUMINATION OF CENTRAL-STATION SWITCHING ROOM IN BROOKLYN

sides of the operating aisle and the lamps are installed in horizontal trough reflectors covered with diffusing glass. The reflectors are back to back, with the glass diffusers inclined so that the light is distributed over the panels of the switchboard. With this arrangement the lower portions of the board are illuminated practically as well as the upper part.

## Safeguarding Employees Around Series Lighting Circuits

All generating and switching equipment connected with the series-lighting circuits in the stations of the Edison Electric Illuminating Company of Brooklyn is installed so that the employees are not subjected to any hazard. Although constant-current transformers have



A DANGER-REMOVING CONTRIVANCE

superseded brush-arc machines to a considerable extent, there are still a few of the latter installed in this company's stations. Steel frames have been placed around the overhung shafts carrying the commutators so that the operators will not come in accidental contact therewith. Platforms equipped with insulating legs are provided in front of each arc-circuit switchboard for the operator to stand on while connecting the various circuits. Although the switch plugs are tested periodically to see that they will not break down under high-voltage, the operators are required to wear rubber gloves and hold one hand behind them while inserting the plugs. The gloves are also subjected to periodic leakage tests.

## Water Softening by Electrochemical Methods

Among the papers prepared for the meeting of the American Society of Refrigerating Engineers held recently in New York City was one by Mr. C. P. Landreth, of Philadelphia, calling attention to the fact that electricity will hasten chemical reaction and thereby improve the results obtained with boiler-feed-water softening compounds. To soften water it is analyzed in the usual way and the chemical compound determined which will precipitate the scale-forming compounds present in the water. For instance, calcium hydroxide is used to





# Digest of Current Electrical Literature

## Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

### Generators, Motors and Transformers

**Mechanical Forces in Circuits Carrying Heavy Currents.**—P. V. HUNTER.—The chairman's address to the Newcastle Section of the (British) Institution of Electrical Engineers. With the increasing size of generating and transmission systems there is a tendency for manifestation of the mechanical forces experienced by circuits carrying heavy currents. The stresses were first experienced as a matter of practical importance in the end-turns of turbo-alternators subjected to a short-circuit. The problem was complicated by the fact that the damage largely depended on the character of the short-circuit. A growing fault allowed the armature current to demagnetize the generator field, and excessive currents were not produced in the stator windings. As a result, there was difference of opinion among experienced engineers respecting the effect of short-circuits on alternators. In some cases they apparently stood up satisfactorily and in others not. The primary precaution is to brace the end-turns in a manner enabling them to withstand the mechanical forces. With the object of reducing the magnitude of the forces, reactance coils in series with the generator windings, preferably inserted at the star end of the windings, have been adopted, more particularly in the United States. This arrangement is to be recommended where the generators are wound for the pressure of transmission. It is, however, more usual at the present day to transmit at pressures for which generators cannot be satisfactorily wound, and in such cases a more satisfactory arrangement is to use a step-up transformer directly connected to the terminals of each generator, incorporating a substantial amount of reactance in the transformer windings. Serious mechanical forces accompanying the flow of current are by no means confined to the end-turns of alternators. Of all the electrical apparatus the transformer is that which is in a position to be subjected to the greatest mechanical stress from this cause. The author thinks that the majority of transformers manufactured to-day have inadequate provision against the mechanical stresses of short-circuit. That more trouble is not experienced is no doubt almost entirely due to the fact that the generating plant is not able to maintain full primary pressure on short-circuit. This protection will disappear with the growth of the generating system. While these remarks refer to ordinary voltage transformers, there is, however, little doubt that many series transformer failures, if properly traced to their source, are due to mechanical movement of the primary coils under heavy rush of current. The series transformer is in the unfortunate position of not being able effectively to limit the value of the current which can be passed through it. A sound mechanical construction of series transformer windings may, therefore, be regarded as necessary. In this connection the soundest arrangement is decidedly that in which the primary consists simply of a bar without turns. Their reliability from all points of view is so far superior to that of any other type that they should undoubtedly be used wherever possible. One curious effect of the mechanical stresses accompanying the flow of current is the tendency of knife-type disconnecting switches to

open automatically under a heavy rush of current. The effect is similar to that which tends to increase the perimeter of a conductor forming a closed loop, and does not exist if the conductors above and below the switch are in line with it. So far as generators are concerned the addition of even a comparatively large reactance does not materially affect either the cost of the generator or its efficiency. In the case of reactors between busbar sections and on feeders, however, the conditions are different. The division of a network into a number of isolated sections very materially increases the cost and must be avoided except in the case of networks so large as to require a number of separate power stations. The disadvantage of sectioning a network is greater the higher the diversity of the load. The objection to the use of reactance at the power-station end of feeders is the increased effective voltage drop incurred. This depends on the power-factor of the load. The simplest way out of the difficulty is to supplement the reactance coil with a regulator in each feeder which can be adjusted to maintain the voltage constant at the far end of the feeder under any normal conditions of loading.—*London Electrician*, Dec. 4, 1914.

### Lamps and Lighting

**Street Lighting with Half-Watt Lamps.**—L. BLOCH.—The conclusion of his article, the first part of which was recently abstracted in the Digest. In alternating-current distribution systems the small auto-transformer renders it possible to use the lamps under all conditions. Such transformers are small and inexpensive, their cost being \$3.75. The efficiency is between 85 and 92 per cent. No-load losses are absent, since the transformers are disconnected on the primary side. A 100-watt lamp consumes 0.6 watt instead of 0.53 watt per cp, when the transformer losses are taken into consideration. The secondary emf of such transformers is usually 14 volts or 25 volts. Where it is desirable to reduce the illumination during the late hours of the night use is made of lamps with two filaments which are in circuit during the early hours of the evening, only one being used during the late hours. The change in the connections is made by a special switch which is so constructed that one filament is lighted during the late hours of one night and the other filament during the late hours of the next night and so on alternately. Lamps of this kind usually require three conductors, the three conductors of a three-wire system of  $2 \times 110$  or  $2 \times 55$  volts being used. However, it is possible to use only two conductors by employing special switching apparatus. Failure of a nitrogen-filled tungsten lamp during operation is relatively rare. It is generally replaced by a new lamp after 1000 hours since the candle-power is then usually decreased by 20 per cent, but one has considerable leeway. The chief decrease of candle-power (about 15 per cent) occurs during the first 600 hours. Further decrease is very slow. The decrease to 80 per cent of the initial candle-power occurs in about 950 hours, the decrease to 75 per cent only after 1200 hours. Before the candle-power had decreased by 20 per cent only 19 per cent of all of the lamps became defective. The initial specific consumption was 0.505 watt per hemispherical cp for a clear glass globe and with an



external reflector. The nitrogen-filled tungsten lamp is used for street lighting in Berlin and suburbs and various other German cities.—*Elek. u. Masch* (Vienna), Nov. 1, 1914.

#### Generation, Transmission and Distribution

**Battery Reserve in Single-Phase Station.**—W. T. KUMMER.—The first part of an article on the battery reserve employed in the Zurich lighting station. The station is supplied with energy from the Albula power station by means of three-phase currents which are converted from rotary converters into single-phase currents of the same frequency. The converter sets are also connected with storage batteries operated in parallel for reserve in case there should be a failure of the primary three-phase supply. The author discusses this arrangement and outlines the history of the electricity supply in Zurich, which has led to this particular arrangement.—*Schweiz. Bauzeit.*, Nov. 21, 1914.

**Power-Plant Testing.**—W. M. SELVEY.—An abstract of a paper read before the (British) Institution of Electrical Engineers. The author deals generally with the testing of plant in central stations, particularly from the point of view of guarantees. The opinion is expressed that the accuracy of such tests is now fully up to requirements. The author deals in turn with boiler plant, turbo-generators, meters, condensers and air pumps, cooling towers, centrifugal pumps and fans.—*London Electrician*, Nov. 27, 1914.

#### Traction

**Electric Railroad.**—E. E. SEEFEHLNER.—The first part of an illustrated article on the electric railroad between Vienna and Pressburg. This new electric railroad had formerly been vigorously opposed, as it was thought that there was not enough traffic to justify the expense. But even during peace times so much traffic developed that the rolling stock had to be increased by 70 per cent. The road has proved even more successful during war. Each train had to carry morning and evening double loads. The trains are operated by electric locomotives, and the standard train consists of two cars, each with sixty passengers; but now trains are continually being run with four cars, each with 186 passengers. The schedule is nevertheless very regular. The single-phase locomotive has proved very successful, although the attendance had to be considerably reduced. Some locomotives have had to run 10,000 km (6000 miles) in a month. The director of the road, his son and his daughter have served as locomotive engineers in emergency cases. Within the cities of Vienna and Pressburg the direct-current system is employed. On the interurban line the single-phase system is employed at 15,000 volts or 16,000 volts. Where the different systems join the locomotives are exchanged. Illustrated notes are given on energy supply and line consumption. The article is to be concluded.—*Elek. u. Masch* (Vienna), Nov. 15, 1914.

#### Installations, Systems and Appliances

**Control of Motors.**—A series of illustrated articles on motor control and regulation. E. A. Hanff deals with the magnetic switch, and A. G. Popcke outlines the various forms and classes of controllers used in industrial service, giving the relative advantages and disadvantages of each. Only fundamental standard forms are considered, as the design of special apparatus for specific requirement involves simply modifications or combinations of the fundamentals. J. H. Albrecht deals with furnace skip-hoist control, H. L. Beach gives an analysis of diagram construction, W. H. Patterson discusses automatic starters and controllers, A. G. Ahrens magnetic control for steel-mill auxiliary motors, H. D. James electric elevator control, W. O. Lum mag-

netic controllers for crane motors, W. E. Thau liquid rheostats for controlling wound-secondary induction motors, T. E. Simpers control of electrically driven rubber calenders, H. F. Boe the automatic control of laundry machines driven by alternating-current reversing motors, J. A. Blickman the manufacture of electric controllers, T. S. Perkins the evolution of industrial controllers, R. L. Kimber control panels for synchronous motors, Graham Bright control for mine hoists, W. Sykes and G. E. Stoltz the control of induction motors for rolling-mill drive, H. C. Nagel the design and application of rheostats, W. R. Johnston the selection of control apparatus for portable drilling rigs.—*Elec. Journal*, December, 1914.

#### Wires, Wiring and Circuits

**Heating of Conductors.**—T. HIROBE.—An abstract of a report on a theoretical and experimental investigation of the heating and insulation deterioration of current-carrying conductors. The results are summarized under the following headings: insulating materials investigated, methods of measurements, specific resistance of copper, specific conductivity and emissivity, insulation resistance, dielectric strength, specific inductive capacity.—The original voluminous report was published as Report No. 12 of third section, Electrochemical Laboratory, Tokio, Japan. Abstracted in *London Elec. Review*, Nov. 6, 1914.

**Electric Conductors.**—TH. BAILLANT.—The author has worked out new tables for the rapid determination of the cross-section and of the voltage drop in electric lines, from the figure of the kilowatt multiplied by the length in meters for different voltages and power-factors.—*Elek. Zeit.*, Nov. 19, 1914.

**Cable Laying.**—BRUGSCH.—An illustrated article on the methods of laying the cables for energy supply to the elevated railroad in Hamburg.—*Elek. Zeit.*, Nov. 12, 1914.

#### Electrophysics and Magnetism

**Contact Rectification.**—RALPH C. HARTSOUGH.—Much experimental evidence has been brought to light upon the phenomenon that a large current will pass in one direction and that only a small current, if any at all, will pass in the opposite direction through contacts of certain dissimilar solids. But some important points have remained undecided. The author has made a careful investigation with a silicon-carbon contact. The surfacing and finishing as well as a suitable mounting of the silicon received much attention. Two points applied gave approximately twice the magnitude of rectified current that one point gave. Also, two pairs of surface areas, surfaced exactly the same way, one area being a little over twice that of the other, gave very nearly twice the rectified current. The author concludes that the magnitude of the rectified current is approximately proportional to the area of contact. The surfaces were photographed and some interesting conclusions reached. There is a "forming" action of the surfaces. By "forming" is meant that a better rectifying surface results from certain manipulation. The "forming effect" is a bringing of more points on the surface into activity. Pressure would bring more points into contact, theoretically, but increased pressure does not increase the rectifying properties of a surface. Pressure evidently has a crushing effect on the points of the surface, thereby destroying the property of rectification. The author's theory is that in the "forming processes" there are points which are very close yet not active as rectifiers and an increase in voltage causes an arc across these points, bringing them into contact. This theory is compatible with the fact that two surfaces which have been "formed" when separated have to be "re-formed." This shows that there is no chemical formation and that

this forming is evidently a point phenomenon. A surface once "formed" will hold constant as a rectifier as long as it is undisturbed. A novel effect was discovered, namely, that a rectifier which would give complete rectification with an alternating emf would allow with equivalent value of direct emf as much as 15 per cent to 20 per cent of the current to pass in the high-resisting direction. Data are given on the relation between current and pressure.—*Phys. Rev.*, October, 1914.

#### Units, Measurements and Instruments

**Meter.**—An official communication by the Reichsanstalt by which modifications of a magnetic motor meter for direct current made by the Allgemeine Elektricitäts Gesellschaft and an alternating-current induction meter of the same company are admitted for calibration.—*Elek. Zeit.*, Nov. 12, 1914.

#### Telegraphy, Telephony and Signals

**Wireless Telegraphy in Australia.**—J. G. BALSILLIE.—A paper illustrated by diagrams presented before the British Association on wireless telegraphy in Australia. It was considered that for the purpose of efficiency and economic control all stations should be of a standard design and range. A standard station was designed and stations of this type were erected at Melbourne and Hobart. Experiments with these stations were conducted with the object of ascertaining their mean average range with vessels at sea under varying conditions. The data collected from these experiments indicated that with average atmospheric conditions it was possible for Melbourne and Hobart stations to communicate reliably 450 miles to vessels at sea in daytime and approximately 1500 miles at night, provided that land intervened for not more than 5 per cent of the distance. It was ascertained that with land intervening the sea range of stations was reduced in the relation of five to two in respect of that portion of the distance which was over land. These particulars hold good only in respect to a 500 meter-wave length and day range. It was, therefore, decided to adopt as a standard within the Commonwealth stations a day range of 450 miles over sea, and nineteen of these stations have been erected. From experiments it was ascertained that aerials of the squirrel-cage type gave the most satisfactory results, and that using masts 160 ft. high an aerial capacity of not less than 0.0013 mf, and not more than 0.002 mf, should be used, when employing a 600-m wave, to obtain the best results. Practically all radiotelegraph stations intercommunicate at night, and even in the daytime adjacent stations intercommunicate. Melbourne signals are nightly heard at Perth, a distance of 1700 miles. Curves are given showing the difference in communication between different stations under atmospheric conditions in spring, summer, autumn and winter. Miscellaneous observations are added on the variation of the intensity of signals, the effect of wind on the strength of signals, the potential gradient and atmospheric disturbances, the direction of reception, the effect of fog and other disturbances.—*London Electrician*, Nov. 13, 1914.

**The Arc as a Generator of High-Frequency Oscillations.**—F. MERCER.—A paper illustrated by diagrams presented before the Physical Society in London. This paper contains the results of a series of experiments on a copper-carbon arc when used as a generator of high-frequency oscillations. The author investigated the effect of the ratio of self-induction to capacity and the gas pressure on the production of oscillations. There is a definite value of inductance for any chosen capacity which gives a maximum current in the shunt circuit. The effect of increasing the gas pressure becomes more marked as the electrical pressure is in-

creased, but as the gas pressure rises the steadiness of the arc diminishes. The effect is somewhat similar to that obtained by increasing the arc length. Any effort made to increase the output by the use of a magnetic field or by altering the arc length or the resistance in series with the arc is detrimental to the steadiness of operation.—*London Electrician*, Nov. 20, 1914.

**Cable Telegraphy.**—H. W. MALCOLM.—A continuation of his long mathematical series on future progress of cable telegraphy. The author discusses trains of damp oscillations and the influence of signaling condensers.—*London Electrician*, Nov. 20, 1914.

#### Miscellaneous

**"Point Five" Association.**—PICKVANCE.—His address as chairman of the "Point Five" Association. The association has for its object a very definite self-centered scheme, namely, the encouragement and development of the use of electricity for all possible domestic purposes. The author urges that just as the motor load has been built up by the central stations availing themselves of their power of hiring motors, so this association should use all its endeavors and energies to draw into its ranks all those engineers who are in a position to hire cookers and heaters, "so that the ultimate results will be such as to secure for us the hearty co-operation of manufacturers, by reason of the fact that we, collectively, shall be able to place orders in quantities much greater than is possible at the present time. The absence of powers to wire houses, supply or hire cookers and heaters is so important to the object to which this association is pledged that we cannot get away from it." The author then takes up the competition with gas companies and the question of mains. An account of the extended discussion which followed is also given.—*London Electrician*, Nov. 13, 1914.

## Book Review

#### ELECTRIC-LIGHT ACCOUNTS AND THEIR SIGNIFICANCE.

By H. M. Edwards. New York: McGraw-Hill Book Company, Inc. 172 pages, illus. Price, \$2.

With the amount of attention that is being given to the matter of standard accounting systems for public utilities by the engineering organizations as well as by the various regulating bodies, it is not surprising that more books on accounting subjects are becoming available. "Electric Light Accounts" is prepared by an authority on accounts for electric-lighting utilities and contains a clear and concise statement of the object of accounting systems in general and an outline of a system which is especially adapted to electric-light companies. A mere statement of the division or classification of accounts would prove of little value, but the explanations accompanying the statement of the various accounts to be carried make the book a useful one to central-station managers and accountants. The text is divided into three parts: Part I, "Balance Sheet"; Part II, "Income Accounts," and Part III, "Miscellaneous Items." Chapters under these parts deal successively with description of balance sheet, plant investment, current assets, suspense accounts, liabilities, reserves, capital stock, definition of income, gross earnings from operation, operating expense accounts, account symbols, work order system, customers' accounts and records, accounting for supplies, renewal and contingency reserves, the income statement and what it should contain, and analysis of a balance sheet. Specimen forms for various accounts are given, and a complete index makes the volume available for ready reference.

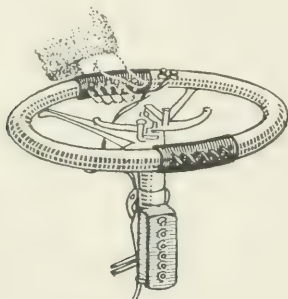


# New Apparatus and Appliances

## An Illustrated Descriptive Record of Recently Developed Manufactured Products of Interest to Electrical Readers

### Electrically Heated Grip for Steering Wheel

Electrically heated leather-covered grips for use on steering wheels of automobiles have been developed by the Interstate Electric Company, New Orleans, La. The grips are attached to the wheel, as shown in the accom-



ELECTRICALLY HEATED GRIPS

panying illustration, and are provided with laces for making them tight. Energy may be obtained from the storage battery of the car or, if the magneto's rating is high enough, from the magneto.

### Three-Passenger Electric Cabriolet

The cabriolet shown herewith is designed chiefly for business men and is equipped with a convertible body. All panels and battery hoods are of sheet aluminum and the top is of leather. An auxiliary front seat is provided for a third passenger. The width of the rear seat is 50 in. and the depth is 18 in. The car is 7 ft. 4 in.



ELECTRIC CABRIOLET

high, 5 ft. 7 in. wide and 11 ft. 10 in. long. A forty-two-cell battery is used to operate the car. The steering lever and the controlling lever are mounted on the side of the car in a horizontal position, one above the other. The steering lever is the longer and is operated by the right hand, while the controlling lever is oper-

ated by the left hand. When the driver leaves the car these levers may be turned up out of the way and locked. Three separate sets of brakes are provided, and they operate independently. Use is made of two sets of foot brakes of the internal-expanding type. An electric hand brake which is also used is applied by a slight backward movement of the controller lever. The wheel base of the car is 100 in. The car can be operated at speeds of 5, 8, 13, 17 and 20 miles per hour. The car is being built by the Anderson Electric Car Company, Detroit, Mich.

### Refillable Cartridge Fuses

A refillable fuse of the cartridge type recently developed by the Star Fuse Company, 448 Broome Street, New York, has been approved by the National Board of Fire Underwriters and the New York City Department of Water Supply, Gas and Electricity. The de-

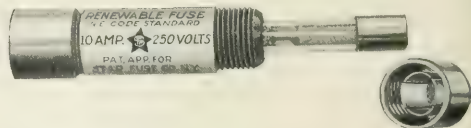


FIG. 1—FERRULE TYPE OF REFILLABLE FUSE

vice is a standard cartridge fuse, being approved as such, and is said to be the first fuse of this type that has been passed by the above authorities. The fuse consists of an inner cartridge made up of a fuse wire which is wrapped in a filler of two sheets of asbestos and inclosed in a glass tube having brass end caps to



FIG. 2—KNIFE-BLADE FUSE

which the fuse wire is soldered and which are cemented to the glass tube. A small space is maintained between the two sheets of asbestos to indicate the condition of the fuse strip. When the fuse blows this space becomes blackened. The complete fuse or inner cartridge is inclosed in a holder consisting of a fiber tube threaded at each end and threaded brass end caps which are

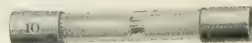


FIG. 3—RENEWABLE ELEMENT

equipped with inner spring clips to hold securely the inner cartridges and insure positive electrical contact. When the fuse blows it is necessary merely to replace that part which is actually destroyed, while the outer brass caps and fiber shell can be used over and over again.

### Insulating Joints

An insulated joint provided with malleable-iron pipe connections and a drawn-steel shell is shown in the accompanying illustration. The insulating material used is called thermoplas, a compound developed by the Cutler-Hammer Manufacturing Company. The pipe connections are equipped with Briggs standard iron-



JOINT WITH FEMALE AND MALE CONNECTIONS

pipe threads. In making the joints the pipe connections are held in alignment and the supplemental or reinforcing shell kept in the die, while the insulating compound is compressed under a pressure of 35 tons. The interior of the shell is molded into one solid mass. The curing of the insulated compound is done at a temperature of 600 deg. Fahr., and each joint is tested at a pressure of 4000 volts, not only between the two pipe connections but between each pipe connection and the outer shell. Joints provided with female and male connections and female connections at both ends are being made. The joints are the product of the Yost Electric Manufacturing Company, Toledo, Ohio.

### A Mechanical Rectifier for Heavy Currents

A mechanical rectifier comprising a pole-changing commutator driven by a specially designed synchronous motor has been devised by Mr. Henry Sandell, Chicago, who is also the inventor of the remarkable electrical violin player which is described elsewhere in these columns. The new rectifier is apparently capable of handling large currents without sparking or heating, and it operates at very high efficiency since the only losses are those of the small motor necessary to drive the commutating switch against the friction of the brushes. The device has applications for charging storage batteries, furnishing direct current for arc-lamp projector lanterns, etc. Several 100-amp machines have been built and are in operation; a 400-amp equipment has been in service at Adams Brothers' Garage, 918 East Forty-third Street, Chicago, for two months, being used to charge electric vehicles, and a 1000-amp machine is now built and awaiting accessory apparatus. Furthermore, it is stated that the Chicago surface-railway company is interesting itself in the prospective purchase of two 8000-amp rectifiers to furnish trolley energy.

The synchronous motor used to drive the commutating element is, according to the inventor, arranged with special interpoles and compensating windings effecting such control of its speed and phase relations that the point of reversal between commutator segments is always maintained precisely at the instant of zero voltage. The synchronous motor is also self-starting, closure of a switch sufficing to put the machine into operation. For battery-charging service only that part of the alternating-current wave above battery voltage is utilized, the special commutator segments being of such reduced length that the current flow is interrupted at the exact instant when the delivered pressure equals the battery emf. This remarkable regulation is said to be effected through means of a small auxiliary brush bear-

ing on the commutator just ahead of one of the main brushes. Protective devices are incorporated in the control equipment to interrupt the circuit in the event of disarrangement of the governing mechanism.

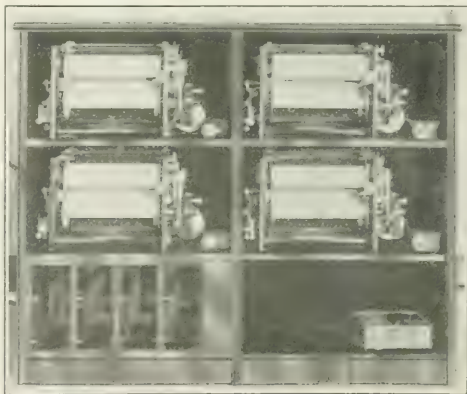
The inventor is now building a three-phase rectifier, similar in principle to the single-phase apparatus described, and from which it is declared practically constant direct-current emf will be delivered, the change in commutator segments being made at the instant of voltage balance between successive phases.

In the case of a 100-amp rectifier operated in the workshop of the manufacturer, the Mills Novelty Company, Jackson Boulevard and Green Street, Chicago, the direct-current arc-lamp load on the machine was varied rapidly from 30 amp to a 70-amp short-circuit without affecting the regulation of the rectifier or causing sparking. When running idle a slight inductive spark or arc was in evidence at the brushes, but this practically disappeared when the load was thrown on. One of these small rectifiers is now being adapted for mounting on the body of an electric passenger car so that the car can be charged from any alternating-current source of the proper frequency. The 100-amp switch weighs complete with motor and mechanism about 45 lb., and a 40-amp machine suitable for vehicle charging will weigh proportionately less.

### Remotely Controlled Electric Violin Music

The remarkable electric violin player already described in these columns has been used to advantage to furnish the music for moving-picture theaters, thus dispensing with the services of musicians and others in the front of the theater. The electric violin player, with its accompanying piano, is operated by a punched paper roll, through the perforations of which electric contact brushes complete circuits controlling the "fingering" at the frets, the speed and pressure of the revolving "bows," and various other expression adjustments which make the performance of the electrical violin player approach that of the human performer.

For the use of moving-picture theaters where a



MULTIPLE-CONTROL APPARATUS FOR ELECTRIC VIOLIN PLAYER

single attendant collects tickets and supervises the interior of the auditorium, the Mills Novelty Company, Jackson Boulevard and Green Street, Chicago, has brought out a "four-feeder" roll attachment, by which any one of four different pieces of music can be switched onto the violin player at will from a face-plate switch



near the ticket taker's station. With this device appropriate music can be rendered for each film presented, any one of the various music rolls being instantly substituted for another by a change of the switch arm. The accompanying illustration shows the four sets of contact devices, any one of which can be switched onto the player circuits.

### Electric Cooker

The heating element of the electric cooker shown in the accompanying illustration is placed below a cast-iron bottom and is thus protected from injury. The device is lined with aluminum and is insulated with rock wool. The outer case is enameled in blue-black



ALUMINUM-LINED ELECTRIC COOKER

and is equipped with polished-steel trimmings. The lid closes in a "water seal" V-shaped groove and is provided with an exhaust valve which is useful when the cooker is employed as a baker. The device is mounted on ball-bearing casters and may be equipped with an automatic clock regulator if desired.

This cooker is being manufactured by the Standard Electric Stove Company, Toledo, Ohio.

### Vertical Motor-Generator for Motion Pictures

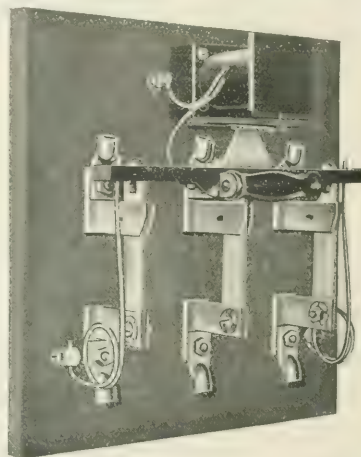
The machine shown in the accompanying illustration is designed to convert alternating-current energy into direct-current energy for operating the arc lamp of a motion-picture set. The apparatus has been made very compact so as to take up the smallest possible space in the operator's booth. The control and indicating devices are placed on a switchboard above the rectifier. The regulator, it is claimed, will instantly adapt the arc to the correct intensity for a film of any character. The switches shown in the illustration control the starting of the rectifying device and the delivery of direct-current energy to the arc lamp. The machine takes up a space 15 in. square, and it is 29 in. high when rated at 50 amp and 34 in. when it is rated at 70 amp.

The device described here is manufactured by the Electric Products Company, Cleveland, Ohio.



### Remote-Control Service Switch

A switch permitting the opening of the circuit at the service entrance of buildings from a convenient point is shown in the accompanying illustration. The switch is installed where the service wires enter the building, and control wires lead from it to a push-button near the main entrance. The main switch is operated by springs and held closed by a latch controlled by a coil made up of two windings so arranged that if one of the fuses should be out current from the other side would



SERIES SWITCH CONTROLLED BY PUSH-BUTTON SWITCH

serve to energize the control coil and release the switch. The switch is made in the unfused and top-and-bottom-fused types and may be back-connected or front-connected as desired. It is being placed on the market by the A. G. Electric & Manufacturing Company, 905 South Howard Avenue, Seattle, Wash.

### Collapsible Portable Lamp Holder for Travelers

The portable lamp holder illustrated herewith can be supported in a number of positions and can be converted into a compact, unbreakable form for carrying in a traveling bag. It consists of three separable parts



FIG. 1—ENTIRE UNIT RE-ASSEMBLED FOR SUITCASE



FIG. 2—PORTABLE LAMP

—the base, socket and connector cord, and shade. Concealed in the base is a spiral-spring clamp and a rubber cup which are employed to fasten the lamp holder to any mirror, desk, chair, bed, etc. Passing through the base and attached to the cup is a rod with a hinged top

on which the lamp socket can be fastened. The shade is equipped with two spring-steel wire loops which clasp the lamp bulb, allowing the reflector to be turned in any direction. The socket is provided with a 10-ft. connector cord and screw plug. To prepare the device for carrying in a suitcase or traveling bag, the socket is removed from its support by a half turn and the plug screwed into it. The combined plug and socket are then placed between the shade clasps, the connector coil is coiled around them, and the base and shade are clamped together. Assembled in this manner, the device occupies very little space and weighs about 1 lb. No lamp need be carried with the device as one can usually be found in the socket to which the lamp holder is attached. The device is manufactured by the Wallace Novelty Company, 18 East Forty-first Street, New York City.

### High-Frequency Generator

For treating various diseases, invigorating the nervous system and facilitating the performance of physio-

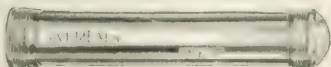


SMALL HIGH-FREQUENCY SET

logical functions a small machine generating energy at high frequencies has recently been developed by the Bleadon-Dunn Company, 208 North Fifth Avenue, Chicago, Ill. This "Violetta" generator, as it is called, weighs only 1.5 lb. and operates on both alternating current and direct current. A vibrating spring gives a low hum and the character of the sound denotes the quality of the interruption. The energy is produced at a pressure of about 75,000 volts, and the current is a small fraction of 1 amp. Oscillations of several millions per second are produced and the frequency is so high that there can be no shock. The apparatus is inclosed in a small case, as shown in the accompanying illustration, and is provided with various types of electrodes for treating the scalp, face, throat, etc.

### Tubular Flashlamp

A tubular flashlamp equipped with a brass case which is heavily nickered has recently been developed by the American Ever Ready Works, 304 Hudson Street, New York. The case is made in the following sizes: 1.25 in.



NICKEL-PLATED TUBULAR FLASHLAMP

by 5 in., 1.5 in. by 6.5 in., and 1.5 in. by 8.5 in. A 2.7-volt tungsten lamp is used with the first device, a 2.9-volt lamp with the second, and a 3.8-volt lamp with the third. Large lamp reflectors are used with the two larger sizes. Both battery and lamp are renewable.

### Battery-Operated House Lamp

A small electric lamp inclosed in a nickered-metal case is shown in the accompanying illustration. The device is designed especially for use by the housewife in the home. A tungsten lamp equipped with a silver-plated

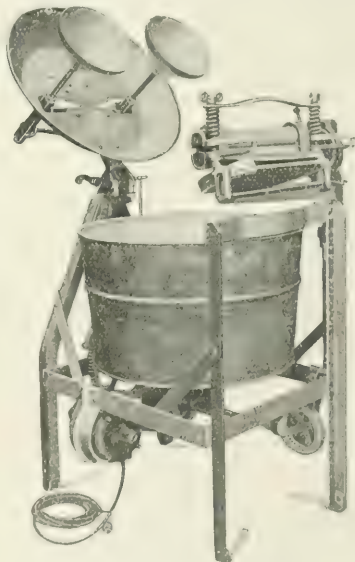


HOUSE LAMP

parabolic reflector is used. Two sizes of this lamp are being made, one having dimensions of 4.75 in. by 4.5 in. by 3.5 in., and the other of 4 in. by 2.75 in. by 2.5 in. Both the lamp and the battery are renewable. The American Ever Ready Works, New York, make this lamp.

### Electric Washer Equipped with Aluminum "Vacuum" Cups

An electric washing machine equipped with two aluminum cups, which work up and down alternately while the tub rotates, is being placed on the market by the Beebe Sales Company, Minneapolis, Minn. The frame is of steel, and the tub and cover of galvanized open-hearth steel. The machine will wash five sheets, it is declared, or the equivalent, at one time. One lever controls the clutch, which throws the vacuum cups into action, and another, operating independently, controls the wringer. The wringer swings into three positions



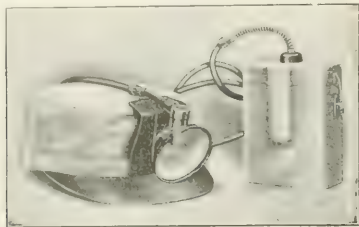
ELECTRIC WASHING MACHINE

and can be used with stationary tubs. The wringer is reversible and is equipped with a tilting water board. When the washing is finished the water can be drawn from the bottom of the tub. The machine is on rollers, so that it is not difficult to move it about if desired.



### Electric Mine Lamp

A lamp which is designed for use in mines and which can be attached to the operator's cap is being placed on the market by the Witherbee Igniter Company, Springfield, Mass. A wet cell inclosed in a cast-aluminum case is used to operate the lamp. The case is attached to a



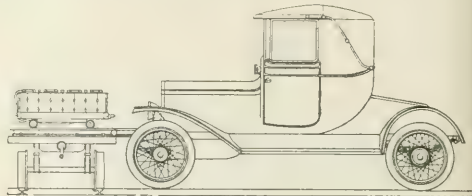
ELECTRIC MINER'S LAMP

belt strap at the miner's waist and is locked. An insulated twin-conductor wire leads up along the wearer's back and over the cap to a reflector lamp attached to the oil-torch support on the cap visor. A tungsten lamp is used, and it is equipped with a German silver parabolic reflector. In order to remove the possibility of an explosion of gas due to the exposure of the glowing metallic filament in case the lamp bulb is broken a device is provided which opens the circuit as soon as the bulb is shattered. This device consists of a wire wicket which holds the bulb in position against two spring-pressed plunger connections which are of unequal length. In case the glass is broken the longest plunger pushes the bulb case out of contact with the shorter one. The lamp socket is a one-piece drawn-steel tube. The face of the reflector and bulb are protected by heavy plate glass, held in position by an expanding spring forming a dirt-proof and moisture-proof joint at the reflector. To the back of the reflector housing is affixed a brass-wire hairpin for carrying the lamp on an oil-torch support provided on the cap visor.

### Interchangeable-Battery System for Electric Vehicles

Convenient means of quickly placing charged storage batteries in electric vehicles and removing the discharged cells for replenishment at an economical low rate, while the cars themselves are meanwhile kept in active service, are provided in the multi-battery system for garages and charging stations which is being introduced by the Klingelsmith Electric Truck Company, 79 West Monroe Street, Chicago. With this system the batteries are mounted permanently in small cars or carriers with ball-bearing flanged wheels which rest on small rails in the battery compartments of the vehicles. On reaching the station the discharged battery is run out of the vehicle compartment onto a platform or a small transfer car moving over a floor track leading to the battery-charging platforms. After the spent cells are removed a freshly charged battery can be immediately run into the vehicle and the latter immediately released for further service on the road. The vehicles are thus kept in continuous service if desired, and are always assured a fresh set of cells upon return to the station. As the batteries can be charged at an economical and low rate, subject to the inspection of the attendant, it is estimated that great saving in the life of the cells will be effected. The injurious effects of rapid "boosting" are avoided, and the cells are insured proper

attention, washing of plates, changes of electrolytes, flushing of jars, etc. With an equipment of different kinds of cells, the appropriate battery can also be selected for the work which the truck or vehicle is to perform on any given trip. The battery carriers have been designed to be interchangeable and to fit all types and sizes of electric vehicles. It is proposed that the

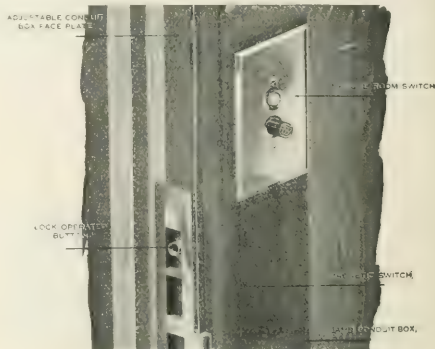


BATTERY BEING DELIVERED TO VEHICLE FROM TRANSFER CAR

service stations shall own the batteries, thus relieving the owner of the car or truck of the investment in batteries and their care and maintenance, although securing for him unlimited mileage and service at less, it is declared, than half the present cost. The multi-battery system described is protected by patents issued to Mr. Joseph M. Klingelsmith, of the company.

### Hotel Door Switch

A solenoid-operated switch designed for use in hotel rooms for opening the lighting circuit after the guest has left his room has been developed by the Hart Manufacturing Company, Hartford, Conn. The switch is installed in the jamb of the corridor door back of the lock strike and is wired in series with a push-button switch. The jamb switch is operated by the bolt in the door lock, which is used when locking the door, from the corridor side. When the door is locked from the room side, however, the switch is not operated, as a separate bolt is used. When the door is locked from the corridor side the switch opens and all lamps are extinguished, but unlocking the door immediately places them in circuit. The lamps are always under the con-



DOOR SWITCH FOR USE IN HOTELS

trol of the occupant of the room when the door is not locked from the corridor side. These switches cannot be used with the ordinary flat strike but must be installed with box-type strikes. The accompanying illustration shows how the push-button room switch may be installed in a special jamb conduit box.

# Jobber, Dealer and Contractor

## NEW YEAR WINDOW DISPLAY

Seasonable Setting for the Beginning of the Year—Need of Attractive Store Fronts as Business Getters

By A. J. EDGELL\*

Reports from all parts of the country indicate greatly increased sales of electric appliances for Christmas gifts. The national advertising of the manufacturers and the efforts of the retailers have made this "an electrical Christmas" to a much greater degree than ever before.

Frequently the effort put forth to increase Christmas business is followed by a reaction which allows an opportunity to slip away. To be sure, there is not much business to be had on the day after Christmas, but in the succeeding days the economically inclined do their shopping. They have waited until after Christmas to



SUGGESTION FOR NEW YEAR'S WINDOW DISPLAY

supply their wants. To prepare for these shoppers the dealer should rearrange his windows. He should also join in the New Year spirit.

New Year's Day is the time for resolutions, the time when people "turn over new leaves" and face the coming year with higher purposes than at any other time. It is the time to urge them to "make 1915 an electrical year."

A display such as the sketch shows calls attention to some of the things that may be done electrically. A circular card, on which is painted "Old Father Time," and an hour glass with figures 1915 are fastened to the background. These may be obtained from a show-card maker, at little cost. Icicles cut from cardboard or cotton batting and sprinkled with diamond dust are also fastened across the background. Some of the appliances are elevated on pedestals which are draped with velours. Cards reading "Wash," "Light," "Heat," "Cook," "Iron," "Clean," are used on the various devices. The large card reads: "Make 1915 an electrical year and it will be a happy one."

Since this is the time when plans are made for the coming year, a good New Year resolution for an electrical dealer is, "I will try to get a proper share of the business that passes my doors each day." Not a very long one, but if carried out its effect on his business would be far-reaching. The dealer would take his proper place among merchants and could count on the

profit made from transient trade to pay his overhead expenses.

The public demands an attractive and modern store front, and a dealer should have one in these days when successful competition is largely a matter of being right on details. So, in his endeavor to "make good" on his resolution, he should go out and size up his store front with the cold, calculating eye of the passer-by. He will probably be amazed at the ugliness of his store's appearance. What he does after his realization of the uninviting appearance of his store front will tell whether he is to get the results he might. If he immediately gets in touch with a painter and an electric-sign manufacturer, he has made a good start.

In the show window there is great room for improvement. To many dealers the possibilities of this publicity factor have not yet become apparent, so they continue to neglect a most wonderful opportunity to attract trade. The average window display has nothing about its make-up to secure more than a passing glance, and very often the impression received by the possible customer is not of the kind that will create a buying desire later. It is rather likely that the jumbled-up appearance of the display will convey the idea that business is being conducted in a loose manner.

A window in which a few goods are arranged in an artistic manner will create immediate sales or will develop interest that will lead to future sales. Windows suffer from over-crowding more than from the other extreme. The mission of the show window is to sell goods, and it is far better to sacrifice the picturesque effect than the selling punch.

A good background with a few articles that are novel or show their value and price tickets used wherever possible can be counted on to attract the attention of the passers-by. Many dealers' windows have no background, so the arrangement of goods, however attractive, cannot secure the whole attention of the passer. The view of the store interior distracts his attention. For this reason, if there were no others, a show window should have a background.

## Christmas Co-operation at Oklahoma City

The electrical supply dealers of Oklahoma City, Okla., began their holiday electrical appliance campaigns the first of December and in the first four days sold fifty irons and about one-third as many toasters. The local central-station organization, the Oklahoma Gas & Electric Company, of which Mr. W. R. Molinard is manager, co-operated in the dealers' campaigns by conducting a display of electrical appliances in connection with the National Manufacturing Exhibit, which was held in Oklahoma City during several weeks of December. Streamers of electric lamps installed along the streets, together with other measures of publicity, were used to call attention to the exhibit, which in turn advertised the contractors' campaign.

## Working Together in New York

The United Electric Light & Power Company, New York City, is co-operating with one of the manufacturers of electric cooking utensils to stimulate the demand for its appliances. Folders describing and illustrating a vacuum cleaner, a toaster, a hot-plate and an iron are being sent to every person in the electric-service company's territory together with a list of special prices on these devices and a return post card by means of which interested persons can request a salesman to call and demonstrate the article marked thereon.

\*The Society for Electrical Development, Inc.



# Industrial and Financial News

## Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

**Glass Ash Tray.**—The General Electric Company, Ltd., 67 Queen Victoria Street, London, England, is distributing an ash tray molded in its "Equilux" glassware. This class of glassware is being made in the form of bowls and globes for the lighting of showrooms of drapery establishments, department stores, etc.

**Pittsburgh Company to Make "Una-Flow" Engines.**—The Mesta Machine Company, of Pittsburgh, Pa., recently acquired the rights from the Stumpf Una-Flow Engine Company, of Syracuse, N. Y., to build the Stumpf "Una-Flow" engines in the United States. The Mesta Machine Company is working on plans to adapt this type of engine for use in rolling mills and also to drive electric generators, air compressors, hoisting engines, etc.

**Wide Use for Resuscitating Apparatus.**—The Life Saving Devices Company, 565 Washington Boulevard, Chicago, Ill., reports that its "lungmotor" is being used by the United States government in a number of its departments, by several states and by many cities. The apparatus is also employed in many hospitals and sanitariums. Among the central-station companies, the Illinois Traction Company, Peoria, Ill., has fourteen sets, and the Southern California Edison Company, Los Angeles, Cal., twenty-four sets.

**Long-Distance Recording Instruments.**—Although the long-distance recording system described in the *Electrical World* of Dec. 12, 1914, page 1165, has only recently been placed on the market, several trial installations have been in operation for some time. One of the first outfits was installed at Peoria, Ill., for the Central Illinois Lighting Company to indicate at the central station the steam pressure at the end of a steam-heating main. Since the installation of the first outfit two other sets have been added.

**Complimentary Tickets for Showroom Display.**—The Kandem Electric Company is sending out so-called complimentary tickets for admission to its showroom at 49 East Twenty-first Street, New York, where it is exhibiting various types of incandescent lamps and arc lamps and accessories. Each ticket bears the caption "Admit one and friends." "Good until Jan. 30, 1915," is also printed on the ticket. The Kandem company's factories are in Germany, and it has recently been receiving shipments via both Holland and Italy.

**Electrical House-Goods Business Improving.**—Edwards & Company, 140th and Exterior Streets, New York, report that the house-goods business is showing a decided upward tendency, and that conditions will soon be normal. This company has recently developed a fire-alarm box of the break-glass type which is being employed extensively in New York City. The company is also meeting with considerable success with its riot bells designed for use on motor-driven fire apparatus. Several other types of electric bells and a push-button call system have been marketed.

**Storm Ravages Telephone Line.**—On Dec. 7 and Dec. 8 over 25,000 miles of wire and 1200 poles of the toll and local lines of the Southern New England Telephone Company were blown down as the result of a severe storm. Emergency shipments of material for making temporary repairs were made from the Western Electric Company's warehouse at West Haven, Conn., and toll lines to every exchange in the State were placed in service again by the evening of Dec. 10. In the seventy-two hours that elapsed between 7 o'clock p. m. Dec. 7 and the same time Dec. 10 1,000,000 ft. of twisted-pair copper-steel distributing wire, 93,000 lb. of bare copper wire, 19,000 lb. of iron wire, more than a ton of copper tie wire and 26,000 sleeves were shipped by the Western Electric Company. Shipments were made by means of special trolley cars and three freight cars. Numerous shipments by express were also made.

**Storage Battery Plant Not Damaged by Edison Fire.**—The fire that destroyed part of the Edison Phonograph Works at Orange, N. J., did not affect the plant of the Edison Storage Battery Company, which is across the street from Mr. Edison's private laboratory. The telephone exchange was in one of the burned buildings, but owing to the prompt action of the New York Telephone Company a temporary switchboard was installed in the battery company's office before business hours the day after the fire began. The Public Service Electric Company also put emergency lines in service in a very short time, so that the Edison Storage Battery Company suffered no interruption in its operation, despite the extensive nature of the fire.

**Preparing for Fan-Selling Campaign.**—The Sprague Electric Works of the General Electric Company, 527 West Thirty-fourth Street, New York, are preparing to start on an active campaign, the first of the year, to sell electric fans for the coming season. A bulletin describing the various types of fans which the company is making will be issued in the near future. At this time, of course, the fan business is rather quiet, although it is expected to pick up very quickly with the beginning of the new year. Several new fittings and conduit boxes have recently been developed by the Sprague Electric Works. The policy of this concern lately, however, is to make fewer special fittings and to devote its attention more to the development of standard devices. The business of the Sprague works has recently been rather dull, and this is said to be due to the industrial depression everywhere.

**Equipment for Indianapolis Street Lighting.**—The Merchants' Heat & Light Company, Indianapolis, Ind., which has recently been awarded a ten-year contract for street lighting in Indianapolis, has just closed a contract with the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., for 2680 street lamps and the necessary regulating devices and switchboards. The lamps are of the flaming-arc type, and each has a rating of 1400 cp. The new contract with the city goes into effect April 1, 1915. The installing of the lamps will begin immediately on their arrival, and it is declared, they will be set up and connected before April 1. The company now awaits a decision from the Public Service Commission on a requested bond issue, totaling approximately \$500,000, to be used in defraying the expenses of new equipment that will be required for carrying out the contract.

**Order for Traction Equipment.**—The St. Louis Car Company, St. Louis, Mo., and the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., have been awarded a contract by the City Railways of Los Angeles for equipment to be placed on exhibition at the Panama-Pacific Exposition which later will go into city service. The apparatus consists of a car of low-floor design which is equipped with double Westinghouse No. 306 50-hp motors and lightweight type "HL" pneumatic control. The Cushing Traction Company, of Cushing, Okla., has just placed an order with the Westinghouse company for a 500-kw geared generator and turbine, one 50-ton locomotive, and equipment for two passenger cars for its new 1500-volt line. This line runs from Cushing to Drumwright, Okla., and will be primarily a freight road, taking most of its traffic from the oil fields. The Manhattan Bridge Three-Cent Line, New York, has recently placed in service six new low-floor cars equipped with four Westinghouse No. 323-A motors and lightweight type "HL" control apparatus. This order is in addition to equipment for four cars purchased in the spring of 1913 from the Westinghouse company. The Easton Transit Company, Easton, Pa., has also just purchased one four-motor equipment of No. 306 Westinghouse motors and type "HL" control.

**Engine-Stopping Devices.**—Owing to the general movement for greater safety in industrial plants the Consolidated Engine-Stop Company, New York, is noting an ever-increasing demand for its electrically operated engine-stop and speed-limiting devices. Legislative enactments for the betterment of employees in factories and power plants have aided considerably in bringing about this demand. Over 5000 installations of the above company's engine stops have been made, among which are those for the following concerns: B. B. & R. Knight, Providence, R. I.; the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.; the La Belle Iron Works, Steubenville, Ohio; the Hotel Astor, New York; the Yale & Towne Manufacturing Company, Stamford, Conn.; the Eastman Kodak Company, Rochester, N. Y.; the Link-Belt Engineering Company, Philadelphia; the Hotel Belmont, New York; the Winton Motor Carriage Company, Cleveland, Ohio; the Brown & Sharpe Manufacturing Company, Providence, R. I., and the B. F. Goodrich Company, Akron, Ohio.

**Professor Crocker on the Industrial Situation.**—Prof. F. B. Crocker, of the Crocker-Wheeler Company, Ampere, N. J., recently stated to a representative of the *Electrical World* that his company has been affected by the general depression that is taking place throughout the country, and, although there has been no material improvement, judging from inquiries being received and the gradual easing up of industrial conditions, a resumption of business activity is expected very soon. In fact, Professor Crocker declared, his company is preparing for a marked change for the better after the first of the year. The Crocker-Wheeler Company is largely a manufacturer of motors and generators, and it has been found that when business is slack companies will repair and patch up old units rather than buy new ones. Again, on account of the flexibility of motor drive and the ease with which motors can be moved from place to place, there is a tendency in factories where all the machines are not working to strip one machine of its motor and substitute it for another which may have broken down. Professor Crocker remarked that his company is not making a strenuous effort to obtain foreign business; however, foreign orders are frequently received. Many of these orders come through commission merchants in New York City. The Crocker-Wheeler Company, on account of its proximity to New York and its ability to transfer its products from the factory to steamers by means of trucks, Professor Crocker stated, is able to handle foreign business very satisfactorily. On account of the war and the elimination of much of the European competition, the foreign business of the company, he asserted, should increase very much.

**Compensator Contract Awarded in Chicago.**—The Lincoln Park Commissioners, under whose jurisdiction most of Chicago's North Side boulevards are administered, has awarded a contract for 800 compensator coils to be used with gas-filled tungsten lamps, the order being divided equally between the General Electric Company and the Westinghouse Electric & Manufacturing Company. Before a selection was made the sample compensators submitted by five different manufacturers were tested in the electrical laboratories of Lewis Institute and of Armour Institute of Technology to determine from an engineering standpoint the relative mechanical and electrical characteristics of the compensator coils. As first choice one of the schools chose the sample of one of the successful bidders and the other school chose the sample of the other successful bidder. In awarding the contract, however, the commissioners pointed out the fact that the existing contracts for gas-filled lamps had been divided between the Westinghouse and the General Electric companies, and by dividing the compensator contracts, it was declared, the manufacturers could be held more closely to the terms of the contracts if failures occurred on units wholly of the same manufacture. In making the selection the question of price did not enter. Quality from an engineering standpoint was considered paramount. The lamps to be installed with the compensators are rated at 200 watts, the efficiency of the compensators is 92 per cent and the compensator coils are rated at 239 watts. The new equipment is to be installed to replace arc lamps now in service, and the work of reconstruction will be carried on under the direction of Mr. Claude H. Shepherd, engineer for the Lincoln Park Commissioners.

## Corporate and Financial

**Western States Gas & Electric Company to Renew Notes.**—The California Railroad Commission has authorized the Western States Gas & Electric Company to renew \$45,000 of promissory notes now held by H. M. Byllesby & Company.

**California Company to Redeem Notes.**—The Coast Valleys Gas & Electric Company has been authorized to issue \$100,000 of first mortgage 6 per cent forty-year bonds at not less than 90. It is the purpose to use \$65,392 to pay off notes payable and certain accounts, and to apply the balance upon additions and betterments.

**Auglaize Power Company to Pledge Notes.**—The Ohio Public Utilities Commission has authorized the Auglaize Power Company to pledge or hypothecate for a loan at not less than 80 \$188,000 of its 6 per cent five-year collateral trust notes. The commission had previously authorized the company to dispose of the above notes at not less than 90, but owing to the stringency of money and the condition of the market the company did not succeed in disposing of them.

**Sierra & San Francisco Protective Agreement.**—Holders of the second mortgage 5 per cent forty-year gold bonds, series B, of the Sierra & San Francisco Power Company have been asked by the protective committee to deposit bonds with the Columbia Trust Company, New York. The amount of outstanding bonds aggregates \$7,667,024. The protective committee is composed of Messrs. Philip L. Saltonstall, Francis R. Hart, Samuel R. Smith and Charles F. Mathewson.

**Annual Report of Massachusetts Lighting Companies.**—The annual report for the year ended June 30, 1914, shows consolidated gross earnings of \$1,395,188, from which was deducted \$982,496 for operating expenses, including taxes, leaving net earnings of \$416,692. Deduction of interest charges of \$119,593 and dividends of \$269,565 left a balance of \$27,534. Since 1910 the gas customers increased from 17,423 to 23,463, and electric customers from 4577 to 7100, the total connected load having increased from 7818 kw to 12,300 kw.

**International Steam Pump Deposits.**—The protective committee of the International Steam Pump Company, composed of Messrs. Lewis L. Clarke, Willard V. King and L. T. Haggin, of New York; Albert N. Parlin, of Boston, and Otto Marx, of Birmingham, Ala., announce that a considerable majority of the preferred stock and a large amount of the common stock has been deposited under the terms of the protective agreement. The time for depositing stock expired on Nov. 30, but the committee has extended it to Jan. 15, 1915.

**New Maine Company Formed.**—The Androscoggin Electric Company has been incorporated with an authorized capital stock of \$2,000,000, of which \$1,400,000 is common and the remainder 6 per cent cumulative preferred. It has taken over the Lewiston & Auburn Electric Light Company of Lewiston, Me., and the Portland & Lewiston Interurban Company. The transaction involves also the ownership of the Mechanic Falls Electric Light Company. The company will do without competition the entire electric-lighting and motor-service business in Lewiston, Auburn, Mechanic Falls and adjoining towns, representing a total population of about 50,000. The consolidated company owns a large hydroelectric station at Deer's Rips and is now building a steam station for emergency purposes. The company has filed a mortgage with the Union Safe Deposit & Trust Company of Portland, Me., as trustee, to secure \$5,000,000 of first and refunding mortgage 5 per cent bonds, the present issue to be \$1,800,000, dated Oct. 26, 1914, and due Oct. 1, 1934. Of the new bonds \$1,200,000 are reserved to retire \$1,200,000 first mortgage 5 per cent bonds of the Lewiston & Auburn Electric Light Company due June 1, 1939, and further bonds are reserved for 80 per cent of the cost of future extensions. Mr. William T. Cobb, Rockford, Me., is president and Mr. Julius Parkhurst, Lewiston, Me., is secretary-treasurer. The directorate is composed of Messrs. William T. Cobb, Maynard S. Bird, Hugh J. Chisholm, Harold Libby and Alla A. Libby.



**California Railway & Power Company's First Annual Report.**—The California Railway & Power Company has made its first annual report, covering the period Dec. 18, 1912, to June 30, 1914. The company controls the United Railroads of San Francisco, Sierra & San Francisco Power Company and Coast Valleys Gas & Electric Company, and is itself controlled by the United Railways Investment Company. The earnings statement for the above period is as follows:

<b>Income:</b>	
Dividends on stocks owned	\$605,000
Interest on notes and accounts receivable, etc.	220,419
Interest on bank balances	4,482
<b>Total</b>	<b>\$829,901</b>
<b>EXPENSES</b>	
Salaries	\$2,355
Taxes	7,741
Transfer agent's, registrar's fees, etc.	2,300
Directors' fees and expenses	1,602
Legal	529
Stationery, printing and postage	489
Traveling	1,982
Organization, portion charged off	937
General	3,232
<b>Total</b>	<b>21,167</b>
<b>Net income</b>	<b>\$808,734</b>
<b>Dividends:</b>	
On prior preference stock	\$314,705
On preferred stock	378,092
<b>Total</b>	<b>692,797</b>
<b>Profit and loss surplus, June 30, 1914</b>	<b>\$115,937</b>

The Sierra & San Francisco Power Company received over 70 per cent of its gross earnings from energy sold to the United Railroads of San Francisco. The company's income statement for the year ended June 30, 1914, is as follows:

Gross earnings	\$1,136,682
Operating expenses and taxes (including depreciation)	508,717
<b>Net earnings</b>	<b>\$627,965</b>
Bond interest (including small item of uncollectible accounts)	374,762
<b>Net income applicable to investment under terms of second mortgage</b>	<b>\$253,203</b>

The Coast Valleys Gas & Electric Company, which serves an area of approximately 500 square miles, showed an increase in net earnings which was not proportionate to the increase in gross owing largely to increased taxes and increased depreciation reserve. The earnings statement for the year ended June 30, 1914, is as follows:

<b>Gross earnings:</b>	
Electric	\$165,626
Gas	43,791
Water	21,234
Miscellaneous	9,333
<b>Total</b>	<b>\$239,984</b>
<b>Operating expenses, depreciation and taxes:</b>	
Operating expenses	\$128,207
Depreciation	9,893
Taxes	11,013
<b>Total</b>	<b>\$149,113</b>
<b>Net earnings</b>	<b>\$90,871</b>
<b>Deductions:</b>	
Interest on first mortgage bonds	\$51,207
Interest on second mortgage bonds	2
Interest on notes and accounts payable (net)	9,440
Uncollectible accounts	716
<b>Total</b>	<b>\$61,365</b>
<b>Net income for year</b>	<b>\$29,510</b>
<b>Net income for period March 20, 1912-June 30, 1912</b>	<b>\$5,118</b>

**United Fuel & Power Granted Time Extension.**—The California Railroad Commission has extended the time in which the United Fuel & Power Company may issue \$197,000 of stock, previously authorized by the commission, to Jan. 1, 1916.

## UTILITIES AHEAD OF PREVIOUS YEAR

### Companies Show Gain of 5 per Cent in Gross and 2 per Cent in Output

During October the central-station companies of New England, according to statistics received by the *Electrical World*, were ahead of last year in both income and output despite continued industrial depression. For the most part

TABLE I—COMPARATIVE RETURNS COVERING 60 PER CENT OF THE CENTRAL-STATION INDUSTRY OF THE NEW ENGLAND STATES

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
May	\$1,704,102	\$1,573,119	8.4	51,519,410	49,752,133	3.6
June	1,467,791	1,356,552	8.3	50,456,031	45,368,312	11.6
July	1,551,797	1,419,597	9.3	50,644,731	45,861,737	10.4
August	1,608,730	1,489,213	7.5	52,398,832	49,576,095	5.5
September	1,658,740	1,556,250	6.7	55,056,974	53,017,201	3.9
October	1,804,918	1,719,573	5.0	59,989,812	58,795,980	2.1

companies operating in the larger cities did very well, as did also the companies which conduct mostly a lighting business in the smaller communities. In most cases companies engaged in generating energy for commercial purposes in the smaller and medium-sized towns showed an increase over last year in gross receipts, but fell behind in

TABLE II—RETURNS FOR SEVEN-MONTH PERIOD FROM NEW ENGLAND ELECTRIC UTILITIES

	INCOME DERIVED FROM SALE OF ENERGY			ENERGY OUTPUT IN KW-HR.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
April (52 per cent of industry)	\$1,501,773	\$1,384,225	8.5	43,386,624	39,181,988	10.8
May (65 per cent of industry)	1,745,160	1,609,234	8.4	52,752,247	50,779,103	3.9
June (67 per cent of industry)	1,560,872	1,442,178	8.3	53,463,013	48,049,756	11.1
July (70 per cent of industry)	1,670,819	1,530,410	9.2	54,074,533	49,255,803	9.8
August (71 per cent of industry)	1,734,583	1,607,649	7.5	55,801,224	52,913,483	5.4
September (71 per cent of industry)	1,811,762	1,696,997	6.8	59,763,538	57,081,873	4.7
October (76 per cent of industry)	2,011,672	1,923,073	4.7	71,041,590	68,987,478	3.0

kilowatt-hour output. It was owing mostly to the diversity of their load that the companies in the large cities did well, while the purely lighting companies did well because they were engaged in the manufacture of a necessity. The companies which reduced their output can attribute this principally to their very small diversity of load.

## Business Notes

**The Beacon Miniature Electric Company**, New York, has changed its address from 108 Duane Street to 118 Duane Street.

**The Diehl Manufacturing Company**, Elizabeth, N. J., has appointed C. A. S. Howlett, formerly of the General Electric Company, vice-president.

**The Reliance Electric & Engineering Company**, Cleveland, Ohio, has appointed E. F. J. Lindberg, formerly of the Central Electric Company, as manager of its Chicago office.

**The Goulds Manufacturing Company**, Seneca Falls, N. Y., has opened an office at Atlanta, Ga. This office is in the Third National Bank Building and is in charge of O. B. Tanner, who is district manager.

**The Robbins & Myers Company**, Springfield, Ohio, has appointed C. R. Hunt, formerly with the General Electric Company, the Crocker-Wheeler Company and the Cutler-Hammer Manufacturing Company, and G. H. Gibbs, formerly with the Western Electric Company and the Westinghouse Electric & Manufacturing Company, in charge of its exhibits at the San Francisco and San Diego expositions respectively. At the close of the Panama-Pacific Exposition Mr. Hunt will maintain a permanent office in San Francisco. The New York offices of the above company have been transferred from 145 Chambers Street to 30 Church Street, Room 400. The warehouse of the company is at 155 Hudson Street.

## New Industrial Companies

**The Leindorf Electric Light Company**, of New York, N. Y., has been incorporated by E. Leindorf, H. Trisch and J. Katz, of New York, N. Y. The company is capitalized at \$25,000 and proposes to do an electrical and general contracting business.

**The Baker Electric Motor Service Company**, of Brooklyn, N. Y., has been incorporated with a capital stock of \$20,000 by B. R. Spears, Frederick Bowers and F. A. Jennicky, 906 Eastern Parkway, Brooklyn, N. Y. The company proposes to deal in automobiles and boats.

**Toll & Company**, of New York, N. Y., have been chartered with a capital stock of \$10,000 to manufacture electrical apparatus for dentists and physicians. The incorporators are Spencer E. Toll, N. M. Toll and K. H. Bissell; Morris Friedburg, 140 Nassau Street, New York, is attorney.

**The Royal Electric Motor Company**, of New York, N. Y., has been incorporated by Abraham Zwenitzky, Isaac Joffe and Benjamin Schwartz; Abraham Miles, 37 Graham Avenue, Brooklyn, is attorney. The company is capitalized at \$9,000 and proposes to do a general electrical contracting business.

## Trade Publications

**Electric Toaster.**—A small electric toaster is the subject of a leaflet sent out by the Cadillac Electric Manufacturing Company, Cadillac, Mich.

**Electrical Devices.**—Catalog No. 203, issued by the W. A. Bonnell Company, New York, contains information on a number of electrical devices.

**Commutator Truing Device.**—Jordan Brothers, Inc., New York, have issued a thirty-two-page illustrated catalog on a commutator truing device.

**Electric Grinders.**—Portable electric grinders are the subject of Bulletin No. 1 recently issued by the Atwater Electric Works, Coopersville, N. Y.

**Sockets.**—The Best Electric Company, Fifty-first Street and Harrison Street, Pittsburgh, Pa., is sending out a folder describing several types of lamp sockets.

**Motorless Flasher.**—The M. C. Ryan Company, Phoenix, N. Y., is sending out a folder containing information on several types of solenoid-operated flashers.

**Electric Passenger Cars.**—The Ohio Electric Car Company, Toledo, Ohio, has published an attractively illustrated catalog describing some of its passenger vehicles.

**Lamp Guards.**—A folder describing and illustrating several types of lamp guards for incandescent lamps has been issued by Harvey Hubbell, Inc., Bridgeport, Conn.

**Battery-Operated Hand Lamp.**—The Metal Specialties Manufacturing Company, Chicago, Ill., has issued several leaflets describing a lamp which can be attached to a dry cell.

**Portable Electric Tools.**—Motor-driven drills, buffers, grinders, etc., are described and illustrated in a catalog published by the Temco Electric Motor Company, Leipsic, Ohio.

**Electric Toaster.**—The P. J. Electric Heating Company, 332 South LaSalle Street, Chicago, Ill., is sending out a leaflet which gives a few of the features of its low-priced toaster.

**Electric Passenger Cars.**—The Anderson Electric Car Company, Detroit, Mich., has issued an attractively illustrated catalog describing its 1915-model pleasure automobiles.

**Porcelain Devices.**—The Illinois Electric Porcelain Company, Macomb, Ill., has published an illustrated catalog containing descriptions of knobs, cleats, tubes, insulators, etc.

**Concrete Lighting Standards.**—Morrison & Quinn, Inc., Rochester, N. Y., are sending out a booklet and sheet which contains information on ornamental concrete lighting standards.

**Automatic Switch.**—Bulletin No. 11 published by the Hartman Electrical Manufacturing Company, Mansfield, Ohio, describes an automatic cut-in and cut-out switch for small lighting plants.

**Hand Lamp Operated by Dry Cell.**—The Manhattan Electrical Supply Company, 17 Park Place, New York, has recently issued a folder which describes and illustrates a lamp operated by a dry cell.

**Electric Devices.**—The Union Electric Company, Hamilton Avenue, Trenton, N. J., has issued several folders which contain information on sockets, receptacles, pendent switches and snap switches.

**Engine-Stopping Devices.**—The Consolidated Engine Stop Company, 130 East Twelfth Street, New York, has issued several illustrated booklets which describe its engine-stopping and speed-limiting devices.

**High-Frequency Generator.**—The Bleadon-Dunn Company, 208 North Fifth Avenue, Chicago, Ill., has issued several bulletins which describe its recently developed "Violetta" high-frequency generator.

**Portable Lighting Fixtures.**—The C. Spiro Manufacturing Company, 68 East 131st Street, New York, has issued a leaflet describing a portable lighting fixture which can be attached to tables, desks, chairs, etc.

**Porcelain Sockets.**—A heavy porcelain socket equipped with aluminum shade holders is described in a folder recently issued by the Federal Sign System (Electric), Lake and Desplaines Streets, Chicago, Ill.

**Removable Bracket.**—"Hotel Sample-Room Lighting" is the subject of a folder recently issued by the Bryant Electric Company, Bridgeport, Conn., which contains information on a removable bracket for incandescent lamps.

**Desk Push-Button System.**—"The Edwards Directory Push" is the title of a folder recently issued by Edwards & Company, 140th and Exterior Streets, New York, which contains information on push-button stations for call systems.

**Apparatus for Softening Water.**—"Chemistry of Water Softening" is the subject of a booklet being sent out by the Kennicott Company, Chicago Heights, Ill. The booklet contains information on apparatus for softening, weighing and filtering water.

**Insulating Compound.**—The Flexible Compound Company, 3607 Haverford Avenue, Philadelphia, Pa., has issued a booklet which describes a compound which may be used as a binder for paint pigments and for treating coils, third-rails, transformers, etc.



## Personal Mention

Mr. J. S. Pevear has resigned as president of the New Orleans (La.) Railway & Light Company. He is succeeded by Mr. D. D. Curran.

Mr. P. T. Glidden, manager of the Consumers' Power Company, St. Paul, Minn., has been elected president of the local Association of Commerce.

Mr. E. J. Bean, formerly attorney for the Public Service Commission of Missouri, has succeeded Mr. William F. Woerner as a member of the commission.

Mr. W. P. Hendricks, superintendent and master mechanic of the Elgin & Belvidere Electric Company, Marengo, Ill., has resigned to engage in other work.

Mr. H. L. Moss, formerly electrical engineer of the Elgin & Belvidere Electric Company, Marengo, Ill., has been appointed acting superintendent to succeed Mr. W. P. Hendricks, resigned.

Mr. A. N. Connett, chief engineer and a joint managing director of J. G. White & Company, Ltd., of London, has accepted the position of a vice-chairman of the Belgian Relief Commission and will go to Brussels to take charge of the distribution of the food and other means of relief being sent to that country from America. Mr. Connett is now in this country, but expects to leave for London on Dec. 30 to receive instructions before going to Brussels.

Mr. H. Thurston Owens, until recently secretary and general manager of the San Diego (Cal.) Gas & Electric Appliance Company, has become associated with the lighting fixture house of Bayley & Sons, with headquarters at 101 Park Avenue, New York City. Mr. Owens has been in the lighting business for fifteen years with the Consolidated Gas Company, the city of New York and the *American Gas Light Journal* and was recently general manager of the La Crosse (Wis.) Gas & Electric Company. He has also been actively identified with the work of a number of gas and electric associations.

Mr. W. L. Locke, superintendent of construction of the Stone & Webster Engineering Corporation, has taken up his activities as head of the construction department at Seattle, Wash. Mr. Locke was in Seattle prior to his assuming charge of the transmission line from the Big Creek development project, in California, to Los Angeles, where he was put in charge of the Los Angeles office, under Mr. Shuffleton. Before going to the Big Creek project Mr. Locke had charge of local construction in Seattle for the engineering corporation which at that time did all of the construction work for the Seattle Electric Company.

Mr. E. E. Eysenbach has resigned as general manager of the San Antonio (Tex.) Traction Company and of the San Antonio Gas & Electric Company to devote attention to his private interests in Oklahoma. Mr. Eysenbach was formerly vice-president and manager of the Consolidated Gas Company of New Jersey, Long Branch, a consolidation of the Long Branch Gas Light Company and the Long Branch Electric Light Company. His duties at San Antonio will be taken over temporarily by Mr. W. B. Tuttle, vice-president of the companies. Before Mr. Eysenbach left San Antonio he was waited on by a committee and presented with a silver coffee service from the men as a token of their esteem.

Mr. D. D. Curran, now president of the New Orleans & Northeastern Railroad, has been elected president of the New Orleans (La.) Railway & Light Company to succeed Mr. J. S. Pevear, resigned. Mr. Curran, who is a railroad man of long experience, was born in Ireland. He entered railroad service in 1873 as a brakeman on the Pennsylvania Railroad, which position he held for five years. He was then successively freight conductor of the Mobile & Montgomery Railroad, passenger conductor of the same road, yardmaster of the Louisville & Nashville Railroad at Montgomery and trainmaster of the same road at Birmingham, Ala. From 1887 to 1893 Mr. Curran was connected with the Central of Georgia Railroad successively as superintendent of the South Carolina division, superintendent of the Southwestern division, superintendent of the Columbus & Western division and superintendent of the Savannah and Western division. He

was appointed to the last-mentioned position in 1892. From February, 1893, to August, 1907, he was superintendent of the New Orleans & Northeastern Railroad. In August, 1907, he was elected president of that company.

Mr. Alonzo Rogers Weed, a member of the Massachusetts Gas and Electric Light Commission since 1906, has been designated chairman of the board by Governor Walsh to succeed the late Forrest E. Barker. The new chairman was born in Bangor, Maine, in 1867, and was graduated from Harvard College in 1887, receiving the degree of LL.B. from Boston University in 1890, in which year he was admitted to the Massachusetts bar. Mr. Weed practiced law in partnership with his brother, Mr. G. M. Weed, at Boston until 1906, and in 1907 became a member of the firm of Brewer, Weed & Weed, Boston. He was at one time instructor in equity in the Boston University Law School, and from 1902 to 1913 was instructor in equity pleading at the same institution, becoming acting dean in 1911. From 1899 to 1903 he was a member of the Newton (Mass.) Board of Aldermen, serving as president in the latter year. In 1904-5 Mr. Weed was Mayor of Newton, becoming a member of the Gas and Electric Light Commission in the year following. In politics he is a Republican and is a member of the Hunnewell Club of Newton and of the Boston City Club. The new chairman's eight years of service upon the board have thoroughly familiarized him with its problems, and in the important codification of laws relating to the production and distribution of gas and electricity which was approved by the last Legislature Mr. Weed bore large responsibilities. Like his predecessor, Mr. Weed possesses under a quiet exterior keen analytical powers and a broad comprehension of technical matters in addition to distinguished legal qualifications. His home is at Newton.

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## Obituary

Gen. Thomas Sherwin, chairman of the board of directors and for twenty-five years president of the New England Telephone & Telegraph Company, died at his home in Boston, Mass., on Dec. 19. He was a native of Boston and was graduated from Harvard College in 1860 at the age of twenty-one. General Sherwin had a notable Civil War record, being brevetted brigadier-general at its close for gallant and meritorious services. He was associated with the development of the telephone business practically from its inception, and for twenty-three years was auditor of the American Bell Telephone Company. He was a man of the highest character and ability, had a delightful personality, and was a director in numerous industrial corporations.

William H. Coughlin, whose death was noted in the *Electrical World* of Dec. 19, was widely known in the New England central-station field. Although Mr. Coughlin belonged to the old school of central-station men, in which operating problems and the pursuit of economies in generating plant service took precedence over purely commercial interests, the Worcester (Mass.) Electric Light Company developed under his able direction along sound lines which furnished a firm basis upon which the remarkable recent expansion of the system has been built. Primarily a steam engineer, Mr. Coughlin supervised the physical growth of the Worcester system with skill and loyalty, and the commercial development which took place during the years of his service, while largely stimulated from without, was guided by him into profitable channels with a practical appreciation of the importance of service extension which was none the less real because his own talents lay along more technical lines. A frequent attendant at conventions of the National Electric Light Association, Mr. Coughlin was always a good listener, and although he was reluctant to express himself before an audience, many a central-station man owes much to his homely, shrewd and penetrating comment upon electrical affairs as advanced in informal conversations outside the session hall. For many years he was virtually general manager of the Worcester company, and his passing removes one more figure associated with early central-station history whose quiet influence was a factor to be reckoned with in the development of the great industry of to-day.

## Construction

### New England

**MARLBORO, MASS.**—Plans are being considered for the installation of an ornamental street-lighting system on Main Street.

**WALTHAM, MASS.**—Plans are being considered for improving the street-lighting system and the installation of additional ornamental lamps.

**PROVIDENCE, R. I.**—Plans have been prepared for the construction, in addition to the art school, for consideration by the School of Design (to cost \$250,000), to be located on North Main Street. The project also includes a power house.

**WINSTED, CONN.**—Plans have been prepared for an addition to the power station of the Winsted Gas Co. by E. H. Waterbury, of Torrington. The building will be 20 ft. by 64 ft.

### Middle Atlantic

**BEACON, N. Y.** (not a post office).—The installation of a municipal electric-lighting plant in Beacon is being considered.

**BERGEN, N. Y.**—The Village Board has approved the contract presented by the Niagara, Lockport & Ontario Pwr. Co., of Buffalo, to supply electricity to operate the municipal electric-lighting system.

**BROOKLYN, N. Y.**—Bids will be received by William Williams, commissioner of Water Supply, Gas and Electricity, Municipal Building, New York, until Dec. 31 for reserving and furnishing electrical generating capacity, current and equipment for use of the high-pressure fire-service pumping stations for the year 1915. Blank forms of bid, proposals and contract, including specifications, can be obtained at Room 2324, Municipal Building, borough of Manhattan.

**BUFFALO, N. Y.**—If a plan proposed by the Department of Public Works and passed by the Common Council meets the approval of the Mayor, an electric-light and power plant will be installed at the new pumping station at the foot of Porter Avenue. The proposed plans provide for the development of 250 hp at a cost of about \$100,000.

**DUNKIRK, N. Y.**—The contract for furnishing the lighting fixtures (300) for the new street-lighting system has been awarded to the Adams-Bagnall Co., of Cleveland, to \$64.41 each. The Westinghouse El. & Mfg. Co., of Pittsburgh, Pa., will furnish the incandescent lamps.

**ELBA, N. Y.**—The Genesee Lt. & Pwr. Co., of Batavia, it is reported, is contemplating extending its lines to Elba to furnish electrical service here.

**LANCASTER, N. Y.**—The Depew & Lancaster Lt. Pwr. & Conduit Co., of Lancaster, is planning to extend its transmission lines to West Seneca to furnish electricity for street-lighting and for commercial purposes. The proposed substation will be located at Gardenville and equipped for receiving energy at 11,000 volts, three-phase, 25 cycles, and distributing it at 2700 volts, including necessary transformers, regulators, switchboards, etc., for distributing electricity for street-lighting system (tungsten lamps) and for lamps and motors for commercial purposes. About 500 poles with necessary line wire, hard wire, street fixtures, transformers, etc., will be required. Contracts have already been placed for poles and line wire in the amount of 60 cp with fixtures. The company will install the equipment but would like to receive prices on the above apparatus and material. A. R. Tremaine is superintendent.

**MECHANICSVILLE, N. Y.**—The Public Service Commission has given its approval of the franchise of the Mechanicville El. Lt. & Gas Co. from the town of Schaghticoke and has also granted permission to exercise the same under a contract with the town for lighting Hemstreet Park and the eastern portion of the bridge from Mechanicville.

**NEW YORK, N. Y.**—Bids will be received by William Williams, commissioner of Department of Water Supply, Gas and Electricity, Municipal Building, New York, N. Y., until Dec. 31 for reserving and furnishing electrical generating capacity, current and equipment for use of the high-pressure fire-service pumping stations for the year 1915. Blank forms of bid, proposals and contract, including specifications, can be obtained at Room 2324, Municipal Building, borough of Manhattan.

**PLEASANT VALLEY, N. Y.**—The J. B. Thompson Co. is contemplating enlarging the electric plant at its mill to supply electricity for lighting the streets of the town

**POLAND, N. Y.**—Plans are being considered by the officials of the village of Poland and Cold Brook for the construction of a joint electric-light plant to serve both villages. It is proposed to build the plant on Cold Brook stream.

**STILLWATER, N. Y.**—The residents have petitioned the Town Board to install an electric-lighting system in the "Frog Island" district.

**WATERBURY, N. Y.**—The capital cost of the New York Utilities Co., of Waterbury, has been increased from \$1,000,000 to \$2,000,000. The company proposes to supply electricity and gas in Jefferson, Lewis, Oneida, Oswego and St. Lawrence (County) counties.

**ALLENTOWN, PA.**—Bids will soon be asked for electrical equipment for the new high school building now being erected in this city at a cost of \$500,000.

**ALLENTOWN, PA.**—Work has been started on the construction of a new armory in Allentown, Pa., at a cost of \$1,000,000. The building will be lighted by electricity.

**CAERNARVON, PA.** (not a post office).—Application has been made to the Governor by George L. Nies, William Swigart and D. S. Martin on Dec. 18 for a charter for the Caernarvon El. Lt. & Pwr. Co. The company proposes to supply electricity for lamps, heaters and motors in Caernarvon Township.

**EASTON, PA.**—The Hart Chemical Corp., recently organized, will begin work on the erection of a large plant next spring for the manufacture of potash and a line of chemicals similar to those until recently imported into this country from Germany. Electrically operated machinery, it is said, will be used throughout the proposed plant. Dr. Edward Hart, professor of chemistry at Lehigh University, is president, and Gilbert Dannehower is mechanical engineer.

**HAZLETON, PA.**—The Harwood El. Co., of Hazleton, has awarded the contract for erecting a transmission line from Hazleton to Hauto to Rodney D. Allen. During the recent storm 5 miles of steel towers, on which were erected high-tension wires, were blown down.

**KUTZTOWN, PA.**—The Borough Council has voted to erect a new municipal electric plant to supply electricity for both municipal and commercial purposes, at a cost of about \$23,000, bonds for which were voted last November. The present plant will be operated until the new plant is completed. F. A. Moyer is chairman of the electric-light committee.

**LANSFORD, PA.**—The Panther Valley El. & Pwr. Co., of Lansford, has recently awarded a contract to the General Electric Co. for the following apparatus: 600 kw in substation transformers, 20 switchboard panels, four 750-volt, 25-cycle, 3-phase, 4-wire, lightning arresters, etc. The company receives energy at 1100 volts, 60 cycles, from the Lehigh Navigation El. Co.

**LAURELTON, PA.**—Plans, it is reported, are being prepared for the construction of a power house in Laurelton, to cost about \$6,000.

**MONACA, PA.**—Plans are being considered by the City Council for the purchase of the distributing systems of the Monaca El. Co. and the Beaver County Lt. Co., which at present supply electricity here. The city is contemplating the installation of a municipal electric plant. The contract with the above companies expires Sept. 1, 1916.

**MOUNT UNION, PA.**—The Council has recently closed a contract with the Raystown Wtr. Pwr. Co., of Raystown, Pa., for a 10-year term, with the privilege of renewal of ten years with the privilege of renewal of two additional terms of five years each. The contract calls for nitrogen-filled tungsten lamps and 100 cp.

**SOUTH BETHLEHEM, PA.**—The Borough Council has passed an ordinance authorizing the borough officials to enter into a contract with the Lehigh Valley Lt. & Pwr. Co., of Allentown, to light the streets of the borough for a period of five years. A. H. S. Croul is general manager of the company.

**CAMDEN, N. J.**—Contracts, it is reported, will soon be awarded to the Victor T. King Machine Co. for extensions to its plant in Camden, to cost about \$1,000,000. The work, it is understood, will include a restaurant, hospital and power plant. Louis F. Geisler is general manager.

**BALTIMORE, MD.**—The Board of Awards has awarded the contract for furnishing electricity for operating and lighting the filtration plant at Lake Montebello, at about \$40,000 per year.

**CHESAPEAKE, VA.**—The Chesapeake & Ohio Ry. Co., it is reported, is contemplating equipping its Guyandotte Valley

branch for electrical operation during the summer season. It is proposed to use electric locomotives, receiving the energy from either an overhead trolley or a third-rail.

**CLIFTON FORGE, VA.**—The Virginia-Western El. Co., of Clifton Forge, Va., is reported, is contemplating extending its transmission lines to Buchanan.

**REHOBOTH, VA.**—Arrangements have been made by the State Land Board with the Chesapeake El. Co. for furnishing electricity for lamps and motors for the plant. Electric lamps will be placed in the houses which will house the convicts and officers in charge of the plant. At present steam power is used.

**WASHINGTON, D. C.**—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Jan. 7 for furnishing five electric lamp standards for the United States Bureau of Engraving and Printing, Washington, D. C., in accordance with plans and specifications, copies of which may be seen at the above office. O. Wenderoth is supervising architect.

**WASHINGTON, D. C.**—In his report Gen. Dan C. Kingman, chief of engineers, has renewed the recommendation of his predecessors in office looking to the utilization of the water of the Great Falls of the Potomac to generate electricity for the District of Columbia. He asks Congress for an appropriation of \$3,000,000 for preliminary work, of which \$1,000,000 is to be applied to construction needed for increased water supply and \$2,000,000 for construction of power plant.

**WASHINGTON, D. C.**—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Jan. 12 for furnishing at the various navy yards and naval stations supplies as follows: 1. Battery, No. 1, Schedule 7734—miscellaneous engine indicators and accessories; Schedule 7727—miscellaneous insulating material; Schedule 7740—four 36-in. parabolic searchlight mirrors; Schedule 7735—three meat and food choppers, one dish-washing machine, one dough-mixing machine and one kitchen and cake machine, all to be electrically operated; Schedule 7740—5000 lb. of lead, 1000 lb. brass bars, 1700 lb. hard-drawn bar copper; Schedule 7728—746 unfinished heavy brass unions, Norfolk, Va.; Schedule 7728—1700 ft. interior communication cable, 2550 ft. lighting and power wire; Washington, D. C.; Schedule 7725—six retorts; Schedule 7735—miscellaneous single-conductor and rubber-covered copper wire; Philadelphia, Pa.; Schedule 7735—5000 ft. flexible cord for portables; Charleston, S. C.; Schedule 7721—two motor-driven buffing lathes; Newport, R. I.; Schedule 7734—300 lb. of brass, seamless tubing; Bids will also be received at the same place until Jan. 19 for the following: Washington, D. C.; Schedule 7745—one motor-driven, 100-hp, 25-cycle, 3-phase, 4-wire, 240-volt, Schedule 7744—miscellaneous hard, not tinned, sheet copper; Schedule 7742—miscellaneous black and galvanized wrought-iron pipe, 36-in. diameter; Schedule 7744—miscellaneous pipe fittings, 3000 lb. 1½-in. seamless drawn brass pipe and 240 1½-in. composition unions. Applications for proposals should designate the schedule desired by number.

### North Central

**AKRON, MICH.**—The town of Akron is contemplating the installation of a municipal electric-light plant.

**BATTLE CREEK, MICH.**—Within the next six months the Citizens' El. Co. expects to purchase a 1500-kva turbine and boilers having a rating of about 1000 hp. D. H. Beasly is president.

**CARLETON, MICH.**—The Town Council is considering the question of lighting the town by electricity.

**DETROIT, MICH.**—The City Council has authorized George Engle, city controller, to issue \$350,000 in bonds for the purpose to be used for improvements to the lighting system.

**SHERWOOD, MICH.**—The Council has granted Mr. Latchan permission to install an electric lighting system in Sherwood. **FLIANCE, OHIO.**—The trustees of the Fairmount Children's Home have awarded the contract to furnish electricity for lamps and motors at the Fairmount Children's Home to the Alliance El. & Pwr. Co. The present steam plant will be discarded and motor-driven pumps will be installed and the laundry equipment will be operated by electricity.

**CANAL DOVER, OHIO.**—The installation of an additional 350-hp gas engine and generator, to cost about \$20,000, will be recommended to the City Council by Fred



Warner, chief engineer. An addition to the present power station will be necessary to provide space for the proposed generating unit.

**CINCINNATI, OHIO**—Plans are being prepared for the installation of a new service station for electric vehicles, for Charles Behlen & Sons, on Rockdale Avenue. The building will be 50 ft. by 100 ft.

**CINCINNATI, OHIO**—Spear & Co., Fifth Street and Central Avenue, furniture dealers, have leased a building on Race Street, which will be remodeled at once. The proposed improvements will include the installation of additional electric lines and an electric-light plant, to cost about \$15,000.

**DAYTON, OHIO**—Petitions are being circulated among property owners on a number of additional streets to secure the extension of the proposed ornamental street-lighting system.

**EAST LIVERPOOL, OHIO**—The City Council is contemplating the installation of a municipal electric-light plant, to cost about \$60,000, plans for which have been prepared.

**ELYRIA, OHIO**—The Lorain County El. Co. of Elyria, has applied to the Public Utilities Commission for permission to increase its capital stock from \$10,000 to \$300,000, with a view of establishing a power station and developing the territory surrounding Lorain and Elyria into a manufacturing district. The company has applied for permission to issue \$300,000 in bonds, the proceeds to be used to purchase the holdings of Henry A. Doherty, which include the Citizens' El. Co., and the Elyria Milling & Pwr. Co. Additional generating plant, transmission lines and distributing systems are contemplated. The proposed power plant will have a generating capacity of 15,000 kw, which is fed approximately 100 miles of transmission lines through substations. The Doherty company owns the Baltimore & Ohio power plant in Lorain, which will be changed and made the chief distributing point.

**GALLIPOLIS, OHIO**—The Indian Guyan Coal Co., recently organized with a capital stock of \$300,000 to operate coal-mining properties near it, is understood, proposes to build a hydroelectric power plant on the Ohio River. The proposed plant will have an output of 3000 hp, which will be used in connection with mining operations and to operate an electric railway. S. L. Fedder, of Cleveland, and others are interested in the company.

**RIFLEY, OHIO**—The City Council, it is reported, has appointed a committee to make investigations as to the feasibility of purchasing the local electric-light and gas plant, to be owned and operated by the municipality.

**S. PARIS, OHIO**—The Dayton Lt. & Pwr. Co. of Dayton is negotiating with the Village Council for the purchase of the municipal electric-light plant, or furnishing electricity to operate the local system. If the plant is not purchased, the company will supply for operating the local system will be supplied from the power house in Piqua.

**TIFFIN, OHIO**—The Ohio Lt. & Pwr. Co., of Tiffin, proposes to use the proceeds of \$1,200,000 in bonds for the erection of transmission lines connecting its various properties into main operating groups. The company operates in 11 municipalities in Ohio.

**WILMINGTON, OHIO**—Preparations are being made by the Dayton Lt. & Pwr. Co. for improvements to the local electric plant, which it recently acquired from the Wilmington Wrt. & Lt. Co. The purchase of the property at Cedarville, Lt. & Pwr. Co., of Cedarville, is also contemplated by the Dayton company. If the sale is approved by the Public Utilities Commission, additional equipment will be installed at the plant.

**YOUNGSTOWN, OHIO**—The Public Utilities Commission, has attached the American El. & Pwr. Co. permission to purchase the plant of the Youngstown Hig. Co., at \$125,000. The commission also granted the Mahoning company authority to sell \$300,000 in bonds at 90 and to issue \$500,000 for the construction of the plant.

**HOPKINSVILLE, KY**—The new generating station of the Kentucky Pub. Ser. Co. at Hopkinsville is completed. The old plants of the company will be closed station, which is supplied from the new station in Hopkinsville will also furnish energy in Clarksville, Tenn., Pembroke and Tipton, Ky.

**STURGIS, KY**—The West Kentucky Coal Co., it is reported, has decided to rebuild its power plant in Sturgis, which was recently destroyed by fire, causing a loss of about \$20,000.

**VINE GROVE, KY**—The capital stock of the Citizens' Ltg. Co. has been increased from \$3,000 to \$5,000.

**INDIANAPOLIS, IND.**—After receiving reports on tests made by the city engineer of the use of public works for the Merchants' Lt. & Ht. Co. to use the flaming lamps in fulfilling its contract with the city.

**MILFORD, IND.**—A franchise, it is reported, has been granted to Emil Stroh to operate an electric-light and power system in MILFORD Township.

**PENNVILLE, IND.**—Steps have been taken by citizens of Pennville to organize a company to establish an electric-light plant in Pennville.

**PERU, IND.**—The City Council has authorized the Electric Light Department to extend the municipal electric lines to Loree and Crider Chapel, a distance of 7 miles, to provide electric service to the farmers in that district.

**EAST DUBUQUE, ILL.**—The generating plant of the municipal electric-lighting system has been closed down and electricity for operating the system is purchased from the El. Co. of Dubuque, Ia. R. T. Stewart is superintendent.

**GRANVILLE, ILL.**—Sidney Whitaker, owner of the local electric-light plant, is installing a 120-hp Chuse non-releasing Corliss engine.

**LOUISVILLE, ILL.**—I. N. Stanford & Son, of Louisville, are contemplating the installation of an ice factory in connection with the water and light plant next spring.

**MOUNT VERNON, ILL.**—The Citizens' Gas, Lt. & Ht. Co. of Mount Vernon, has recently installed a 100-kw General Electric rotary converter to supply electricity to operate the system of the City Railway Co. H. E. Brandt is general manager.

**BLOOMINGDALE, ILL.**—Plans are being considered for the installation of an ornamental street-lighting system in the business district.

**LADYSMITH, WIS.**—W. D. Morgan, city engineer, would like to receive prices on the installation of a first-class alarm and an electrically operated general fire alarm or siren.

**SHAWANO, WIS.**—All bids for proposed new wells and pipe line to river have been rejected, owing to being too high. The work will now be done by contract. J. Caparo is superintendent of the city water and light plant.

**HIBBING, MINN.**—The installation of a new municipal electric-light plant in Hibbing is reported to be under consideration.

**MAPLETON, MINN.**—Within the next four months C. L. Sellers, owner of the local electric-light plant, expects to erect about 10 miles of transmission line and to purchase transformers, lightning arresters, insulators and wire for the line, about 125 meters and also a general supply of electrical appliances, including heating and cooking apparatus, vacuum cleaners, washing machines, wiring supplies and switches.

**MINNEAPOLIS, MINN.**—Bids will be received at the State Board of Control, State Capitol Building, St. Paul, until Jan. 7, for construction of Biology Building at the University of Minnesota, including general contract work, heating and ventilating, plumbing and electrical work, in accordance with plans and specifications prepared by C. E. Johnston, architect, 715 Capital Bank Building, St. Paul. Bids will be received collectively and separately. Copies of plans and specifications may be seen at the Builders Exchange, St. Paul, Minneapolis and Duluth, at the office of the State Board of Control, and at the office of the controller of the University of Minnesota.

**ST. PAUL, MINN.**—The Commissioner of Public Utilities has authorized August Hohenstein, purchasing agent, to advertise for bids for nitrogen-filled lamps. It is expected that about 400 old-style arc lamps will be replaced by these new lamps. About 200 additional lamps will be placed in new locations. Bids for energy to maintain the city lamps will be asked for shortly.

**HUMBOLDT, IA.**—Work has begun on the transmission line to be built by the Northern Iowa Pwr. Co. to supply electricity in the towns of Livermore, Luverne and Corwith. The company has also made arrangements to supply electrical service in Havelock.

**LEON, IA.**—Preparations are being made by the Leon El. Co. for the erection of an electric transmission line to Osceola and the installation of a new engine and generator in its plant. Arrangements have been completed whereby the Leon company will supply electricity to operate the system of the Osceola Lt. & Pwr. Co. Electric service will also be supplied to the towns of Van Wert and Weldon.

**RUSSELL, IA.**—The Union Service Co., of Chariton, is reported to have been granted a franchise to supply electricity in Russell. A transmission will be erected from Chariton to Russell.

**REPTON, IA.**—An election held recently by the citizens voted in favor of municipal ownership of the electric light and power plant.

**URBANA, IA.**—Bonds to the amount of \$3,000 have been voted for the installation of an electric-lighting system.

**BRUNSWICK, MO.**—The Brunswick Lt. & Wtr. Co. is installing one 150-hp boiler, a Murray Corliss engine, one single-acting triple pump (motor driven) and one 15-hp Porter-Caplan engine. Lincoln A. Nickell is manager.

**CAMERON, MO.**—Plans for improvements to the municipal electric-light plant, it is reported, are being prepared by Harper & Stiles, 911 Grand Avenue Temple, Kansas City, Mo. The plans provide for improvements to power house and installation of new machinery.

**GRANT CITY, MO.**—John W. Ewing and W. C. Childers, who recently have taken over the power plant of Grant City, Mo. & Pwr. Co. are building a new power house and installing an oil engine.

**JAMESPORT, MO.**—Plans are being considered for the installation of a municipal electric-light plant in Jamesport. It is understood that nothing will be done until next spring.

**MARSHFIELD, MO.**—Within the next two months the Marshfield El. Co. expects to erect a small machine shop, the equipment for which is being ordered. The company is also planning to install a welding outfit and press drill, gasoline engine and motor. John E. Hosmer is secretary and treasurer.

**STOUTSVILLE, MO.**—The installation of a municipal electric-light plant in Stoutsville is under consideration.

**FAIRBURY, NEB.**—The transmission line of the municipal electric-light plant to Jansen (12 miles long), where electrical service will be furnished, is nearly completed. The Fairbury El. Co. commissioners are negotiating with several towns to furnish electricity from the municipal electric-light plant. A new 75-kw alternator and one 150-hp motor, purchased recently, have been installed at the municipal plant. G. D. Myers is manager.

**BONNER SPRINGS, KAN.**—The Kansas City, Kaw Valley & Western Ry. Co., operating an electric railway from Bonner Springs to Lawrence, Kan., will, it is reported, ask for bids about Jan. 1 for completing 21 miles of railway, including grading, laying track and erection of power line.

**COLUMBUS, KAN.**—The installation of a municipal electric-light plant in Columbus is under consideration.

**GAYLORD, KAN.**—The city of Gaylord is reported to have decided to install a municipal lighting system, at a cost of \$7,000.

**MUSCOTAH, KAN.**—The city of Muscotah is contemplating the installation of a municipal electric-light plant.

**PARSONS, KAN.**—The Parsons Ry. & Lt. Co. has submitted to the City Commission for approval a plan which would provide the city with a better system for lighting streets and alleys at approximately the same cost. If adopted by the city, a ten-year contract will be asked.

## Southern States

**WHITEVILLE, N. C.**—The City Council has accepted the proposal submitted by J. D. Mackay, of Whiteville, Lt. Co. Under the present plan the company will furnish electricity for lighting the streets and the cost of installing the equipment will be paid by the property owners.

**SMYRNA, GA.**—The Nickajack Sls. & Co., it is reported, has engaged William T. McCormick, Rome, Ga., to prepare plans for remodeling its hydroelectric plant.

**MILTON, FLA.**—Within the next 12 months the water, light and sewerage committee expects to install a 100-hp, 2300-volt engine-driven generating unit and to purchase material for about 1½ miles of transmission line, including transformers. H. A. Menden is engineer.

**NEWPORT, TENN.**—The Carolina, Greenville & Northern R. R. Co., recently incorporated with a capital stock of \$1,500,000, is planning to build an electric railway from Kingsport to Newport, a distance of 30 miles. Right-of-way has been secured for a considerable distance. H. S. Reed, of Los Angeles, Cal., is president.

**GURDON, ARK.**—Preliminary plans and estimates of cost for the installation of a municipal electric-light plant, water-works

and sewer system have been prepared. The proposal will be submitted to the voters on Jan. 15.

**GRITNA, LA.**—The City Council has granted Robley S. Stearns a franchise to supply electricity in this city and also a contract for lighting the streets of the city. Plans, it is said, are being made by Mr. Stearns to organize a company to take over the franchise and contract. Work will be begun immediately on the erection of the plant.

**WEST MONROE, LA.**—The contract for the construction of an electric-light plant and for improvements in the water-works system, it is reported, has been awarded to C. A. Rees, of Shreveport, at \$16,000.

**YALE, OKLA.**—The proposal to issue \$32,000 in bonds for the installation of a municipal electric-light plant will be submitted to the voters. H. Askin, of Cushing, is engineer.

**LOCKNEY, TEX.**—The property of the Lockney L. & Pwr. Co. has been purchased by William McGhee. Improvements to the system, including the installation of a new engine, will be made by the new owner.

**MARBLE FALLS, TEX.**—The Galveston River Pwr. Co. is planning to erect an electric transmission line from its hydro-electric power plant, here under construction, to Marble Falls, to Houston and other cities and towns.

**ORANGE, TEX.**—Preparations are being made by the Orange Ice, Lt. & Wtr. Co. for extensions to its plant, work on which will begin March 1, 1915. The plans provide for the installation of one 75-kw and one 150-kw, three-phase, 60-cycle generator (not yet purchased). H. A. Burr is president.

**SMITHVILLE, TEX.**—Plans are being considered, it is reported, by Donald E. McKee, electrician, for the construction of an electric-light and power plant in the eastern part of the State. The proposed plant will have an output of about 400 hp, to be driven by steam or gas engines.

## Pacific States

**EVERETT, WASH.**—The Everett Trades Union has recently passed a resolution asking the city of Seattle to extend its electric-lighting and water service to Everett.

**EVERETT, WASH.**—The County Commissioners of Snohomish County have granted the Jim Creek Wtr. Lt. & Pwr. Co., of Arlington, a franchise to lay pipes and electric distributing systems under and over certain county roads, to enable the company to extend its service to a number of points in Snohomish County. Work on the proposed extensions and improvements, it is understood, will begin soon after the first of the year.

**SEATTLE, WASH.**—The estimate submitted to the City Council by J. D. Ross, superintendent of lighting, on the use of municipal energy, in place of that of the Puget Sound Trac. Lt. & Pwr. Co., to operate the Seattle, Renton & Southern railway under municipal ownership places the cost at \$29,780. In addition, more than \$100,000 will be required for pole-line construction, extra feeder system, necessary substations and electrical equipment to give adequate voltage at all points on the line. This last estimate is based on the theory that the city will operate 36 cars instead of 26 cars, the number now in service.

**SPOKANE, WASH.**—The installation of 40 additional arc lamps, making the total 1400, has recently been ordered by Mayor

Fassett. Bids will soon be asked for lamps and installation of same.

**GOLD HILL, ORE.**—Bids will be received by B. G. Harding, recorder, Gold Hill, until Jan. 4, for installation of a street-lighting system for the city.

**AUBURN, CAL.**—Plans are being considered by the Board of City Trustees for the installation of a municipal electric-light plant.

**CALIPATRIA, CAL.**—Plans are being considered by the Chamber of Commerce for the installation of a street-lighting system in Calipatria.

**CUCAMONGA, CAL.**—The Ontario Pwr. Co. of Ontario, it is reported, has submitted a proposal to the Council offering to install electric lamps from Base Line to the Santa Fé depot, provided that the city will sign a five-year contract.

**STOCKTON, CAL.**—The City Council has accepted the bid of the Western States Gas & El. Co. for lighting the streets and boulevards for a period of five years from Dec. 15, 1914. The contract will cover the present system and certain additional lighting.

**DOWNNEY, IDAHO.**—The City Council is contemplating the installation of street-lighting system, work on which will begin soon.

**SODA SPRINGS, IDAHO.**—At an election to be held Dec. 23 the proposal to issue \$15,000 in bonds for the installation of a municipal electric-light plant will be submitted to the voters. J. F. Woodall is chairman of board.

**GREEN RIVER, UTAH.**—Bids will be received by the Green River Irrigation District, Green River, until Jan. 1, for bare and insulated copper wire, insulators, pins, cross-arms and other line material for 7 miles of transmission and distribution lines of the electric-lighting system to be installed in Green River. Also for furnishing and installing hydraulic machinery and electrical apparatus for the power house of the Green River Irrigation District, and for 275 cedar poles from 30 ft. to 35 ft. in length. Plans and specifications may be obtained from S. J. Moor, city clerk.

**HOLBROOK, ARIZ.**—The installation of an electric-light plant is under consideration. L. S. Frith, of Holbrook, N. M., is reported interested in the project.

**JEROME, ARIZ.**—The Arizona Pwr. Co. of Clifton, has extended its transmission lines to the smelter of the United Verde Copper Co., of Clarksville, near Jerome. Other extensions are contemplated by the Arizona company.

**LUSK, WYO.**—Preparations are being made for the installation of a municipal electric-light plant in Lusk, for which bonds have been voted.

**PUEBLO, COL.**—The Arkansas Valley Ry. Lt. & Pwr. Co., of Pueblo, it is reported, has secured a contract from the El Paso Consol. G. M. Mining Co. to furnish 150 hp to operate hoists; electrically operated compressor will be installed later.

**WHITE OAKS, N. M.**—The Wild Cat Leasing Co. is constructing a new electric power plant near White Oaks, as supplement to its present plant, increasing its output to 1100 hp. The company is extending its transmission lines to the properties of the Parsons Mining Co. and the American Mining Co.

## Canada

**BANFF, ALTA.**—Plans have been prepared by C. H. Mitchell, consulting engineer of the water-power branch, Department of

the Interior, Dominion of Canada (at the request of the Canadian Pacific Ry. Co.), for a hydroelectric installation in the Rocky Mountains, at Banff.

**FORT GEORGE, B. C.**—The local electric-light plant of the Northern Interior Pwr. Co. was recently destroyed by fire.

**VICTORIA, B. C.**—The fire warden's committee of the City Council has recommended the installation of a new fire-alarm system, to cost about \$10,000.

**BROCKVILLE, ONT.**—Work will soon begin by the Hydro-Electric Power Commission of Ontario on the construction of an auxiliary power house at Brockville, to cost about \$4,000. The station will be equipped with transformers to step down the energy received at 26,400 volts over the new transmission line now under construction, from Prescott, to 220,000.

**ORILLIA, ONT.**—The Council has requested the Water and Light Commission to install fifty 100-watt tungsten lamps on Main Street from Andrew Street to the lake. It is proposed to use the poles of the telephone company.

**OTTAWA, ONT.**—The McDonald Hydro-Electric Htg. Co., Ltd., has been granted permission to operate in Ottawa.

**SMITHVILLE, ONT.**—At a public meeting held recently the ratepayers decided to request the Hydro-Electric Power Commission to prepare an estimate of the cost to supply electricity for lamps and motors to the village and surrounding territory.

## New Incorporations

**LOVELL, DEL.**—The Nevada-California El. Corp. has filed articles of incorporation under the laws of the State of Delaware. The company is capitalized at \$30,000,000 and proposes to organize syndicates, associations and corporations, to construct and operate telephone and telegraph lines, oil and gas plants and to generate and distribute electricity. The incorporators are Lawrence C. Phipps, Guilford S. Wood, W. E. Porter and H. D. Thatcher, all of Denver, Col.; Arthur B. West and Rodney Curtis, of Riverside, Cal.

**STANLEY, N. D.**—The Stanley El. Co. has been incorporated with a capital stock of \$10,000 by N. G. Nelson, O. M. Klien and A. G. Holm, all of Stanley.

**MONTPELIER, VT.**—The Third Falls Pwr. Co. has been incorporated by Bancroft Abbott, of Norwood, Mass.; Charles H. Thompson, Benjamin A. Sumner, both of Montpelier, and Frank A. Walker, of Barre. The company is capitalized at \$150,000 and proposes to develop water-power and generate electricity at a plant to be built on the Lamolite River.

**RICHLANDS, VA.**—The Richlands Ser. Corp. has been incorporated with a capital stock of \$25,000 to construct and operate gas plants.

**TACOMA, WASH.**—The Molander-Hawaiian Pwr. Co., of Tacoma, has filed articles of incorporation with the county auditor. The company is capitalized at \$250,000 and proposes to develop electricity and distribute same in Tacoma and vicinity. The incorporators are George C. Bratt, H. A. Frauens and Samuel Cassimer, all of Tacoma.

**FAIRWEATHER, WIS.**—The Fairweather El. Co. has been incorporated with a capital stock of \$25,000. The incorporators are: John C. Laper, John O. Laper and Jesse W. Laper.

# Weekly Record of Electrical Patents

## UNITED STATES PATENTS ISSUED

DEC. 15, 1914.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York, N. Y.]

1,020,668. FLASHLAMP ATTACHMENT FOR ELECTRIC BATTERIES; F. Basedow, Chicago, Ill. App. filed June 4, 1914. Mixture lamp with switch clamped to terminals of battery cell.

1,120,708. CURRENT-CONTROLLING APPARATUS; E. L. Gale, Sr., Yonkers, N. Y. App. filed May 1, 1905. Motor starter.

1,120,709. AUTOMATIC STARTER FOR ELECTRIC MOTORS; E. L. Gale, Sr., Yonkers,

N. Y. App. filed May 26, 1905. Has manual switch for successively closing circuits in certain order.

1,120,712. CONTACT-MAKING MECHANISM; C. I. Hall, Chicago, Ill. App. filed March 10, 1913. By which a slow-moving part makes instantaneous contact.

1,120,728. ELECTRIC BRAKE; W. D. Lutz, Allendale, N. J. App. filed March 20, 1912. Alternating-current brake for elevators.

1,120,748. HOLDER FOR X-RAY TUBES; E. N. Ryder, Brewster, N. Y. App. filed Dec. 19, 1913. By which the rays can be directed upon the head of a patient.

1,120,758. HOT-MEAL SERVER; C. Stirn, San Francisco, Cal. App. filed March 17,

1914. Electric heater keeps food heated while on table.

1,120,769. LAMP ATTACHMENT FOR FIRE-ARMS; O. J. Villaggio, Milwaukee, Wis. App. filed Dec. 26, 1913. Attachable to ordinary revolver.

1,120,780. THERMO-ELECTRIC COOKING POT; H. R. Gehlhoff, Danzig, Langfur, Germany. App. filed April 3, 1912. Concentric thermo-electric couples with the hot joint of one couple adjacent to the cold joint of another couple.

1,120,805. CIRCUIT-CLOSING MECHANISM; T. Gibson, G. A. Farmer and E. Read, Burton-Upon-Trent, Eng. App. filed May 29, 1913. Carried by train and operated by ramp rail.



1121,090. **ELECTRIC DOOR OPENER**; M. Guett, Hartford, Conn. App. filed Jan. 17, 1913. Unlocks the latch without opening the door.

1121,104. **COMBINATION HORN**; J. W. Jones, New York, N. Y. App. filed Nov. 18, 1909. Electric horn combined with a reed horn.

1121,121. **APPARATUS FOR INDICATING A FAIR CHARGE FOR ELECTRICAL CURRENT CONSUMED**; E. T. R. Murray, Radlett, Eng. App. filed Dec. 10, 1910. Instrument with special scale, a movable index and an interfering device thrown into operation when the maximum demand is exceeded.

1121,124. **ALARM SYSTEM**; L. A. Northrup, San Francisco, Cal. App. filed Oct. 14, 1912. Burglar alarm which blows whistle and operates a light.

1121,138. **ANTISTATIC FRICTION DEVICE**; J. J. O'Toole, New York, N. Y. App. filed Jan. 23, 1913. Has collecting fingers rotating above the bed of the printing press or the like.

1121,242. **ELECTRIC TABLE LAMP**; R. S. Gitt, Chicago, Ill. App. filed Apr. 18, 1914. Base, stem and shell made in a one-piece glass shell.

1121,248. **PORTABLE ELECTRIC-LIGHTING APPARATUS**; H. H. Hirsch, Philadelphia, Pa. App. filed March 3, 1913. Miner's lamp with provision to prevent explosions.

1121,249. **PORTABLE ELECTRIC-LIGHTING APPARATUS**; H. H. Hirsch, Philadelphia, Pa. App. filed March 3, 1913. Lamp is automatically extinguished when its casing is subjected to stresses tending to break it.

1121,283. **TRANSLATING DEVICE FOR RAILWAY SIGNALING**; H. D. Patterson, Mount Vernon, N. Y. App. filed June 1, 1909. Alternating-current system.

1121,351. **MANUFACTURE OF INSULATORS FOR HIGH-POTENTIAL ELECTRIC CONDUCTORS**; F. M. Locke, Victor, N. Y. App. filed March 9, 1909. Porcelain base and boron compound fused together to form a homogeneous body.

1121,964. **THERAPEUTIC APPARATUS**; J. H. Neel, Los Angeles, Cal. App. filed Feb. 3, 1913. Series of adjustable oppositely disposed magnets.

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1121,984. **STATIC COLLECTING AND DISCHARGING MECHANISM**; J. S. Thompson, Chicago, Ill. App. filed Feb. 9, 1912. Charges accumulated on printing press are discharged at intervals.

1121,987. **HEATING DEVICE**; F. M. Vogel, Pittsfield, Mass. App. filed Feb. 12, 1912. Parts can be moved to vary the area of contact and flow of heat, as desired.

1121,992. **NEUTRALIZING INDUCTIVE DISTURBANCES**; F. W. Alexanderson, Schenectady, N. Y. App. filed April 2, 1913. Alternating-current electric-railway system.

1121,995. **SIGNALING SYSTEM**; C. E. Beach, Binghamton, N. Y. App. filed Jan. 23, 1914. Series of switch mechanism for fire-alarm system.

1121,997. **ELECTROMAGNETIC SELECTIVE DEVICE**; W. S. Burnett, Milwaukee, Wis. App. filed Aug. 23, 1909. Applied to signal locking or unlocking mechanism.

1121,014. **ELECTRIC APPARATUS**; H. M. Hobart, Schenectady, N. Y. App. filed Jan. 23, 1914. Cools dynamo-electric machines by wetting the surface of the cores and then directing a current of air upon the wetted surface.

1121,065. **METHOD OF AND APPARATUS FOR PREVENTING SPARKING IN DYNAMO-ELECTRIC MACHINES**; B. J. Bolcourt, Colorado Springs, Col. App. filed Jan. 27, 1911. Ratio of interpole magnetic motive force is jumped up during abnormal loads.

1121,067. **ELECTRIC BELL**; S. C. Bryanti, Chicago, Ill. App. filed Aug. 27, 1913. Highway crossing bell.

1121,074. **ELECTRIC HEATER**; H. W. Denhard, San Francisco, Cal. App. filed July 17, 1908. Positive and negative electrodes submerged in water.

1121,077. **ELECTRODE DEVICE FOR HIGH-FREQUENCY APPARATUS**; W. Dubilier, Brooklyn, N. Y. App. filed Nov. 21, 1910. Rod electrode adjustably supported in a hollow casing electrode.

1121,090. **ELECTRIC DOOR OPENER**; M. Guett, Hartford, Conn. App. filed Jan. 17, 1913. Unlocks the latch without opening the door.

1121,104. **COMBINATION HORN**; J. W. Jones, New York, N. Y. App. filed Nov. 18, 1909. Electric horn combined with a reed horn.

1121,121. **APPARATUS FOR INDICATING A FAIR CHARGE FOR ELECTRICAL CURRENT CONSUMED**; E. T. R. Murray, Radlett, Eng. App. filed Dec. 10, 1910. Instrument with special scale, a movable index and an interfering device thrown into operation when the maximum demand is exceeded.

1121,124. **ALARM SYSTEM**; L. A. Northrup, San Francisco, Cal. App. filed Oct. 14, 1912. Burglar alarm which blows whistle and operates a light.

1121,138. **ANTISTATIC FRICTION DEVICE**; J. J. O'Toole, New York, N. Y. App. filed Jan. 23, 1913. Has collecting fingers rotating above the bed of the printing press or the like.

1121,242. **ELECTRIC TABLE LAMP**; R. S. Gitt, Chicago, Ill. App. filed Apr. 18, 1914. Base, stem and shell made in a one-piece glass shell.

1121,248. **PORTABLE ELECTRIC-LIGHTING APPARATUS**; H. H. Hirsch, Philadelphia, Pa. App. filed March 3, 1913. Miner's lamp with provision to prevent explosions.

1121,249. **PORTABLE ELECTRIC-LIGHTING APPARATUS**; H. H. Hirsch, Philadelphia, Pa. App. filed March 3, 1913. Lamp is automatically extinguished when its casing is subjected to stresses tending to break it.

1121,283. **TRANSLATING DEVICE FOR RAILWAY SIGNALING**; H. D. Patterson, Mount Vernon, N. Y. App. filed June 1, 1909. Alternating-current system.

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**ELECTRICAL ENERGY**; P. C. Hewitt, New York, N. Y. App. filed Jan. 30, 1909. Produces intermittent or vibratory current.

1121,361. **VAPOR-ELECTRIC APPARATUS**; P. C. Hewitt, New York, N. Y. App. filed Feb. 4, 1903. Provision made for cooling and maintaining the proper purity and density of gas or vapor.

1121,368. **METALLIC-FILAMENT LAMP**; H. J. Jaeger, Wehewaken, N. J. App. filed Jan. 27, 1914. Has high and low candle-power filaments for use on automobiles.

1121,374. **CAP FOR LAMP SOCKETS, PENDENT SWITCHES AND OTHER ELECTRICAL DEVICES**; C. Klein, Milwaukee, Wis. App. filed April 8, 1912. Cap lining retained in place by a yieldable member engaged beneath edge of the lining.

1121,379. **ELECTRICALLY PROPELLED VEHICLE**; H. W. Leonard, Bronxville, N. Y. App. filed March 2, 1903. Prime mover drives generator which supplies the propelling motors. (Fifty-six claims.)

1121,380. **ELECTRICALLY PROPELLED VEHICLE**; H. W. Leonard, Bronxville, N. Y. App. filed March 2, 1903. Individual electric motor for each drive wheel.

1121,381. **ELECTRICALLY PROPELLED VEHICLE**; H. W. Leonard, Bronxville, N. Y. App. filed March 2, 1903. Two drive motors for each drive wheel.

1121,400. **AUTOMATIC TELEPHONE CALLING DEVICE**; P. Richardt, Prague, Austria-Hungary. App. filed Nov. 25, 1912. Ringing accomplished by merely taking receiver off the hook.

1121,409. **PROCESS FOR REMOVING LIQUID FROM ORGANIC AND INORGANIC SUBSTANCES**; B. Schwerin, Frankfurt-on-the-Main, Germany. App. filed April 6, 1914. Particularly for drying peat.

1121,416. **AUTOMATIC ELECTRIC GAS-DRIP ALARM**; C. H. Stevick, Astoria, N. Y. App. filed Jan. 23, 1914. Gives notice of collection of condensation water in a gas pipe or drip cup.

1121,420. **OPERATING MEANS FOR ELECTRIC-LAMP SWITCHES**; A. J. Tigley, New York, N. Y. App. filed July 14, 1914. Has a rotary switch member.

1121,424. **SIGNALING APPARATUS FOR VEHICLES**; W. M. Voss, Tampa, Fla. App. filed May 11, 1914. Automatic rear signal.

1121,444. **ELECTRIC WIRE CONDUIT FOR BUILDINGS**; L. Adler, New York, N. Y. App. filed April 23, 1913. Made of sheet metal, elliptical in cross-section.

1121,473. **TRANSFORMER**; J. L. Conry, Aubur, N. Y. App. filed Jan. 10, 1913. For wireless work; special arrangement of primary and secondary windings.

1121,539. **CIGAR LIGHTER FOR ATTACHMENT TO AUTOMOBILES AND THE LIKE**; M. C. Schwab, Chicago, Ill. App. filed March 23, 1913. Attachable to the steering wheel.

1121,540. **ELECTRIC RECORDING INSTRUMENT**; A. L. Sohn and C. L. Adams, Los Angeles, Cal. App. filed April 20, 1910. Employees' recording device.

1121,544. **CONTROL SYSTEM**; N. Wilkinson, Milwaukee, Wis. App. filed Sept. 13, 1909. Uses resistance for a rheostat as a discharge resistance.

1121,545. **DYNAMO-ELECTRIC MACHINE**; R. B. Williamson, Milwaukee, Wis. App. filed Oct. 5, 1908. Fastening for the stator coils.

1121,561. **ADVERTISING DEVICE**; H. J. Keating, Chicago, Ill. App. filed June 2, 1913. Solenoids with air pistons controlling the movement.

1121,562. **SELECTIVE SIGNALING SYSTEM**; O. T. Ladenan, Milwaukee, Wis. App. filed April 30, 1912. Of particular utility in connection with railroad lines.

1121,587. **MOTOR STARTER**; A. C. McWilliams, Chicago, Ill. App. filed Feb. 19, 1912. For alternating-current motors.

1121,574. **CIRCUIT INTERRUPTER**; C. Ralboro, Wilkinsburg, Pa. App. filed Oct. 7, 1908. For high-voltage alternating-current circuits.

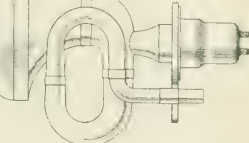
1121,575. **CULINARY APPARATUS**; T. Abt-meyer, Wilkinsburg, Pa. App. filed March 13, 1911. Frying-pan construction.

1121,591. **THERMOSTATIC VALVE**; J. F. McElroy, Albany, N. Y. App. filed May 27, 1910. For steam-heating apparatus on a railway car.

1121,593. **ALARM MECHANISM FOR DISTRIBUTION SYSTEMS**; James D. Nelson, Cincinnati, Ohio. App. filed Feb. 9, 1911. For automatic fire-extinguishing sprinklers.

13,849 (reissue). **APPARATUS FOR MELTING AND MIXING METALS IN VACUO**; W. S. Simms, London, England. App. filed Sept. 16, 1913. Original patent No. 1,015,091, dated Jan. 16, 1912. Tilting crucible contained in vacuum chamber.

1,121,104—Combination Horn





















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